EXPANSIVE LEARNING IN TECHNOLOGY STARTUP ORGANIZATIONS: AN ACTIVITY-THEORETICAL ANALYSIS

by

George Chiran

A thesis submitted in conformity with the requirements for the degree of

Doctor of Philosophy

Department of Leadership, Higher and Adult Education
Ontario Institute for Studies in Education
University of Toronto

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2019

Department of Leadership, Higher and Adult Education
Ontario Institute for Studies in Education – OISE
University of Toronto

Abstract

This study examines the complex, and sometimes conflicting dimensions of learning dynamics in highly innovative, rapidly transforming startup organizations, from an activity-theoretical perspective. Given the pivotal role startups play in the innovation economy, it is important to better understand these dynamics and associated tendencies in development by conceptualizing learning as both a socio-culturally mediated, collaborative and contradictory process, situated in times of rapid change. To examine these dynamic relations, the study draws upon key concepts from the Cultural Historical Activity Theoretical (CHAT) tradition, which are applied and extended to develop an expansive view of learning in startup organizations examined. The study is designed to address two overarching objectives. First, by developing a greater understanding of mediation/boundary crossing/contradiction (MBCC) dynamics in startup organizations in the process of development - area which I will demonstrate has not been effectively examined in Information and Knowledge Management (IKM) literature - this study will contribute to an understanding of conditions and relations shaping the processes inherent in distinct and divergent trajectories of tendential development in relation to knowledge creation in organizations examined. Second, central to the activity-based approach adopted in this study is a robust examination of the potential for expansive learning (PfEL) in startup work, conceived as a function of a contradiction/resolution/synthesis (CRS) dynamic, grounded empirically. Research
findings provide original and valuable contributions not only to CHAT research but also to the field of IKM and adjacent domains of adult education and entrepreneurship learning, broadly conceived. It is argued that the focus on everyday work practices of startup organizations provides a foundation in understanding tendential development and learning in startup work, complementing existing approaches to conceptualizations of learning in IKM literature.

Keywords: expansive learning, learning dynamics, information and knowledge management, dynamics of change in learning, startup learning
Acknowledgments

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# List of Abbreviations

ACEG – Advisory Council on Economic Growth  
ADS – Activity Developmental Specimen  
BPR – Business Process Reengineering  
CHAT - Cultural Historical Activity Theory  
CRS – Contradiction/Resolution/Synthesis  
EL - Expansive Learning  
EVoL – Expansive View of Learning  
GoC - Government of Canada  
IKM - Information and Knowledge Management  
ISED – Innovation, Science and Economic Development Canada  
ICT - Information and Communication Technologies  
KAT – Key Analytic Theme  
KBE - Knowledge Based Economy  
MBCC – Mediation/Boundary Crossing/Contradiction  
PfEL – Potential for Expansive Learning  
PMP – Project Management Professional  
RQ – Research Question  
SMB - Small and Medium Business
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Chapter 1: Struggles of Development in Startup Work: Knowledge, Learning and Creation of New Work Practice

This study aims to enhance and complement conceptualizations of learning dynamics in rapidly developing high-tech, knowledge economy organizations from an activity-theoretical perspective, using technology startup organizations as illustrative contexts for the study. Consequently, this introductory chapter outlines the importance of the research topic examined by presenting the research context, implications of the study and value for theoretical development and practice. Relevant definitions are introduced to orient the development of key concepts, which are further elaborated in greater depth and applied for the analysis in later chapters. The following sections also include an introduction to the complex challenge of research focused on learning in startup contexts. Research findings, while exploratory in nature, provide original and valuable contributions to an activity-theoretical re-conceptualization of learning in Information and Knowledge Management (IKM) scholarship and the field of adult learning, more broadly conceived.

1.1 Organizational Context of Innovation and Development: Cultural and Historical Perspectives of Startup Work

This study is positioned in the context of substantial interest for innovation focused practices of emerging, high-tech, knowledge economy\(^1\) organizations undergoing rapid transformations towards new forms of work and learning, a context which, I argue, is characterized by uncertainty, complexity and rapid change. The Advisory Council on Economic Growth (ACEG) highlights the importance of the contemporary economic environment, stating that:

\(^1\) A broad range of views exist in relation to what precisely might constitute a knowledge economy in contemporary society (Miettinen, 2012; Powell & Snellman, 2004). In the context of new demands in the organization of production and pronounced effects of economic growth, meeting emerging challenges of learning at work requires an attention to the changing dynamics of innovation-driven qualitative transformations. As Virkkunen and Newnham (2013) noted, these historical changes “have not been a smooth accumulation and increase in knowledge but have rather taken place as surges of innovation-triggered qualitative transformations” (p. 1). Consequently, they present new challenges in relation to new “ways of learning and accumulating knowledge and passing it on, interacting with changing ways of organizing production and regulating economic activities and social behavior” (Virkkunen and Newnham, 2013, p. 1). Positioning this study in the context of changing ways of development, knowledge creation and learning, we can begin to understand how associated innovation-driven knowledge creation activities shape and are shaped by overarching, macrostructural influences, and situated, socio-cultural dynamics of variations, change and development in practice.
Canadian workers face a rapidly changing economy which will have a profound impact on the nature of work and jobs of the future. To be equipped for this change, there is a critical need for Canada to rethink our approach to learning, work, and training. (ACEG, 2017b)

A significant direction in response to these challenges may be conceptualized in relation to an imperative to develop what the European Commission (2007) terms as a sense of initiative and entrepreneurship, and which is described as:

[…] the ability to pursue and persist in learning, and to organise one’s own learning including through effective management of time and information, both individually and in groups. This competence includes awareness of one’s learning process and needs, identifying available opportunities, and the ability to overcome obstacles in order to learn successfully. This competence means gaining, processing and assimilating new knowledge and skills as well as seeking and making use of guidance. Learning to learn engages learners to build on prior learning and life experiences in order to use and apply knowledge and skills in a variety of contexts: at home, at work, in education and training. Motivation and confidence are crucial to an individual’s competence. (2007, p. 8 in Ontario, 2016, p. 20)

To extend this idea and building on Engeström’s concept of expansive learning, extensively applied in this study, I argue that we not only need to learn how to learn, but also learn to learn ‘what is not yet there’, both individually and collectively. However, while claims for the importance of learning in the context of these turbulent times of change are now pervasive, actual documentation of the dynamics of learning and knowledge creation have been fragmented and uneven to date. Overall, there is considerable attention to startups both as integral components of the Canadian innovation economy and as significant settings for knowledge creation in the broader context of digitization and interconnectivity enabling new modalities for development with implications for regional ecologies for innovation and broader national super-cluster initiatives (GoC, 2017; Huynh & Do, 2016; Tibando & Do, 2018). Based on these considerations, the changing nature of work coupled with the introduction of new tools and practices in startup environments offer opportunities to rethink modalities in which activities focused on knowledge creation can support skill development and learning continuously and effectively (Adner, 2006; Haapasaari, Engeström, & Kerosuo, 2018).
Despite the growing popularity of work in the field of entrepreneurship and innovation, the unique contexts of startup organizations bring about challenges which are difficult to address or solve. While often significant or unexpected, these challenges should be addressed and overcome in order to foster new opportunities for development and change which may enable collaborative, inclusive and transformative cultures that widen individual and collective horizons of possibilities. As Giardino, Unterkalmsteiner, Paternoster, Gorschek, & Abrahamsson (2014, p. 28) point out, startups represent highly significant elements of the innovation economy. They emphasize that “[i]n the US alone, 476,000 new businesses are established each month, accounting for about 20% of job creation” (p. 28). The importance of learning in these environments is a significant area of interest, as Giardino et al. (2014) further highlight: “[t]he environment of startups is dynamic, unpredictable and even chaotic, forcing entrepreneurs to act quickly, fail fast and learn faster to find a market niche” (p. 28). In this study, we can observe similar characteristics across participating startups, in particular in relation to unpredictability in development, resulting in distinct strategies for knowledge creation in coping with rapid change.

It is significant to note that a robust understanding of learning dynamics in startup organizations represents a highly valuable area of interest for both academic research and practice, especially in the context of new trends reflected in an increased attention to entrepreneurship and innovation. In the Canadian context, this attention for innovation is reflected in initiatives at the national level, an example of which is the innovation superclusters initiative (GOC, 2018). Furthermore, over the past years, new supportive systems for startups have emerged in Canadian ecologies for innovation, enabled by a significant attention to innovation as a driver for change and development (Tibando & Do, 2018; Wolfe, 2018).

Nevertheless, despite a growing interest in supporting startup models both in professional settings (incubators, accelerators) and higher education (campus-linked accelerators/incubators), there have been few attempts at understanding the nature and role of learning in relation to everyday knowledge creation in startup work practices in relation to their ongoing struggles to develop and grow despite often challenging conditions of uncertainty and rapid change. This study therefore contributes towards a more comprehensive and a conceptually robust examination of important

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2 The official website for this program describes the contemporary attention to innovation and the novelty of the specific context upon which this study focuses as follows: “This initiative is a first of its kind for Canada, fostering stronger connections—from large anchor firms to start-ups, from post-secondary institutions to research and government partners—and opening the door to new forms of industry partnership. It represents a significant commitment to partnering with industry and supporting the success of leading domestic and global companies that choose to innovate in Canada” (GoC, 2018).
aspects which can be used to both better understand and potentially support the work/learning experiences of startup professionals within the dynamic and rapidly changing conditions of their distinct work environments.

In order to better understand the social and cultural context of *startup work* at the specific historical time and place of the research study as presented in this dissertation, several additional points of clarification are necessary. Notably, over the past decades, the overall business environment for startups has evolved significantly, as new resources such as accelerators, incubators, or diverse forms of co-working models emerged to address startup needs in the Canadian innovation sector. As the economic environment continues to change due to factors including technological advancements or economic policies, new clusters of innovative organizations continue to emerge and challenge existing business models. Furthermore, incubator and accelerator programs have evolved over the past years\(^3\), supporting these clusters of startup organizations through community building and diverse resources supporting growth. In addition to providing support for these emerging companies, these organizations create opportunities for talent development and learning. These opportunities can be conceptualized on a continuum from formal workshops and courses designed to prepare future entrepreneurs for the challenges of leading startup organizations, to informal learning opportunities, creating possibilities for new connections, or facilitating opportunities for productive interactions between different stakeholders, founders and individuals who work in these highly dynamic environments (Bramwell, Hepburn, & Wolfe, 2012).

The concept of historicity, as conceptualized in the CHAT tradition, encourages an awareness of a past-present-future continuum which shapes the conditions of development in organizations, and which is itself shaped by the dynamics surrounding progression over time. This concept, in relation to activity offers an “explanation of how people make history but not as they choose” (Sawchuk, 2013, p. 99). Based on this principle, we need to “explore the successive and intersecting developmental layers, including the emergent new ones, in the activities under

\(^3\) It is relevant to mention in relation to the activity-theoretical concept of *historicity* and the macro structural dynamic highlighted in this chapter that government policy, industry/sectoral investments were related to “strategies that would transform regional innovation ecosystems and develop job-creating superclusters of innovation, like Silicon Valley” (GoC, 2019). In this context, we can interpret findings as “evidence of layers of history actively influencing the present-day actions of the subjects” and remember that ”[h]istory is always present in human activity. Layers of historically earlier forms of the activity can be both constraints and resources. They persist in practical routines, in ways of thinking, in material artifacts and rules. If one tries to understand activity without historicity, consequential phenomena […] are easily dismissed as arbitrary irrational features, even pathologies, of certain individuals or classes of people, to be eliminated or, at best, ignored” (GoC, 2019)
scrutiny” (Engestrom, 2005, p. 323). Consequently, if we consider the continuum between the past, present and future in relation to ongoing development, we can make inferences about experiences which shape experiences in startups and which result in distinct outcomes under demanding conditions over time. Past experiences, either within the organization or in distinct contexts produce learning experiences which are reflected in ongoing decisions as well as broader “modes of participation” in activity in the present. Similarly, the promises of desired outcomes in relation to future objects and goals either reinforce or inhibit these modes of participation. The promise of a future outcome which is desirable or rewarding represents a potential that startups gravitate towards. On the other hand, the fear or dissatisfaction associated with past experiences represent elements associated to learning which also shape modes of participation in development, the activities people chose or the ones they avoid. Overall, we might conceptualize startup development as actively constructed and dialectically navigated, on a continuum between these past experiences and the potential of future projections; a continuum which may be meaningfully described in terms of trajectories of development and change. In relation to historicity, Virkkunen (2009) noted the importance of increasingly complex and interconnected forms of knowledge creation, pointing out:

On the global level, the historical socialization of forces of production seems to proceed in waves of transformation triggered by technological revolution (Freeman & Louça, 2000). At present, the emerging digital information and communication technology is fueling a great leap in the socialization of human activities, leading to the integration of functions and ever more complex and tightly interconnected systems of human activity. The knowledge management discourse is an offspring of this historical transformation: the socialization of forces of production increasingly involves the deeper division of labor, as well as broader and intensified exchange in the production of knowledge and learning (von Hippel, 2005; Zuboff, 1988). There is an increasing need not only for theoretical generalizations and scientific knowledge in productive activities, but also for new kinds of platforms and instrumentalities for integrating various forms of scientific and technological knowledge in order to master increasingly complex objects (Keating & Cambrosio, 2003). (p. 144)

As will become increasingly clear in this study, learning shapes startup knowledge creation practices, and knowledge creation practices in turn shape the forms of learning which guide everyday work activities. Furthermore, as Virkkunen & Newnham (2013) point out, “[l]earning
and knowledge creation is about generalization, that is to say, identifying essential differences and variation” (p. 2). This complex and recursive relation is reflected in the multiple conceptualizations of knowledge acquisition in the context of startup work, as exemplified in a multiplicity of definitions (Mårtensson, 2000; Ruggles, 2009). Relating the complexity of learning to knowledge creation in startup contexts is challenging in part due to the intricacy of associated phenomena as reflected in various definitions and frameworks which are prevalent in other theoretical traditions. Such diversity of definitions, however, can also be seen as an opportunity for dialogical approaches seeking to understand the implications of knowledge creation/learning for organizational development, building on considerations of relevance for practical approaches to learning in startups.

Understanding the importance of startup organizations as a uniquely relevant context for the examination of knowledge creation and expansive learning (EL) developed in this research study requires an awareness of cultural, historical and social dimensions framing the specific conditions contributing to the unique orientations for development of the organizations examined, an interplay of multiple dimensions which may be described as the macro-structural dynamic of development. This overarching dynamic provides important elements for the conceptualization of startup development on a continuum between the past and the future, within and across bounded conditions which shape progression towards their goals. Within this dynamic, we can observe the interplay of forces which shape the activities of organizations as they progress from their origins towards set goals. As they develop, organizations, both self-consciously and un-self-consciously, define and re-define their objects, constructing their identities in relation to activities which are influenced or “mediated” by broader narratives of innovation and success embedded within these broader dynamics they are positioned in. The stories startups construct in the context of their development are important in their transformation, and, as we will observe in subsequent chapters, mediate their progression over time as they navigate these macro structural dynamics in both similar and more divergent ways over time.

To further understand what I refer to as the broader macro-structural dynamic, it is important to take a moment to reflect on some relevant statistics and their implications for startup

---

4 Broadly conceived, Expansive Learning (EL) can be described as a “historically new type of learning, which emerges as practitioners struggle through developmental transformations in their activity systems, moving across collective zones of proximal development” (Sannino & Engeström, 2018, pp. 46–47). In this context, “[t]he metaphor of expansion depicts the multidirectional movement of learners constructing and implementing a new, wider, and more complex object for their activity” (Sannino, Engström, & Lemos, 2016, p. 603).
organizations. A national survey research study conducted by Innovation, Science and Economic Development Canada (ISED), for example, provides useful insights into challenges faced by small organizations in relation to learning. It is relevant to underline that startups examined shared characteristics of small organizations in general and displayed unique characteristics of the specific nature of startups in particular⁵. According to ISED (2016), 54.1% of businesses in Canada have between 1 and 4 employees. These small organizations represent "micro-enterprises". A more detailed chart illustrating the prevalence of small businesses (1-99 employees) is shown below:

<table>
<thead>
<tr>
<th>Number of Employees</th>
<th>Cumulative Percentage of Employer Businesses</th>
<th>Total</th>
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<tbody>
<tr>
<td>1-4</td>
<td>54.1</td>
<td>632,460</td>
</tr>
<tr>
<td>5-9</td>
<td>73.5</td>
<td>226,412</td>
</tr>
<tr>
<td>10-19</td>
<td>86.2</td>
<td>147,823</td>
</tr>
<tr>
<td>20-49</td>
<td>95.1</td>
<td>103,607</td>
</tr>
<tr>
<td>50-99</td>
<td>97.9</td>
<td>33,328</td>
</tr>
<tr>
<td>Small (1-99)</td>
<td>97.9</td>
<td>1,143,630</td>
</tr>
</tbody>
</table>

Table 1 Number of Employer Businesses by Number of Employees (ISED, 2015)

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⁵ Development in start-ups, as will become increasingly clear in subsequent chapters, requires transformative forms of knowledge and learning which emerge in obvious and less obvious ways as these organizations navigate the turbulent conditions of rapid change in development. This dialectical form of development requires, in other words, “learning what is not yet there” (Sannino, Engeström, & Lemos, 2016, p. 603) given startups must chart new horizons almost continually. The knowledge created in the context of development is inextricably linked to learning and the struggles of everyday life/work of start-up organizations. Consequently, this study seeks to illuminate the human face of start-up learning and organizational life in relation to information and knowledge management (IKM) practices for development, as viewed from the vantage point of CHAT/EL.
The statistics related to firm size are relevant in underlining the importance of better understanding aspects of learning in small organizations, which represent a surprisingly large proportion of all organizations in the Canadian economy:

While it is well understood that small businesses make up nearly the entirety of all firms, just how small these firms are is not common knowledge. Of the 1,167,978 employer businesses active in Canada, micro-enterprises (firms with 1 to 4 employees) constitute 54.1 percent of all private employers, which is the largest SME group. If the groups of employer businesses with 5 to 9 and 10 to 19 employees are included, they account for 86.2 percent of employer businesses. (GoC, 2016)

A glance at these basic statistics illustrates the prevalence of small organizations in the Canadian economy and, in turn, the need for a deeper understanding of practices which facilitate or hinder the creation of knowledge which is required for development. This knowledge, I argue, is inextricably linked to learning. However, these statistical summaries, illustrate little about the everyday practices of startups specifically and how learning is constructed, structured and potentially expanded in the context of the actualities of startup work. Consequently, this study aims to contribute empirical insights in relation to the potential for expansive learning based on the lived experiences of participants in the specific context of startup organizations conceptualized within the broader category of Small and Medium Businesses (SMBs) and viewed from an activity-theoretical perspective. The importance of new ways of learning in rapidly changing work environments has been widely acknowledged in the field of IKM (Ala-Mutka, Punie, & Redecker, 2008; Ala-Mutka, 2008). However, relatively little is known about the ways startup employees themselves navigate organizational practices to pursue learning and development opportunities in the context of knowledge creation practices in their organizations. Moreover, there is a dearth of studies utilizing robust theories of learning to interpret these practices in times of rapid change.

Addressed in detail later on in the thesis, it is important to mention that existing literature related to learning in startups observed how professionals sometimes struggle in the process of defining their work and learning approaches in response to changing expectations for collaboration and responsiveness, blending dimensions of work and learning in practice (Aldrich...}

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6 Startups can be conceptualized as a small subset of small and medium businesses (SMBs), and can be distinguished through several indicative characteristics, as further discussed in this chapter. Notable characteristics include a pronounced focus on innovation, high levels of uncertainty and rapid change in development, among others.
Observations emerging from this study suggest that startup employees need to learn new models or skills rapidly and refine practices to enhance professional competences, which in turn may indicate that individuals struggle in redefining their work through new tools, practices and by operating in new and innovative ways (Almeida, Dokko, & Rosenkopf, 2003; Mansoori, 2017; Scarmozzino, Corvello, & Grimaldi, 2017). Strategies for development sometimes require adaptation or change, sometimes both (e.g. changing the conditions to which one then adapts). They require an evaluation of what is known, familiar, predictable on one hand, and what is new, unfamiliar and potentially unpredictable on the other.

The complexity of examining the multi-layered, situated and contextual nature of learning in organizations represents a challenge for scholars in a broad range of disciplines. To address this challenge, this study adopts and applies three key themes relevant in the conceptualization of expansive learning as a socio-cultural process as it develops over time, as viewed from the perspective of startup employees. Aspects of CHAT as a research lens have been discussed in previous studies from multiple perspectives. This research seeks to advance IKM literature by addressing a number of key analytic themes (KATs); namely, the conceptual themes of mediation, boundary crossing and contradictions as interrelated analytic themes building the basis of a framework designed to analyze the complex socio-cultural phenomena underpinning learning processes in everyday startup work activities for knowledge creation examined in times of rapid change. Following brief descriptions of these key analytic themes which provide the foundations for the framework proposed, insights derived empirically from data are used to extend and integrate a model for the potential for expansive learning using a CHAT-based analysis to illustrate contributions to IKM literature in support of arguments proposed. These contributions to scholarship are argued to contribute to existing literature by providing perspectives which can enhance the understanding of learning in startup work activities in relation to their potential for the generation of expansive learning in practice.

Aspects of learning have been explored empirically in IKM literature, yet the literature review in Chapter 3 suggests that there is limited research in this body of literature examining the dynamic breadth and depth of learning as understood in the activity-theoretical tradition. To demonstrate the limited conceptualizations of learning in IKM literature and illustrate areas where an activity-based approach can complement, deepen and/or extend existing studies, this research leverages selected concepts from CHAT to evaluate aspects of learning which have
largely been neglected in studies of information and knowledge management. On the basis of the review completed, I contend that the KATs mentioned above and adopted here provide new directions in conceptualizing socio-cultural dimensions of learning which have largely been understudied. To address these areas for intervention, I examine empirically how and to what degree learning is enabled by translation efforts of contradictions in startup work processes, focusing on relations between the constituents of activity systems and activity systems themselves as they relate to change and development.

Understanding the complexity of learning in startup work environments requires an in-depth conceptualization of relations between the constituent components of activity in development, while simultaneously taking into account the unpredictability and changing nature of organizational requirements. In particular, the rapidly changing nature of startup work conditions, I argue, presents distinctive opportunities for new insights into processes and practices at the basis of learning, development and the creation of knowledge as these organizations navigate uneven domains of uncertainty and complexity in development. As Engeström and Sannino (2010) point out:

The basic argument for such a focus on work settings is that traditional modes of learning deal with tasks in which the contents to be learned are well known ahead of time by those who design, manage and implement various programs of learning. When whole collective activity systems, such as work processes and organizations, need to redefine themselves, traditional modes of learning are not enough. Nobody knows exactly what needs to be learned. The design of the new activity and the acquisition of the knowledge and skills it requires are increasingly intertwined. (p. 104)

Indeed, in times of rapid change, traditional models are insufficient in examining learning dynamics, especially when, as Engeström and Sannino’s (2010a) comments above underline, “nobody knows exactly what needs to be learned” (p. 104). The evolving nature of work and increasingly shorter product life cycles are also reflected in the shift from standardized to fluid and complex practices which require more integrative analytic approaches. Evolving transformations reflect constantly shifting processes in which “accelerated concept-level changes in work and organizations require generalization and learning that expand the learners’ horizon and practical grasp up to the level of collective activity systems” (Engeström & Sannino, 2010, p. 104). Consequently, there is a need for an expansive approach to development, which can facilitate the “formation of new types of activities and use values with huge expansive potentials”
(Engeström & Sannino, 2010, p. 104), to address both the societal changes as well as what Engeström refers to as “runaway objects” (Engeström, 2009). Viewed integratively, these aspects present “tremendous challenges for concept formation and practical redesign at a scale that has to exceed the boundaries of any single discipline, profession or organization” (Engeström & Sannino, 2010, p. 104). These economic and work-related shifts are described by Engeström and Sannino (2010) as follows:

In mass production, what needed to be mastered was variation in the ways different workers performed the same tasks. This led to standardization of key actions and action sequences. In modern flexible mass production or ‘lean production’, what needs to be mastered is variation in the form of deviations from an optimal streamlined process, that is, breaks, disturbances and waste. This leads to continuous process optimization.

(Engeström & Sannino, 2010, p. 104)

The tensions between variation and standardization in work practices acquire significance in the context of innovative work environments where disturbances and discontinuities seem to be more prevalent in comparison to environments characterized by more repetitive, routinized work. The new forms of production in startup work appear to be distinct in terms of their processes, requiring the creation of knowledge in navigating the complexity of change for development. By adopting a focused, systematic empirical approach to the study of learning in such environments, this research aims to explore how and to what degree learning is mediated and how active individuals are initiating, engaging in or otherwise actively pursuing learning opportunities within and across organizational boundaries, areas which have so far remained elusive in the body of literature examined.

Based on these considerations, this research study provides an important opportunity to advance the understanding of learning in startups at a time of profound transformations in work, broadly conceived, facilitated by advancements in communication speeds or emerging practices and methodologies resulting in pressures and changing expectations of workers as learners (Chiva, Ghauri, & Alegre, 2014; Lee & Walsh, 2016). Resulting changes in learning dynamics however, cannot be separated from factors related to social and cultural mediations including the nature of information/knowledge, collaborative conceptualizations of cultural, historical contexts, and often contradictory aspects of change in the context of development and innovation over time (Engeström, 2016a; Sannino, Daniels, & Gutiérrez, 2009). These broader
structures could be meaningfully described as the third dynamic referred to in this study, the *macro-structural dynamic of knowledge creation and learning in startup development*.

1.2 Struggles for Development of Small Startup Organizations in Conditions of Uncertainty, Limited Resources and Rapid Change

This research study examines learning dynamics in the “turbulent worlds of work and technology” (Engeström, 2005a, p. 172) in startup organizations as revealed in uncertain and unstable situations in which organizational practitioners are required to deal with and manage complexity and change. In these work environments, practitioners develop specific types of knowledge and skills under rapidly shifting conditions characterized by uncertainty and *rapid change*. Competences of individuals are often judged on their ability to respond to and manage events and issues that seem to be new, unusual and overall challenging. Navigating these forms of complexity in startup work therefore requires individuals to develop new instruments and forms of collaboration that mediate between individuals and the often-unpredictable objects of their activity (Engeström & Scaratti, 2016). While the need for knowledge creation is an important element for the development of startups, especially in times of *rapid change*, little is known about the mechanisms used by these organizations and the individuals within them in navigating the challenging conditions defining their growth.

The creation of knowledge for development requires gathering information, but also questioning, analyzing and implementing new ideas. In other words, it involves transforming the unknown into insights which are relevant, and which are related to the objects and goals of development. This knowledge is important for supporting practices which are repeatable, patterned and familiar. These repetitive actions provide elements to a basis for adaptation. On the other hand, the knowledge created in the process of development requires encounters with the unexpected in the complexity of ecologies startups are part of. This ambivalent nature of development taking place in the absence of prescriptive approaches is challenging and contradictions necessarily emerge as organizations develop towards their objects, transforming challenges of past experiences into desired future outcomes, in different ways and to different degrees in practice. These approaches to development and the creation of knowledge can be conceptualized on a continuum and their transformative potential is dependent upon the specific context in which they take place, or, what could be meaningfully described as the *situatedness* of
activity, an aspect to which I will return in the theoretical explanations which follow in a subsequent chapter.

Navigating uncertainty involves encountering the unknown and unexplored, which can be both promising and terrifying simultaneously, evoking excitement and fear, hope and anxiety, or certainty and uncertainty. Overall, it requires attention to opportunities for transcending contradictions inherent in it, and the development of skill to distinguish relevance in an ocean of details. I refer to this process of transcendence as the translation of contradictions in practice. Navigating between the known and the unknown through activity presents opportunities to realize the full potential of possibilities in work and learning, despite the range of paradoxes, dilemmas, double binds and other manifestations of contradictions encountered in this process.

Struggles in the context of startup development may be conceptualized at different levels, depending on the situation, activity or the meaning individuals attribute to specific situations and their distinctive modes of participation in activity. Rapidly changing conditions of startup development and transformations necessarily result in changing expectations, experiences, actions, adjustments and the creation of new goals in relation to broader organizational objects both individually and collectively. As conditions change, sometimes dramatically, adjustments are required individually or collectively in these organizations. In response to these uncertain, rapidly changing contexts, people learn to respond in distinct ways – adapting, changing coping, individually or collectively. Startups, while distinct, share a nexus of such characteristics, but to different degrees. While often conceptualized as challenges, these conditions serve as sources of contradictions, which, we will see, are necessary for learning in the context of change and development.

Problems in the forms of struggles are manifestations of phenomena arising from contradictory meanings or experiences people develop as they evaluate and interpret their activities over time and engage with the structures of their environments. More or less consciously, they evaluate the contradictory conditions of diverse situations and make judgements regarding the actions and activities they pursue. At any moment, they have the capacity to change their environments, themselves – imagining new possibilities or coping with the often-unpredictable nature of change. These decisions are based on a desire to choose an optimal path, considering both the possibilities and the constraints of the socially situated context they participate in. Struggles to make sense of and participate in everyday practices for development are accompanied by feelings of hope, anxiety, satisfaction or curiosity, but are
experienced in distinct ways, individually and collectively, shaping behaviors, desires and overall modes of participation over time.

The prevalence of the “unexpected”, challenging conditions, obstacles and limited resources presents a contradictory nexus which is uniquely critical for startup development as these organizations navigate the unknown in the pursuit of objects and goals. For these reasons, startup learning has been a central topic in research over the past years, indicating a significant interest in aspects of learning as a source of change and development in the context of difficult entrepreneurial conditions (Reis, 2011; Weinberg & Mares, 2014). Companies – large and small – are under pressure to innovate and enhance efficiency, despite often challenging economic or social conditions they operate under. Startups in particular need to cope with distinct and uniquely challenging conditions of change, aspects which, as I will show, shape their orientations and tendential development in practice. Consequently, I argue that it is important to understand how and to what extent learning in startups shapes and is shaped by specific and broader social and cultural elements, facilitating or hindering their expansion into their local ecologies for innovation and beyond. Developing a deeper understanding of the role of learning dynamics in startups as indicative examples of complex learning environments is therefore paramount (Yamagata-Lynch, 2010a), especially in the context of rapid change in development. In particular, an appreciation of the distinct pathways startups take on their trajectories for development is crucial to a more robust understanding of learning in these environments. Most important, understanding these struggles in terms of conceptual themes adopted in this study, we might develop steps towards an understanding of processes through which such challenges may be transformed into opportunities for positive change that benefit individuals, organizations, their communities and society.

1.3 Research Goals, Approach and Questions: Need for and Significance of an Activity-Theoretical Approach to the Examination of Learning and Knowledge Creation in Development

Recent years have witnessed a marked increase in interest by researchers and practitioners in the concept of Expansive Learning (EL), as a result of ongoing search for more collaborative and transformative forms of learning in modern work environments (Engeström, 2018c; Kaptelinin & Nardi, 2006; Yamagata-Lynch, 2010a). This interest is reflected in a broad adoption of principles for examining both outcomes and antecedents as the basis of learning
transformation supporting theoretical and empirical contributions to different bodies of literature. Scholars have consistently highlighted the importance of conceptual tools related to EL in developing a deeper understanding of learning dynamics in organizations and making valuable contributions to conceptualizations of learning in diverse professional contexts from an activity theoretical perspective. As Engeström (2004) says, “[e]ach type of work generates and requires a certain type of knowledge and learning” (p. 11). Supporting the broadening of current understandings of EL through activity-based perspectives, the work of Engeström provides new foundations for a more robust examination of complex work environments in a diverse range of professional contexts. Drawing on Engeström’s work in particular, I examine in this study aspects related to the distinct learning dynamics in the everyday work of startup organizations using an integrated framework of concepts derived from the CHAT tradition. This approach provides a foundation for the claim that an expansive view of learning grounded in CHAT enables new insights into the dynamics of learning and development in startup work, as viewed from an activity-theoretical perspective.

Despite the need to create knowledge rapidly to support development, specific practices, strategies or mechanisms supporting learning dynamics in startup organizations specifically, are largely unknown. Existing examinations of learning in relation to strategies for knowledge creation in the context of rapid forms of development appear to be based mainly on anecdotal data, with limited evidence of empirical insights into the dynamics of change in learning. An activity-theoretical approach to such examination, I argue, can complement existing scholarship while providing a highly valuable addition to the growing body of knowledge of Information and Knowledge Management (IKM) literature.

As many of the participants in this research outlined, there is a noticeable integration between often overlapping personal and professional dimensions of activity in the work of startups (“startup work”), suggesting a multi-dimensionality of learning in practice. This integration, I argue can be effectively examined in an activity-theoretical tradition by analyzing the detailed insights provided by participants regarding their views and experiences of startup work in relation to learning.

Notably, a recent statistic even suggests that learning is one of the top reasons why individuals would work in startups.
What are the two reasons you would want to work for a startup

<table>
<thead>
<tr>
<th>Reason</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel that I will learn a lot</td>
<td>41</td>
</tr>
<tr>
<td>Good startups have a strong financial potential for the future</td>
<td>41</td>
</tr>
<tr>
<td>I want to have an impact on factors important to me</td>
<td>31</td>
</tr>
<tr>
<td>Startups have a flat hierarchical structure</td>
<td>29</td>
</tr>
<tr>
<td>I like the culture</td>
<td>21</td>
</tr>
<tr>
<td>Agility of roles</td>
<td>19</td>
</tr>
<tr>
<td>The unpredictability of work</td>
<td>13</td>
</tr>
</tbody>
</table>

* Share of respondents who want to join a startup

Table 2 Reasons for joining a startup (Olawoye, Pogue, Sück, & Uppal, 2018)

While valuable in directing our attention toward startup learning, these statistics tell little about the actual learning experiences of professionals in everyday work in these organizations, and obviously, even less about the socio-cultural dynamics in these unique and fast changing work environments. This observation therefore contributes to the broader argument concerning the necessity of a socio-cultural approach in examining aspects of startup learning which have so far remained under-researched and which could benefit from an activity-theoretical perspective.

In order to contribute to theoretical and empirical conceptualizations of learning in startup contexts, it is important to outline several preliminary considerations. As illustrated in previous studies, over the past decades, startup organizations have gained increased attention in different bodies of literature and policy related initiatives designed to encourage participation and progress in the innovation economy (Foo & Lim, 2016; Mansoori, 2017). However, despite this increased
attention to innovation and startup work overall, aspects related to struggles shaping learning
dynamics in these unique organizational settings have not been explored extensively.
Nevertheless, learning in startups, I argue, represents an important area of research in the
overarching context of rapidly evolving, agile workplaces. A more robust understanding of the
unique struggles experienced by startups in times of rapid change therefore requires new
approaches and theoretical lenses which complement existing frameworks and models.

This study starts from a foundational assumption that there is significant potential for
learning embedded in the socio-cultural relations shaping collaborative and potentially
transformative practices for knowledge creation in situated contexts of startup work. In this
study, participant experiences illuminate the ongoing struggles in their activities in relation to
rapid development linked to evolving demands for performance and achievement in
environments where time is often of essence. A deeper analysis of the multiple modalities
through which individuals engage in developmental practices related to knowledge creation in
their startup organizations reveals the impact of distinct dynamics of work and learning. This
aspect in turn provides a foundation for a complex discussion highlighting structural relations
which can be made visible through the lens of CHAT in startup work activity as the primary unit
of analysis (Engeström, 2001a; Yamagata-Lynch, 2010a). Learning, I argue, therefore represents
a central component in this transformation, as individuals adapt to and navigate the complexity of
work practices for knowledge creation through diverse approaches reflecting variations in modes
of participation in activity in response to organizational strategies, in the context of development,
in times of rapid change. The importance of learning in these contexts will be further reinforced
across the following chapters and supported by relevant empirical illustrations emerging from
participant narratives.

Supporting this aspect of the overarching objective, this dissertation aims to examine the
complex, sometimes conflicting dimensions and mechanisms of learning in startup activities of
highly innovative, rapidly transforming startup organizations, primarily with respect to
knowledge creation strategies in the context of startup work in times of rapid change. The overall
objective of this project is to contribute to an understanding of conditions facilitating or hindering
learning processes, and their associated, potentially expansive mechanisms in relation to situated
activities, by examining learning dynamics in knowledge creation activities (Engeström, 2001b;
Engeström, 2004; Engeström, 2016). To achieve this goal, an activity-theoretical research design
is used to study the central questions proposed using the CHAT-informed approach inspired by
the work of Engeström in the domain of EL. Furthermore, this thesis intends to examine
significant and complex mechanisms for learning in the context of startup work by highlighting
the multi-dimensional struggles and aspirations of participants as they navigate contradictions in
daily knowledge creation activities. I explain how the relationships between the concepts of
mediation, boundary crossing and contradictions as a source of change in learning are essential
elements supporting an enhanced understanding of intersecting dimensions of work/learning
embedded within and across social and cultural dimensions of startup contexts. To support
analysis, the foundational work of Engeström in the CHAT tradition provides the basis for
advanced discussions and examinations of emerging patterns of rules in work practices, some of
which are negotiated, developed or challenged by various stakeholders in multiple ways.

To achieve this overarching objective, I therefore examine how strategies for knowledge
creation in startup work shape distinct and potentially diverging trajectories for organizations in
times of rapid change in relation to the potential for expansive learning, in the unique contexts of
participating technology startup organizations. Stemming from this vital objective, the literature
review completed for the purposes of this study revealed relatively few studies examining
learning in startups from an activity-theoretical perspective, and even fewer that either adequately
or accurately grasped key analytic concepts or terms which are taken in this study to be central to
a robust grasp of learning. Consequently, research questions (RQs) subdividing the literature
review were formulated as follows: (1) How and how well does IKM research address the
mediated nature of learning in enterprises? (2) How and how well does existing IKM research
address the source of change in learning in relation to the concept of contradiction in activity?
and (3) How and how well does existing IKM research assess collaborative and boundary-
crossing learning dynamics in enterprises?

The findings from the literature review in fact clearly reveal that the existing IKM
literature could benefit from additional case studies examining the potential for expansive
learning in relation to knowledge creation activities both generally and in startup settings in
particular. Aside from the theoretical contributions, this study is motivated by an interest to
explore the nature of learning in startup work environments in which neither employers nor
employees regularly have access to formal professional development opportunities prevalent in
larger organizations. The research question helps to examine the relation between learning and
knowledge creation within the particular context of startup organizations in an ecology for
innovation, addressing a need for additional contributions to the conceptualization of startup
learning dynamics and business innovation through a combination of ideas across CHAT, IKM and startup/innovation. Balancing attention to both macro- and micro-structural dynamics in relation to knowledge creation in everyday practices and learning of individuals-in-activity in startup organizations in the context of navigating the developmental conundrum of limited resources, uncertainty and rapid change with the learning of individuals-in-activity, this question addresses original and both empirically and theoretically-informed conceptualizations of learning-in-activity as inextricably interrelated with everyday knowledge creation practices shaped by strategies for development, aspects which are relevant in startup-learning dynamics and business innovation more broadly conceived. Stemming from this simple overarching objective, the core research question based on research gaps identified in literature is formulated as follows:

*How do developmental knowledge creation strategies impact the potential for expansive learning of professionals in Canadian innovation-focused technology startup organizations, in times of rapid change?*

Consequently, the research question lays the foundation for a dialogical re-conceptualization of the potential for distinct, more expansive forms of learning in relation to possibilities and limitations of startup work, knowledge creation, development and change in the context of startup organizations through a unique combination of ideas across CHAT, IKM and attention to start-up innovation. Concurrently, it provides the basis upon which examinations of rapidly changing and contradictory dimensions of startup work can be made more visible. Placed in relation to socio-cultural and historical dynamics, the specific, everyday practices of development in startup organizations examined acquire particular significance, enabling conceptualizations of mechanisms through which startup work and learning are defined and re-defined under rapidly changing conditions. Given the overarching goal of the research question in illuminating aspects relevant to tech start-up learning dynamics and business innovation in relation to the unique combination of ideas across CHAT, IKM and start-up/innovation, it is important to point out that the commitment to understanding the essence of the human face of learning and organizational life in startups requires an innovative approach, balancing the attention to the details of everyday work with the broader macrostructural dynamics shaping development and knowledge creation in practice. In addition, grasping the essence of the complex nature of the startup learning dynamics and business innovation in this way requires analytic attention to multiple dimensions
simultaneously, to both the individual and collective, to knowing, learning and doing simultaneously.

Supported by theoretical considerations derived from the CHAT tradition, this question informs and guides the research methods, methodology and instrument development. In this context, the working hypotheses of the study—inclusive of several key CHAT concepts (underlined below)—can be summarized as follows:

1. Startup employees’ learning activities are mediated socio-culturally through a variety or artifacts, shaping distinct and potentially divergent orientations over time in tendential development.

2. Learning activities of startup employees are socially organized through collaborative practices in which boundary-crossing facilitates knowledge creation and the directions of development of individuals.

3. The learning processes are dialectically negotiated, as startup employees navigate contradictions through processes which facilitate the emergence of expansive learning, to different degrees.

To address the complex nature of the construction of knowledge in the occupational lives of individuals in startup organizations, it is necessary to illuminate the roots of challenges which shape contradictory and dynamic elements inherent in startup work and development. Therefore, this study examines complex learning mechanisms in relation to knowledge creation practices in specific startup environments by seeking to understand the multi-dimensional struggles and aspirations of individuals in their learning journeys. This research objective, this core research question and the subsequent working hypotheses involve in the course of analysis a series of sub-questions and issues with relevance to the primary question. These questions include:

- What are the preferences and attitudes of participants towards learning in relationship to IKM within or across their organizational boundaries?
- How do participants perceive IKM tools/practices as mechanisms for learning and development?
- How are organizing processes for expansive learning shaped by shifting/evolving IKM practices in technology startups?
- How and/or to what extent are emerging forms of IKM tools and practices shaping the nature and structure of learning processes in tech startups in times of rapid change?
- How do participants interact with IKM tools in the startup contexts examined?
How can IKM practices enhance, undermine or otherwise affect the potential for expansive learning opportunities in the specific startups examined?

How and to what extent do contradictions within or across organizational boundaries affect learning outcomes for participants with regard to IKM tools and practices?

The questions highlighted above guiding this study can be seen as basic points of departure into a broader attempt to advance conceptual understandings of phenomena central to discussions related to learning in situated startup work in the context of knowledge creation, in times of rapid change. Research findings structured around the questions highlighted above assist in the development of new theoretical and practical conceptualizations of learning dynamics in evolving, fast changing startup work environments. Furthermore, an understanding of these issues represents a relevant contribution to CHAT and solid foundation in practice, as illustrated through empirical insights presented in later chapters.

The expansive view of learning (EVoL) in startup organizations is rooted in a cultural-historical tradition as developed by Engeström in his classic work Learning by Expanding first published in 1987 with a revised second edition released in 2014. Engeström’s view of learning provides a relational understanding of the interconnected nature of socio-cultural and historical dimensions of everyday work activities which transcend the micro/macro dichotomies while conceptualizing social relationships in perpetual transformation in practice. To meaningfully understand learning, it is argued, we need to carefully consider new approaches in examining the relations and abstractions constructing everyday practices. These relations can be best understood as situated forms of social relations which are embedded in broader systems of production, labor and exchange (Engeström, 2014).

The need for an EVoL is in part also based on an observation that startup work is often focused on addressing high-potential market opportunities, which may be temporally limited (Eisenmann, 2013). As a result, time is of essence, as reflected in accelerated approaches related to “time-to-market” and the development of “minimum viable products” (Fagerholm, Sanchez Guinea, Mäenpää, & Münch, 2017; Zijdemans & Tanev, 2014). I argue that these time pressures to develop new solutions are linked to challenges in knowledge creation strategies related to mediations of learning dynamics in specific startup activities, creating forms of contradictions within and across organizational boundaries that enable a potential for expansive learning. Furthermore, startup organizations need to compensate for the scarcity of resources available by operating efficiently in team environments towards common goals and key strategic objectives.
Operating in fast-evolving and dynamically changing markets therefore presents both challenges and opportunities in developing more effective approaches to address obstacles as they are encountered in practice.

Drawing on the work of Engeström, I adopt this relational approach to the study of startup learning to contribute to the development of an expanded conceptualization of learning, which advances current conceptualizations of EL in or directly relate to the field of IKM. This research therefore places emphasis on the importance of an expansive view of learning in startups as a function of socio-cultural relations structuring everyday practices in rapidly developing work environments. The work of Engeström as a starting point for the analysis highlights the social relations shaping the mediated structure of activity, collaborative forms of development and navigation of contradictions in practice. Building on the cultural-historical foundation for an activity-theoretical view of learning, we can gain deeper insights into the dynamic nature of practices analyzed in terms of object-oriented activities mediated by a range of tools/artifacts in activity as the primary analytic unit. This theoretical backbone provides a robust foundation for a detailed analysis of learning which, while not eschewing the role of the individual as such, differs from experiential, self-directed or personalized conceptualizations of learning, and instead focuses on activity-based conceptualizations that expand understandings of learning as contextual, relational, ordered as well as dynamic and open to the unexpected. This activity-theoretical perspective incorporates multiple dimensions of learning manifested within startup workplaces and beyond their organizational boundaries as individuals navigate contradictions endemic to activity and learning potential in practice.

Consequently, this study takes a robust, socio-cultural perspective on the relationship between knowledge creation practices and learning at a time of increased attention to the innovation economy as a driver for knowledge creation and skill development (Haapasaari et al., 2018; Engeström & Sannino, 2010). By examining complex, and sometimes conflicting dimensions of learning dynamics in these highly innovative, rapidly transforming organizations, this study aims to provide insights into the pivotal role startups play in the innovation economy and contribute to a deeper understanding of learning in everyday work practices conceptualized in their historically and culturally situated, and socially mediated forms (Engeström, 2001c; Jonassen & Rohrer-Murphy, 1999). The problems outlined in this study are addressed by developing a greater understanding of learning experiences in startups in relation to different
degrees in solving and/or resolving contradictions in organizational processes, area which has not been researched extensively in IKM literature related to startup work.

In emphasizing these important aspects, the activity-based approach to an expansive view of learning adopted in this study places a significant focus on the social relations which shape the distinct modes of participation of individuals who work in startup environments. This approach not only captures organizational aspects of IKM, but takes into account the ideas, feelings, perceptions and the development of rules, formal and informal, which shape startup work over time. As a result, non-material artifacts acquire significance in everyday situations as they function within the contradictory mediations which give rise to material tools shaping practices over time, and vice versa. This expansive view of learning in practice is constantly negotiated through socio-cultural relations which are closely related to the innovative developmental activities individuals engage in. These approaches to innovation provide a basis for a comprehensive understanding of learning in activities not as a passive process, but one which is inseparable from both the situated contexts in which they are produced, as well as the broader economic and cultural environments which influence their development. This CHAT/EL vantage point enables the development of elaborate accounts of learning as situated practices conceived in specific contexts, within/beyond organizational boundaries and in the times of rapid change described in this study.

1.4 Towards an Activity-Theoretical Re-Conceptualization of Knowledge Creation and Learning Expansion in Startup Work

To develop theoretically and empirically robust conceptualizations of the human face of learning and organizational life in relation to patterns of social relationships in startup work, I employ the concept of activity as the smallest meaningful unit of knowledge creation and development to examine the dynamics of change within and across the organizations examined. Building on theoretical foundations which were established and accumulated over time in CHAT literature, I contribute to the existing interdisciplinary dialogue insights from the particular organizational context of startups to illustrate how learning emerges as a function of transformative pressures embedded in the productive processes of startup everyday life and work. The activity-theoretical approach adopted in this research study is therefore based on considerations grounded in emerging conceptualizations of the changing nature of learning in
work environments characterized by constantly changing work environments. Engeström (2011) describes this complex challenge of learning as follows:

Human learning takes place within and between complex, continuously changing activity systems. Learning needs themselves are increasingly opaque. It is not at all clear just what needs to be learned to cope with the demands of complex activities and global networks in constant turmoil. Humans – practitioners, teachers, students – are intentional and interactive beings who keep interpreting and reinterpreting the challenges and tasks they face in their own, multiple, changing and often unpredictable ways. They do not neatly obey the laws of linear causality. (p. 599)

Broadly conceived, knowledge and innovation are significant factors in relation to the development of startups as exemplars of emerging organizations in evolving ecologies of which they are part. As Engeström (2008b) point out, “[s]ymptomatically, much of the recent literature on new organizational forms goes beyond variation and focuses on the production of innovations and knowledge as strategic factors – objects and motives in our terminology” (p. 13). This form of “knowledge- and innovation-driven production” (Engeström 2008b, p. 14) can be meaningfully conceptualized in relation to activity, constantly changing and influenced by a range of factors shaping ongoing transformation over time.

The approach adopted in this study is reflected in the theoretical foundations of CHAT/EL, which can be described as follows:

The theory of expansive learning is based on the dialectics of ascending from the abstract to the concrete. This is a method of grasping the essence of an object by tracing and reproducing theoretically the logic of its development, of its historical formation through the emergence and resolution of its inner contradictions. A new theoretical idea or concept is initially produced in the form of an abstract, simple explanatory relationship, a “germ cell.” This initial abstraction is step-by-step enriched and transformed into a concrete system of multiple, constantly developing manifestations. In an expansive learning cycle, the initial simple idea is transformed into a complex object, into a new form of practice. Such a theoretically grasped practice is concrete in systemic richness and multiplicity of manifestations. (Engeström, 2015, p. xx)

In search of a useful level of integration in conceptualizing learning in relation to cultural and historical dimensions which motivated this study, the activity-theoretical approach adopted attempts to explore the phenomena examined through original means which are grounded in
robust theoretical roots (Engeström, 2001b, 2016). Consequently, the work of Engeström in the area of EL and CHAT was used as a guiding lens in exploring the complexity of learning from an activity theoretical perspective as an original approach to an examination of knowledge creation and change in participating organizations. Supporting this choice is a rationale for complementing the widespread conceptualization of learning implicitly expressed or embedded broadly in organizational structures. To address this challenge, I suggest that an activity-based view in the analysis of learning in startup work provides both useful theoretical insights and potentially more transformative solutions to complex challenges which have traditionally received relatively limited attention in IKM literature (Crawford & Hasan, 2006; Hasan & Crawford, 2003; Hasan & Crawford, 2006; Karanasios, 2018). This study was therefore motivated in part by a desire to enhance these understandings while building on the theoretical and empirical foundations of CHAT/EL using startup organizations as uniquely relevant settings for a detailed activity-theoretical analysis of learning dynamics in times of rapid change. The activity-theoretical approach adopted views knowledge creation activities in the context of development as primarily dialectical/contradiction-driven changes, reflecting the interpretations of participants and highlighted through illustrative examples using the case studies examined. This conceptualization of development as relational, socio-cultural and dialectical in essence provides an opportunity to understand rapidly shifting processes in the relational patterns of startup work development and activity “in motion” (Ollman, 2008, 2013).

The limitations I allude to can be effectively addressed at the nexus of complexity, limited resources and rapid change by means of a detailed attention to empirical insights emerging from a dialogical approach between CHAT perspectives and IKM research. Adopting this approach enables an appreciation of the importance of details of practice, conceptualized in relation to activity as a basic unit of analysis, from which the complex mechanisms of development unfold. From this perspective, complex developmental practices can be understood in relation to activities and clusters of practices which share common characteristics. Nathanael and Marmaras (2008) define work practices as “relatively stable arrays of activity” (p. 361). These practices can be conceptualized as “more or less stable, historically developed and partially unacknowledged arrays of activity, which are at the basis of successful action in a particular work setting” (Nathanael & Marmaras, 2008, p. 359). While these are potentially applicable definitions, work practices, from a CHAT perspective, can also be conceptualized as collections of activities which share similar points of reference. Therefore, this study focuses on the potential for expansive
learning in startup work practices as distinctive systems of activity/activities, analyzing how learning relates to sustaining or hindering factors shaping activity in development over time, in relation to learning. This thesis takes the stance that the different dynamics examined in this study – the mediation, boundary crossing, contradictions dynamic of knowledge creation and the contradiction/resolution/synthesis dynamic of expansive learning - are interrelated under the overarching framework of CHAT/EL within and across organizations as valuable models which enable a more effective understanding of knowledge/learning dynamics in situated and rapidly changing work contexts of startup organizations.

In recent literature, scholars have noted the importance of creating effective conditions for learning in startup organizations (Aldrich & Yang, 2014; Scarmozzino et al., 2017). Literature highlights that the fast-paced transformation in workplaces is accompanied by challenges in meeting the requirements of both current, as well as future employee development needs. Clearly, therefore, themes of digital skill transformation and the need to reevaluate worker capabilities for a fast changing digital economy emerge at a time of profound transformations, which, I argue, are linked to rapidly changing conditions for development, but also broader cultural and historical narratives of skill, knowledge and technology advancements which are linked to systemic developments in the innovation economy (Karlsson, Gråsjö, & Wixe, 2015; Teece, 2018).

Despite the growing number of studies examining startups, there are still too few examples which examine the situated struggles of development and learning in startups, and, notably, even fewer examples of activity-theoretical research examining learning dynamics in startups, area which can benefit from socio-cultural, empirical and theoretical contributions. In addition, as several studies highlighted, an ecosystem approach to startup support can create a pool of resources including mentorship, networking, and learning (Miller & Bound, 2011). While practices related to inter-organizational learning in these ecologies for innovation have largely been explored and documented, activity-theoretical aspects of learning within and across organizational boundaries of startup organizations represents an area which has not been explored extensively in existing literature.

In response to this challenge, a central aim of this study is to gain deeper insights into activity-theoretical conceptualizations of learning in startup contexts and understand how learning is supported or hindered in the context of knowledge creation and development in times of rapid change. Additional aims include an exploration of the potential for expansive learning in relation to the theoretical model of CHAT/EL which is particularly suited to address aspects of
learning in these complex work environments. Associated challenges, I argue, can be addressed more effectively in the context of rapidly changing conditions of startup work in development through a CHAT lens with an emphasis on learning in activity, described as follows:

Activity is a specific form of the societal existence of humans consisting of purposeful changing of natural and social reality. In contrast to the laws of nature, societal laws manifest themselves only through human activity that constructs new forms and features of reality, thus turning the initial material into products. Any activity carried out by a subject includes goals, means, the process of molding the object, and the results. In fulfilling the activity, the subjects also change and develop themselves. (Davydov, 2012, p. 39)

By way of methodological introduction, this study draws on a broad range of opinions gathered through qualitative data based on the rich narratives shared by participants. Aside from the overarching goal to provide a valuable resource for a deeper understanding of learning dynamics in startup work, this study also aims to contribute to the ongoing discussion on how to effectively conceptualize knowledge creation practices in relation to learning to better support developmental practices in startup organizations in times of rapid change. This study therefore seeks to illuminate potentially expansive learning strategies in participating organizations and re-conceptualize the scope and nature of learning as an expansive process, viewed from an activity-theoretical perspective (Engeström, 2001b). The investigation of contradictions in particular practices related to knowledge creation in the context of rapid development employed in this study is empirically informing the analysis of the potential for expansive learning, which in turn gives grounds for predictions of the directions of development of individuals-in-activity as distinct projections of professional/“knowledge work” (Gorman, 2011) futures.

In developing an appreciation of the significance of expansive learning in innovative work environments, an attention to “mundane actions and small traces, something badly needed when one wants to make sense of the often unremarkable, piecemeal textures underneath articulated breakthroughs” (Engeström, 2018, p. 237) is required. As Engeström and Scaratti (2016) point out, activity theory enables opportunities to examine the “potential of new mediational instruments and forms of collaboration” (p. 171) which can be illuminated through a detailed analysis of situated practices and activities at the basis of change. The framework developed in this study as a function of three CHAT-based key analytic themes constructs an expansive view of learning in startup work, allowing deeper examinations of the multifaceted and
differentiated forms of knowledge created in this process in relation to the potential for learning expansion in practice. This thesis therefore contributes to the development of expansive learning as a “historically new type of learning, still in the process of taking shape and only relatively rarely observable in practice” (Engeström, 2016, p. 28). Taken together, these new understandings of learning and change can be developed through examinations of practices in different contexts in relation to collaborative practices related to change and expertise in transformation. This key point of emphasis will become increasingly clear and more prominent in subsequent chapters, highlighting the need in startup work to learn “what is not yet there” with attention to relations shaping the development of startups in times of rapid change.

Considering the current challenges in conceptualizations of learning in startups and the promising potential for new insights in understanding learning dynamics in the unique context of startup work, an activity-theoretical approach was adopted to complement the existing body of knowledge and enhance understandings of learning in specific, situated contexts of participating organizations (Engeström, 2001a; Engeström & Sannino, 2010). This approach represents an attempt to examine aspects of learning which have not been addressed extensively in IKM literature to date, offering new opportunities for future research in this growing area of interest. To achieve this overarching objective, this study aims to make three main contributions to theory and practice. These can be introduced as follows. First, it aims to contribute to the development of activity-theoretical approaches to the examination of learning dynamics in startup organizations. Second, it aims understand how learning is shaped in knowledge creation practices through empirical interpretations of participant narratives. Third, it aims to empirically derive conceptual and analytic tools which can be adopted in future studies in the field of IKM (definitions, concepts, methodologies).

More specifically, this study aims to advance and build on theoretical foundations by exploring relationships between a.) the expansive view of learning as an MBCC dynamic of knowledge creation in relation to distinct and potentially divergent trajectories of development and b.) the potential for expansive learning reflected in a CRS dynamic of learning expansion in relation to potential projections of professional/"knowledge work" futures as illustrated by vivid examples highlighted in participant narratives. The robustness of this approach in contributing to the existing body of knowledge in the CHAT tradition, I argue represents a valuable contribution to theoretical development and potential translations in practice. Adopting this systematic approach to the study of learning in startup work enables connections between concepts for the
purpose of testing and extending understandings of emerging themes or theoretical concepts in the CHAT tradition. In this research, I therefore aim to enhance existing literature and develop new theoretical applications which complement and advance the expansive learning model while developing viable conceptual tools for the analysis and evaluation of the potential for expansive learning from an activity-theoretical perspective in startup contexts examined. This structured approach offers valuable opportunities for systematic examinations which help to extended or complement previous studies in startup contexts.

The importance of an activity-based view as an approach uniquely suited for an examination of learning in everyday startup work is emphasized and contrasted throughout this study in relation to conventional conceptualizations of learning in the field of IKM. This approach provides an expansive view of learning extending beyond the conscious, institutionalized, planned, classroom-based or formalized approaches prevalent in IKM studies. An activity-based perspective also allows us to move beyond current conceptualizations of learning in IKM literature by enabling a more critical approach, capturing less formalized forms of learning embedded in social interactions shaping variations in modes of participation of individuals in startup work over time. The attention to everyday practices for knowledge creation taking place within and across organizational boundaries is based on the rationale that significant learning takes place as individuals attempt to resolve contradictions in the form of tensions, challenges or dilemmas, and seek opportunities for development outside of organizational boundaries in response to limited resources within their firms. Overall, the trajectories emerging from this study provide a conceptualization of the process of exploratory, innovation-focused development, learning and knowledge creation on a continuum between past motives/experiences and future objects/projections. This exploratory form of development requires the creation of new knowledge for navigating unfamiliar domains at the nexus of uncertainty, limited resources and rapid change to generate more expansive outcomes for individuals and the startup communities they are part of. These aspects will be further discussed and supported through empirical insights in the analytic chapters.

1.5 Structure of the Thesis

This study can be understood generally as composed of three main stages unfolding across the remaining seven chapters of the work. In the first stage, an indicative review—the methods of which will be explained later on—was completed to interrogate IKM literature through the
CHAT-based central themes of *mediation, boundary crossing and contradictions* to discover theoretical gaps to which this study aims to make a contribution. The *second* stage involved analysis of interviews with participants from technology startup organizations for the purpose of understanding relevant processes and practices related to the themes of *mediation, boundary-crossing* and *contradictions* shaping distinct and potentially diverging *trajectories* in development. The third stage examined the *potential (realized, under-realized and un-realized) for expansive learning* in *startup work* using interview data as the foundation for an analysis of the degree of *translation of contradictions* (synthesized, partially resolved or translated/un-resolved) in activity, informing predictions of multiple *projections for professional futures* in participating startup organizations. Collectively, these steps enabled an appreciation of *startup learning* framed in the historical and cultural context of contemporary economic and social conditions startups were situated in at the time of the research study, shaping development and change.

In summary, Chapter 1 provided an introduction to the importance of the topic of learning in startup organizations and highlighted the relevance of the current project in making meaningful theoretical contributions to IKM literature. This chapter presented the research problem by reviewing the context of startup organizations and the importance of examining learning dynamics in the field of IKM from an activity-theoretical perspective. In addition, the chapter introduced the research questions and clarified certain concepts and assumptions needed for further exploration. Lastly, this chapter explained the significance of the study in conceptual, contextual, methodological and theoretical dimensions. In this chapter I also offered a sketch of unique characteristics of startups, and tensions in the broader innovation ecologies startups are part of related to challenges characteristic to small organizations in relation to learning. I argued that these introductory perspectives are useful in providing a relevant context to the examination of *startup work* and learning in times of *rapid change*.

Chapter 2 provides the theoretical basis for the use of a CHAT approach in this dissertation. Related to this theoretical foundation, EL is positioned as the key framework upon which I draw to examine aspects of learning in times of *rapid change*. In this chapter I define the terminologies/ analytic themes emphasized, highlighting areas for intervention and the potential for a reconceptualization of learning as a function of the three KATs adopted. This approach provides an overview of the theoretical foundations of concepts adopted from CHAT/EL theory and used in this dissertation to analyze learning dynamics in startup activities in the organizations
examined. The contributions of CHAT/EL concepts were instrumental in the development of the framework adopted in this project. This chapter therefore outlines considerations regarding the choice of the theoretical and conceptual framework developed to support the contributions of the study to IKM literature. I argue that while IKM literature helps us to understand learning as a product of organizational work practices, it does not as effectively capture the evolving, socially constructed and dialectically mediated relationships undergoing rapid changes, as from an activity-theoretical perspective.

In Chapter 3, relevant literature is reviewed, highlighting the complexities and limited understanding of learning dynamics in IKM literature from an activity-theoretical perspective. In this chapter, I complete an indicative review (Cheng & Gilbert, 2009a; Johnston, MacNeill, & Smyth, 2018; Trimikliniotis, 2004) of IKM literature in relation to the three key analytic themes (KATs) adopted and demonstrate why IKM studies could benefit from a re-conceptualization through a CHAT lens. This chapter situates this study within the broader context of the IKM body of knowledge, narrowing the focus on the three KATs and their implications for startup learning specifically. The three key concepts are operationalized to highlight the primary focus areas for the study and their relevance for the thematic analysis presented in subsequent sections of the dissertation. The three major KAT’s examined are mediation, boundary crossing/collaboration and contradictions as a source of change in learning. Collectively, the KATs adopted construct an expansive view of learning in startup work, which represents a valuable contribution to IKM literature, broadly conceived.

In Chapter 4, I provide a description of the methodological process undertaken in this dissertation and the development of the interview instrument. I explain and justify the research design and methodology, participant recruitment, instrument development, data collection, approach to analysis and aspects related to the maximization of study rigor. The methodology of the study consists of survey, interview and field observations. An activity-theoretical analytic approach was employed to analyze data. In this chapter, I describe how the research design shaped the process of conceptualizing research requirements, data collection, examination and presentation of the study data in order to enable a closer analysis of relationships between learning and identified areas for intervention in IKM literature examined. The case studies illustrate several themes emerging from this research, including the way participants perceive and experience learning under conditions of rapid change, as well as modalities for developing a range of cultural and symbolic interactions mediated within/across organizational boundaries and
navigated through the translation of *contradictions* to different degrees in the complex work environments represented by startups.

Chapters 5, 6 and 7 represent the analytic chapters of the study. Together they offer an expansive view of learning in startup environments. Drawing from participant narratives in interview data, I explore conceptualizations of learning in work practices of technology startups using an activity theoretical lens aligned to the three KATs specifically as they relate to the identified areas for intervention in IKM literature in order to contribute to new conceptualizations of learning in this body of knowledge. The data brings forward aspects related to the heterogeneity of approaches to learning in startup work practices and the *contradictions* embedded in the *mediated* structure of *startup work*. Using qualitative analysis, I outline aspects which in some cases appear to influence learning positively, while at other times appear to hinder the same processes in relation to knowledge creation and change. These chapters expand the key analytic themes identified, outlining the distinct elements transforming learning dynamics, viewed from an activity-theoretical perspective. In these chapters, the focus is placed on aspects of learning originating in activity, at subtle levels of conceptualization in dimensions which are often unnoticed in other theoretical domains. The three KATs describe an *MBCC dynamic* which provides the basis for three distinct trajectories orienting the development of the participating startups in practice. Dynamic, often contradictory interactions and interdependencies in learning among mediated structures of overlapping activity spheres are therefore of high significance in the contexts examined.

In Chapter 8, the final chapter, I consolidate empirically derived insights from data collected and synthesize findings using a CHAT-theory driven approach to support the thesis proposed specifically in relation to the potential for expansive learning (PfEL) by examining the distinct degrees of translation of contradictions as a *CRS* (*contradiction/resolution/synthesis*) *dynamic* in efforts at synthesis. This approach places attention on processes embedded in the *mediated* structure of activity, in which dialectical relationships are conceptualized under an overarching socio-cultural and economic context, and which dynamically influence learning as employees navigate contradictions that shape their *projections of professional/“knowledge work” futures* and create meaning within their situated learning contexts (Cobb & Bowers, 1999; Engeström, 2001a; Sannino et al., 2009). This chapter presents how this research study extends current literature in light of research findings and elaborates on implications for potential future research directions suggesting equitable directions for adult learning and development in times of
rapid change. In this chapter, I emphasize the variations in the modes of participation in activity of participants, connecting the KATs integratively and inferring potential directions of development towards professional/”knowledge work” futures for individuals-in-activity. Lastly, this chapter emphasizes the potential value of the study for theory and practice by outlining strengths and limitations and suggesting potential future directions in research and practice.

1.6 Summary

Despite the importance of startups in supporting economic development in the innovation ecologies they are part of, there is limited research examining learning dynamics in these complex work/learning environments from a CHAT/EL perspective. This area, however, represents an important topic of interest which can shape the ways in which knowledge creation strategies may be approached through innovative development practices in times of rapid change. Indeed, as previous studies have confirmed, knowledge creation and learning are inextricably linked in practice. Moreover, there has been a dearth of scholarly work that focuses on activity-theoretical approaches to startup learning. Learning, I argue, is critical for these emerging organizations in capturing new opportunities in novel and effective ways which benefit startup employees, aspects which are empirically examined in this study. I further contend that in order to understand the dynamics of learning in startup work, we need to examine the range of practices for knowledge creation with an attention to contradictions as a source of change in learning.

These practices necessarily involve an understanding of the human face of learning and organizational life in development – the hopes, fears, rewards, despair, anxiety or curiosity which, together, simultaneously shape how people, individually and collectively, make choices, evaluate options pursue or avoid activities in the context of the innovative, exploratory form of development I describe in this study. Fear, confusion or hope are learned and unlearned in the presence or absence of expansive actions such as questioning, analysis or reflection. Certainty and doubt are necessarily sides of the same coin in the process of “becoming”. In the process of knowledge creation, we can observe the ambivalent nature of creative and destructive aspects which either solidify or destabilize the patterns at the basis of trajectories in expansion. Patterns of both adaptation and transformation will become visible as individuals and their startup communities navigate contradictions towards future projections which are actively constructed, negotiated, but which at times appear elusive. This journey from a known, familiar origin
towards an unknown, uncertain destination is one in which struggles are prevalent, exposing individuals and their communities to challenges which are either patterned or episodic, or a combination of both. Overall, the processes I examine are complex and contradictory, yet highly important for learning in the absence of prescriptive approaches to development. Learning to derive the knowledge necessary to transcend these challenges represents a key element of expansion, one which is more or less successfully accomplished by startup practitioners over time as they progress on trajectories of development in practice. Insights related to these practices will be empirically derived from data collected and analyzed in this study, providing foundations for future research directions in activity-theoretical approaches to the study of learning dynamics in startup organizations.

To conclude, this chapter introduced the research area by discussing the importance of examining learning dynamics from an activity-theoretical perspective in startup work environments as fast changing and rapidly evolving organizational settings in the context of rapid change. These introductory considerations will be used to further enlighten the potential for expansive learning in startups conceptualized as both machineries of knowledge production (cf. Cetina, 2009) and complex learning environments (Yamagata-Lynch, 2010a). These introductory theoretical elements and considerations which will follow in Chapters 2, 3 and 4, provide the foundations which support the rationale for an activity-theoretical approach to the study of learning dynamics in startup environments and guide the subsequent analysis. The interrelated nature of development in relation to variations in modes of participation in activity provides foundations for understanding how knowing, feeling or experiencing change or the struggles surrounding startup work are linked to learning in activity. Overall, this research study distinguishes patterns and elements which provide a means of recognizing divergent trajectories of learning within and across startup organizations examined, building on the conceptual elements which are introduced in the next chapter and subsequently applied in analysis. The approach adopted in this study can be described as emergent and the nature of the study, insights and conclusions are exploratory in nature. Consequently, while building on solid historical and theoretical foundations, it is not suggested that it is fully transformative in nature. The insights emergent in this study however can be considered as increasingly important in order to answer the complex challenges faced by organizations in challenging conditions of development and change, providing an alternative way of grasping the multifaceted nature of learning and aspects relevant in the context of startup learning specifically.
Chapter 2: Theoretical Foundations for an Expansive View of Learning (EVoL) and Examination of the Potential for Expansive Learning (PfEL)

Conceptualizing learning in the context of this study requires a foundational understanding of the origins of the activity-theoretical approach employed, and a condensed, but comprehensive definitional explanation of the key analytic themes (KATs) adopted in the examination of Information and Knowledge Management (IKM) literature. These same themes are then used in the empirical analysis to develop an expansive view of learning (EVoL) in startup work, based on which distinct and potentially divergent trajectories of development are evaluated in relation to distinct types of knowledge created. Subsequently, projections for professional/“knowledge work” futures and directions of development for individuals-in-activity based on variations in modes of participation in activity are examined in relation to a contradiction/resolution/synthesis (CRS) dynamic probing the potential for expansive learning. The CHAT based KATs are discussed as the primary analytic concepts applied in examining IKM literature from an activity-theoretical perspective. Specifically, the three key analytic units adopted from CHAT/EL are used to underpin the conceptualization of an expansive view of learning in startup work. The CHAT based approach serves in developing the framework to critically evaluate empirical data presented in subsequent chapters.

2.1 Introduction

Although it is easily argued that many robust conceptualizations of learning are available, in the present study I argue for the unique relevance of utilizing a Cultural-Historical Activity Theory (CHAT) approach as developed in the work of Yrjö Engeström and colleagues (Engeström, 1987, 2016a; Engeström, Y., Engeström, R., & Kärkkäinen, 1995; Engeström & Keroasu, 2007). Indeed, for students of CHAT there are many sub-genres of the tradition, which could be considered as well. Herein however, taken as a leading sociocultural approach to learning, I will use Engeström’s unique version of CHAT to both inform and prepare the
framework for this research study by facilitating an analysis of a multitude of relationships among its constituents in everyday work practices for knowledge creation of startup organizations in times of rapid change. In particular, this approach to CHAT will enable a multi-dimensional and multifaceted analysis of complex and evolving practices highlighting the situatedness of learning as shaped by cultural and historical influences over time.

In taking the CHAT approach in general and the Engeström inspired approach specifically, I attempt to move decisively beyond traditional techno-centric, dominant and uniform conceptualizations of learning\(^8\) which have been widely adopted in IKM literature, but which can only provide limited conceptualizations of learning embedded in the developmental conundrum of startup work. In contrast, I argue that the activity-theoretical approach in this study supports a more robust analysis of socio-cultural and relational interactions in situated startup contexts, illustrating how aspects of learning are reflected in concrete experiences of individuals as reported in complex and often conflicting participant narratives often ignored by other studies. The concepts of mediation, boundary crossing and contradictions adopted from CHAT therefore provide substantial analytic power in examining expansive aspects of the human face of learning in startup work activity both within and across organizational boundaries.

More specifically, I seek to demonstrate that a CHAT-based approach to examining tension points in knowledge creation practices of startup work through Engeström’s theory of EL can contribute to a deeper understanding of the potential for expansive learning in technology startups examined. Building on this approach, we see that a multitude of contradictions and paradoxes in startup practices for knowledge creation allow us to understand the limits and potential for EL in areas which have largely been neglected in IKM literature.

The field of IKM represents an evolving area of interest within organizations which are continuously transformed through interactions between multiple actors and practitioners shaping development and transformations in practice (Foray & Lundvall, 1996; Mårtensson, 2000). At the same time, IKM is regarded as an important area of interest for both practitioners and academics

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\(^8\) Dominant and relatively uniform conceptualizations of learning prevalent in IKM literature, as will be further demonstrated in subsequent chapters, are re-conceptualized in this study based on a foundational assumption of CHAT as summarized by Sannino & Engestrom (2018), who point out that “[the] human mind is not located within the brain, not even bounded by the skin of the individual. The mind is in actions and activities in which humans engage with the world, by means of cultural artifacts such as signs and tools” (p. 44). Consequently, to understand the wholeness of learning in development, we need to shift our attention “from what is going on inside the individual to what happens between human beings, their objects, and their instruments when they pursue and change their purposeful collective activities”. (p. 44)
(K. Nelson & Middleton, 2003; Schlögl, 2005). While practitioners seek to find more efficient methods to meet organizational goals, academics face significant challenges in bridging the gap between theory and practice through robust analytic methods (Jarzabkowski, 2005; Schlögl, 2005). As a result, the aim to conceptualize learning in the complex fabric of work practices of small and often highly agile organizations represents a major challenge for researchers. In this study, the activity-theoretical approach adopted aims to address the challenges associated with conducting research in highly dynamic and rapidly evolving contexts of startup organizations, focusing on the structural dynamics of development across different levels of generality: macro structural (socio-cultural, historical), meso structural (mediation, boundary crossing, contradictions – MBCC) and micro structural (contradiction, resolution, synthesis - CRS). This new perspective of examining learning in startups is based on theoretical foundations in the field of CHAT/EL. Building on these foundations, I contribute empirical insights based on data collected in startup settings examined, expanding the existing body of knowledge while contributing to the theoretical development of learning in these rapidly changing information and knowledge intensive contexts (Behara, 2000; Davenport, 2016; Evangelista & Savona, 2003).

This research comes at a time of rapid changes and emerging approaches to work and development in organizations, placing startups in a unique position to lead through innovative practices and a potential for significant opportunities to re-evaluate the structure and nature of development and change through more expansive forms of learning. This study explores the mediated nature of learning, boundary crossing dynamics and contradictions as a source of change in learning as concepts central to our understanding of the interconnected nature of learning conceptualized in an intricate fabric of challenges and possibilities for change and development in a delicate balance. Extending the work of Engeström (1987, 2011, 2018)

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9 Building on the centrality of the principle of wholeness of activity for CHAT analysis, it is not only necessary to recognize these relationships as understood, experienced and framed over time by participants in the context of dialectical development, but also conceptualize the different levels of generality, dialectically integrated and in constant motion (Ollman, 1993). These dynamic processes of transformation involving changing goal-orientations and a myriad of artifacts individuals interact with, individually and collectively, provide a foundation for the conceptualization of change as a function of contradictory dynamics and rapidly shifting patterns of object-relatedness configuring and re-configuring mediations while shaping individual modes of participation in activity. This approach speaks to knowledge development and learning practices at distinctive levels of generality but can be seen as expressions of the same core contradiction, inextricably interrelated in the structure and complexity of everyday startup work/life. Consequently, moving forward in this thesis it will become clear that understanding the wholeness of the human face of expansive learning requires an integrated approach linking the internal, cognitive dimensions of learning with the broader structural dynamics of material relations in social, cultural and historical contexts through which it unfolds. And, dialectical thought, as I and others have suggested, is a crucial resource for more fully understanding this.
primarily, related to EL, this study builds new connections between educational sciences and the unique contexts of startup organizations on a conceptual bridge of learning between IKM and CHAT, complementing and extending both bodies of literature. However, before examining theoretical foundations of the key analytic themes adopted, it is relevant to begin by locating the study and KATs in the broader field of CHAT and explain the scope of examining aspects relevant to EL in this field.

The CHAT/EL approach adopted in this study is, broadly speaking, positioned among the four arenas Edwards, Fenwick, & Sawchuk (2015) refer to as ‘sociomaterial’, placing emphasis on complex interrelations of diverse elements in systems as primary units of analysis, tracing how knowledge is created through stabilization/adaptation processes and emphasizing the inseparable nature of system constituents in practice. The dynamic interactions of contradiction and expansion in the CHAT tradition in examining social practices in relation to learning highlight the mediated nature of activity as constantly negotiated through artifacts which place contradiction-driven object transformations central to the analysis of expansion. By examining the socio-material dynamics of work in relation to activity, it is possible to understand both the significance of different artifacts/tools in mediation, their integration with other dimensions of life including networks/communities of practice, and the mechanisms of learning expansion through the successive resolution of contradictions in practice. These introductory considerations help situate the study among theoretical approaches to socio-material studies of learning, which lead us toward a more in-depth overview of CHAT origins and analytic themes adopted, as presented in the following sections.

From a theoretical perspective, I position this study as an extension of Engeström’s work in Learning by Expanding (1987). Engeström’s work examining EL within and across organizational contexts provides a solid foundation for an examination of development in startup organizations as organizational contexts in times of rapid change, an area which I argue has not been studied extensively in CHAT and in relation to EL specifically. Such contexts can offer an expansive view of learning beyond traditional educational settings in which the creation of knowledge is a central goal in the context of development, enabling an examination of learning in a much broader range of contexts where aspects of transformation, collaboration and overall expansion, as conceptualized from a CHAT/EL perspective, are central.
2.2 Cultural-Historical Activity Theoretical Foundations: Activity, Development and Expansive Learning

Building on Engeström’s work, the three KAT’s were adopted in this study based on their importance for understanding learning dynamics in the CHAT tradition. These KAT’s were subsequently used to evaluate areas for original and significant contributions to IKM literature, as illustrated in the next chapters. The indicative review of existing literature conducted for this study suggests that limited research has been undertaken to understand learning dynamics in everyday work practices of startup organizations. In this study, an activity-theoretical analysis of knowledge creation in startup work represents a significant point of departure into deeper examinations of the potential for expansive learning in startup organizations. CHAT is built on several foundational assumptions, as highlighted by Taylor (2014):

[... ] the experience and knowledge of previous generations—evident in objects, norms, values, and other aspects of culture—mediates human interactions with the world (Lompscher, 2006). People transform their conditions, aiming to produce and reproduce conditions for their life (Chailken, 2012); learning thus involves an expansion of an individual’s realm of possible actions (Roth et al., 2012). CHAT has much potential for educators because of this focus on development and learning practices. Its interdisciplinary approach also holds promise for the development of new conceptual tools for tackling important theoretical and methodological questions in the social sciences (Engeström & Miettinen, 1999; Sawchuk et al., 2006). CHAT studies examine the histories of systems and relations among material artifacts as well as their divisions of labour, cultural norms, and rules; in short, “how things came to be as they are, how they came to be viewed in ways that they are, and how they are appropriated in the course of developmental trajectories” (Fenwick et al., 2011, p. 9). (p. 98)

Based on the assumptions and theoretical principles illustrated in this chapter related to the three KATs adopted, this study contains an examination knowledge creation in the CHAT domain, contributing to the field of IKM through an in-depth analysis of the situated nature of learning and its implications in relation to startup work practices for knowledge creation in times of rapid change.

In continuation to the introductory considerations presented in this section to illustrate the rationale for an activity-theoretical approach to the study of learning in startup contexts, in the following section I examine the KATs adopted in relation to an expansive view of learning as the
primary source for the definitional work. Engeström’s work is employed to allow the emergence of a framework for analysis in areas where the activity-theoretical approach can contribute to a reconceptualization of learning in IKM literature. The three KAT’s, consequently, translate into a conceptual model in examining the potential for EL in knowledge creation activities of startup organizations (Engeström, 2000). This model therefore examines the dynamics of learning in startup work as it emerges in complex relations of change in development using a structured approach which at the same time allows sufficient flexibility to examine interactions among diverse factors relevant to a robust conceptualization of learning dynamics in change. By adopting this approach, we can make steps towards a more integrated conceptualization of human activity in startup work as “material, practical, and always, by necessity, social collaborative processes aimed at transforming the world and human beings themselves with the help of collectively created tools—is the basic form of life for people” (Stetsenko, 2005, p. 72).

In relation to the themes adopted in/for analysis, it is relevant to point out in the first instance the commitment of this approach to the principle of activity as the primary unit of analysis. Activity systems may be argued to be composed of six main components: subject, object, tool, rules, community and division of labor, positioned in socio-cultural and historical dimensions of practice (Engeström, 2001a). Overall, the activity system model is best applied as a unit adopted to transcend dualisms and create integrative links between the individual and broader communities in relation to the ways in which work is distributed. Furthermore, activity is a dynamic structure through which people agentively engage with the world to both change it and be changed by it. As Sawchuk (2013b) summarized it, activity is both the primary unit of analysis of human learning as well as the primary unit of human agency. Some of the key terms which define the activity theoretical approach according to Leont’ev (1974; 1978) have been summarized by Sawchuk (2003)10. In this sense, activity can be conceptualized as a unified - and

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10 Sawchuk (2003) summarized some of the basic concepts of activity theory as follows (quoting Leont’ev 1974. 1978):

**Activity**: subject, object, actions and operations; "activity is the minimal meaningful context for understanding individual actions" (1978). The famous example of Leont’ev (1981:210-213) concerns primeval collective hunt where participants, in order to catch game, separate into two groups: catchers and bush beaters. Bush beaters frighten the game toward the catchers. When compared with the goal of hunting - to catch the game, for food and clothing - the actions of the bush beaters in themselves are irrational; they can be understood only as part of the larger system of the hunting activity.

**Subject**: a person or group engaged in an activity.

**Object**: held by the subject and motivates activity, giving it a specific direction behind objects there "always stands a need or a desire, to which the activity always answers"

**Actions**: goal-directed process; different actions can be undertaken to meet the same goals; "...just as the concept of motive correlates with that of activity, so the concept of goal correlates with that of action."
unifying - concept which is indivisible, rather than a single task or action (Foot, 2014). This conceptualization enables a holistic analysis of cultural and historical aspects in which activity takes place and forms of mediation as dynamic processes changing over time (Engeström, 2014; Foot, 2014). Representative features of activity include object-orientation, its distributed nature and the activity system as the primary unit of analysis (Engeström, 2001a). In an activity, individuals contribute collectively to the community to different degrees and consequently shape the outcomes of an activity system over time. The construction of activity therefore is based on different interactions which are *mediated* by rules, artifacts and tools (Engeström, 2000; Jonassen, 2002). In this view, the rationale for the activity-theoretical approach adopted in this study is based on the conceptualization of interrelated interactions in activity and the possibility of observing their manifestations in practice (Engeström & Sannino, 2011).

The figure below illustrates a third generation activity system model integrating relevant components: individuals as the primary subjects, the startup community as the object-oriented system and the object/goal they pursue in the context of the activity. This view of overlapping activities enables an understanding of the interconnected nature of interactions, their dependencies and their artifact/tool mediated nature in practice.

(1974:23)

**Objects and actions relations:** typically undergo transformation, though with some stability over time.

**Operations:** "...methods by which an action is realized. Their uniqueness is that they respond not to motive and not to a goal of action but to those conditions under which the goal is assigned... (164); "Actions are related to goals, operations to conditions. Let us assume that the goal remains the same; conditions in which it is assigned, however, change. Then it is specifically and only the operational content of the action that changes." (1978:65)

**Central technical focus:** mediation of activity by socio-cultural/historical artefacts.

**Goal:** "...like a law determines the mode and character of action... Let us take the case of a person's activity energized by food. Food is his motive; however, to satisfy this desire for food he must carry out actions not immediately directed at obtaining food. For example, his goal may be to make a hunting weapon. Does he subsequently use the weapon he made, or does he pass it on to someone else and receive a portion of the total catch? In both cases, that which energized his activity and that to which his action is directed do not coincide.... actions are not special, separate entities that comprise activity. Human activity exists only in the form of actions or chains of actions." (1974:23-24)

**Tools:** "...tool is a material object in which are crystallized not actions or goals, but modes and operations" (1974:26); "A tool, for example, viewed apart from its connection with a goal, becomes as much an abstraction as an operation viewed apart from its connection that the action it realizes." (1974:28)
In relation to this framework, it is important to point out that development involves exploration of pathways towards an object (Yamagata-Lynch, 2003). This object serves as a source of significant possibilities. At the same time, the object of startup work is highly constrained by a range of factors, which need to be illuminated to facilitate progress. We might conceptualize development therefore as a form of exploration, encountering the unknown, creating new knowledge in the process of exposure to the contradictions inherent in the structure of everyday work practice. The knowledge accumulated can be used to adjust strategies as individuals and their communities discover and interpret phenomena over time and engage with different artifacts/tools in the context of development (Engeström & Sannino, 2010, 2011b; Yamagata-Lynch, 2003). This exploratory process produces actions and activities through which information is created, exchanged and stored to make sense and cope with the complexity inherent in the structure of practice. An active form of exploration in relation to development stimulates the capacity to either embrace new horizons of possibilities or accommodate/adapt to the changing conditions in activity. These experiences translated into new knowledge elevate the possibilities for change and transformation in a world characterized by constant change.

The dynamic interplay between exploration and adaptation in development in activity serves as the foundation for the emergence of often unpredictable occurrences which create new information and knowledge. The engagement with this new knowledge generates learning which extends horizons of possibilities. This knowledge and learning, however, emerges unevenly within and across activities, as individuals and their communities frame the new knowledge in distinct ways, either intra-cognitively in the form of artifacts or socially in relation to the generation of new tools – a new “instrumentality” as described in the CHAT tradition (Engeström, 2007; Kerosuo & Engeström, 2003a). These conditions provide possibilities through which individuals and their communities orient their actions, navigating between contradictions.
of hope/fear, certainty/uncertainty or adaptation/exploration-change. Actions emerging in these contexts are oriented by elements which are relevant to the goal/s pursued, evaluated in relation to past events or experiences which occurred in the past, framed and re-framed over time as new information/knowledge emerges.

2.3 Constructing an Expansive View of Learning: An MBCC Dynamic

In order to study learning in startup work, I develop the analytic framework with distinctive and primary attention to the concepts of mediation, boundary crossing and contradictions central within distributed and situated activity to understand complex pathways of interactions towards change in learning. This framework can be described as an MBCC dynamic which constructs an expansive view of learning in startup work and development. Therefore, the proposed framework based on CHAT is used in later chapters as the basis for analyzing the distinct and potentially divergent trajectories of startup development in relation to knowledge creation and learning. The expansive view of learning developed in this study requires an even more specific attention to the element of contradictions as a source of change, which is examined as a contradiction/resolution/synthesis (CRS) dynamic in relation to distinct modes of participation of subjects, shaping distinct orientations of knowledge work directions for individuals in activity. Drawing upon the three key analytic themes (KATs), this framework aims to provide an indicative lens in understanding learning as a socio-culturally constructed phenomenon in fast-changing work environments (Engeström, 1999; Jonassen, 2002), overall.

Focusing on the three areas for intervention identified in the indicative review presented in Chapter 3, this study addresses the under-development of socio-cultural dimensions of mediation, boundary-crossing and contradictions (which I describe as an MBCC dynamic in abbreviated form) in relation to learning from an activity-theoretical perspective. Adopting this perspective, I argue that robust conceptual tools are required to more comprehensively examine learning and development of rapidly changing work environments in IKM literature from a socio-cultural perspective. At the same time, CHAT literature is enhanced through an examination of learning in startup work environments which have not been traditionally examined in educational scholarship. In particular, the lived/situated mediated experiences of individuals highlight aspects of learning which are largely absent in IKM literature. Building on this dialogical approach, different relations of contradictions in learning emerge from their encapsulated forms embedded in the internal dynamics of change in startup activity, highlighting the potential for
transformation in relation to the *contradiction/resolution/synthesis (CRS)* dynamic adopted in this research study. The coexistence of *contradictory* forms of mediation provide elements relevant for the activity-focused developmental perspective to divergent trajectories of development as a mechanism for transcending limitations in practice in cultural and historical dimensions of change over time.

By attempting to understand the *mediated, boundary crossing and contradictory* nature of *knowledge creation* grounded in a dialectical perspective of change in learning, we can deepen conceptualizations of a socio-cultural perspective on learning in startups through robust activity-theoretical contributions. In the next sections, I explain the three key concepts of the CHAT tradition with attention to particular elements which give rise to several distinct areas of analytic concerns relevant for the subsequent analysis.

### 2.4 Mediation as a Key Analytic Theme: The Role of Tools, Artifacts and Signs in the Cultural Mediation of Activity

Learning in work activity is influenced by the various tools and artifacts which are involved in work practices. These artifacts appear in different forms, either constructed in activity or adopted from external sources (Daniels, 2004; Yamagata-Lynch, 2010c). Furthermore, as Kaptelinin and Nardi point out, “[t]he human relationship with technology has always been of special interest to activity theory, which is hardly surprising given the focus of the theory on mediation and tools” (p. 3). The concept of *mediation* can be understood in a number of ways or dimensions which I briefly discuss below. The first dimension of an *expansive view of learning* (EVoL) refers to the processes which mediate knowledge creation as startup development activity in relation to learning. Despite a generic awareness of aspects related to mediation in IKM literature, the relationship between these processes and learning is poorly understood and can benefit from an activity-theoretical perspective.

One of the key objectives of this study in relation to the theme of *mediation* is to shed light on learning processes embedded in startup activities, drawing upon expansive learning principles based on CHAT as a robust source of analytic tools based on sociocultural theoretical traditions which place emphasis on the situated nature of learning and change (Engeström, 2016a; Yamagata-Lynch, 2010b). This approach aims to describe mediated transformations as the basis of learning in relation to changes in object as individuals navigate contradictions to generate solutions to everyday work challenges in startup settings. A key contribution of this study is
therefore the development of an expansive view of learning as a function of the three KATs adopted, in which the concept of mediation is fundamental.

Tools and artifacts in startup settings could be broadly categorized in three major areas. Some refer to the practices used in coordinating aspects of project development or the use of management tools in documenting learning activities. These practices are often structured and aim to facilitate learning of specific tasks in conscious and more formal ways. This study examines tools and related mechanisms which mediate startup learning in IKM practices (Cole & Engeström, 1993; Engerström, 1999). Other forms of mediation refer to the use of language, symbols and other artifacts which are present in interactions between individuals in activities. The broad range of such artifacts is often interrelated and inseparable from situated contexts. Of particular importance to this study are the linguistic choices and overall discourses used to describe knowledge creation in development and change, as well as the symbolic nature of mediations through artifacts including metaphors and comparisons (Engeström & Sannino, 2011). Activity-theoretical research highlights the importance of linguistic and symbolic dimensions of learning mediation, and the ways in which such discourses shape practices through the adoption of concepts and specific language as tools mediating work practices (van Oers, Wardekker, Elbers, & van der Veer, 2008). Based on an overall evaluation of existing IKM literature, it could be observed that aspects of mediation, viewed in an activity-theoretical tradition, have not been explored either extensively or systematically, and could benefit from additional empirical contributions in order to more effectively address the mediated nature of learning in relation to knowledge creation in startup work.

The interconnected relations among activity system constituents reflect the mediated nature of activity in which learning can be conceptualized as emerging from this unit of analysis, yet additional conceptual tools are required to better describe work practices in relation to learning in differentiated ways in practice, especially in the context of rapidly changing organizational contexts. As an evolving field, IKM continues to adopt new concepts. As mentioned in the introductory chapter, the wide range of terminologies used in empirical IKM studies, and the limited focus on learning dynamics themselves represent key challenges for empirical IKM studies. Therefore, this study contributes to activity-theoretical research in IKM by developing and implementing a solid methodological framework based on a robust set of concepts adopted from the CHAT/EL-based tradition to make meaningful empirical and
theoretical contributions which may serve as new and solid foundations for future learning-focused research in this field.

Different forms of mediation shaping developmental trajectories of knowledge creation in development are therefore central for a dialectical appreciation of learning as a defining feature of startup organizations in times of rapid change. Inherent in these relations are extensions of socio-cultural influences of mediation in which different elements of change emerge, requiring navigation in the course of generating knowledge. As we begin to consider these internal dynamics of startup work, contradictions in the mediated structure of activity will become increasingly evident when brought into focus and magnified through the CHAT lens adopted in this study.

Viewing the learning process from an activity-based perspective requires a shift from other forms of analysis and a focus on the concept of mediation which is used to develop questions central in understanding learning dynamics in startup organizations. Therefore, in this study, I analyze the mediated nature of learning as a relational process which considers the interconnectedness of the subject and the world generally, and individuals and communities in relation to tools/artifacts, rules or division of labor in evolving and often overlapping activity systems directed towards distinct object/goals specifically. The focus on mediation to examine learning as a function of social relations in startups provides a useful approach which takes into account material and more abstract dimensions of learning linked to cultural and historical aspects of startup work as reflected in concrete practices for knowledge creation over time. From this perspective, even seemingly intangible linguistic artifacts such as words, phrases and stories acquire significance, as they are created, used and transformed in startup work. I argue that the mediated nature of learning is inextricably related to everyday knowledge creation evident in the relational approaches embedded in situated contexts, reinforcing the importance of startup learning in an evolving innovation economy in transformation.

2.5 Collaboration/Boundary Crossing Within and Between Organizational Boundaries

The concept of boundary crossing is applied in the CHAT/EL tradition to describe the interactions among activity systems and conceptualize the navigation of complex social activities in situated contexts within and across organizational boundaries (Engeström, 2014). In these environments, several adjacent activity systems may interact, often overlapping and creating
opportunities for either synergies or challenges/discontinuities. Multiple individuals contribute to social systems they are part of. Collectively, they contribute inputs into activity, organizing and reorganizing processes, and ultimately constructing outcomes. It is important to mention that in activity, participants contribute collectively and/or collaboratively, however, their contributions to goal achievement may not always be equal. The outcome of activity, however, is the sum of contributions by multiple participants who are part of the same distributed activity system, collectively conceived.

A topic of significant importance in understanding the collaborative nature of learning in activity represents the coordination of activities, their overlapping nature and interactions in the context of development (Yamagata-Lynch, 2010a). An examination of existing literature reveals a significant area of research dedicated to understanding aspects related to psychological factors such as rewards/punishment, or control/flexibility in relation to mechanisms influencing collaboration in organizational contexts. These mechanisms are often interrelated and in close relationship to social dynamics as outlined in literature concerning the creation of shared meanings and goal-orientation among others. In contrast, an activity-theoretical approach to collaboration and boundary crossing focuses on activity as situated practice, placing less emphasis on individual psychological dimensions such as motivation, or social dimensions such as the relationships among interrelated socially constructed factors and their interpretations more broadly conceived. The collaborative nature of learning therefore represents a foundational element in the activity-theoretical approach adopted in this study.

Since learning is paramount in the development of startup goals, a better understanding of facilitating/hindering factors in collaboration/boundary crossing is needed, with particular emphasis on interrelations in collective dynamics of activity in times of rapid change. Understood in the CHAT tradition, two or more activity systems can share an object, which is created from their interaction in diverse contexts (Engeström, Engeström, & Kerosuo, 2003; Kerosuo & Engeström, 2003). Therefore, the examination of contradictions in boundary objects, such as shared objects between activity systems, illustrated in relation to contradictions, can enable elaborate insights into organizational dynamics in complex learning environments (Yamagata-Lynch, 2010a). Examining interactions between activity systems can enable a broader view for the analysis of change in development beyond individual activity systems, towards more complex analytic frameworks, which represent an important aspect in the context of complex startup work practices in times of rapid change.
Developing a theory of startup learning must therefore take into account how individuals participate in shared/collaborative goal-directed work activities and develop explanations for the potential for learning expansion in these contexts without assuming that learning processes are always in the realm of awareness or that they are always intentional. A reconceptualization of learning from an activity-theoretical perspective therefore may acknowledge the centrality of addressing collaborative activities within and across organizational boundaries in relation to the possibilities for learning expansion in practice at the intersection and/or in the context of overlapping activity systems in development.

2.6 Examining the Potential for Expansive Learning: A Contradiction/Resolution/Synthesis (CRS) Dynamic

Viewed from an activity-theoretical perspective, the concept of contradictions therefore represents a central point of interest and may be conceptualized as a source of change in learning (Engeström, 2001b). Navigating contradictions is a complex process which involves analyzing historically accumulated tensions, discontinuities or dilemmas shaping the cultural fabric of situated contexts in development (Engeström & Sannino, 2011). Contradictions can also arise from the exposure of subjects to novel situations (Engeström, 2014; Sannino et al., 2009). For example, Roth (2003) used an illustrative example of exposure of scientists to unfamiliar graphs and described the process of competence development in terms of creation of cognitive artifacts facilitating the achievement of goals. This process can be explained as a primary contradiction which is located at the subject level (Engeström, 1999a). The new context a subject enters, such as new environment, situation or workplace results in the creation of forms of contradiction which can be analyzed either in deeper dimensions at the activity system constituent level or in the broader context of activity. In another relevant study, Núñez (2009) synthesized four important considerations for effective research of contradictions related to learning from an activity-theoretical perspective: “1) an individual and/or collective unit of analysis, 2) a complete operationalization of the components, 3) the identification of contradictions that broaden perspectives on learning, and 4) possible resolutions to contradictions.” (Núñez, 2009, p. 17). These aspects are foundational in the understanding of the role and function of contradictions in the context of change and development.

To enable a more effective analysis of potentials for change and improve comparability, it is useful to distinguish between different locations of contradictions which may be present within
and across activity systems. Engeström (2016c) distinguishes between four different types of contradictions. A primary contradiction can be positioned within an activity system constituent. Secondary contradictions are positioned between activity system constituents, while tertiary contradictions are positioned between object of activity and a culturally more advanced object. Finally, quaternary contradictions are positioned between a constituent of an activity and another activity system constituent (Engeström, 2016c). In a study examining contradictions, Núñez (2009) distinguishes between two main research streams related to the study of contradictions in activity: one which involves the introduction of a new instrument, and another which involves the introduction of a new object into an activity system (Núñez, 2009). These changes, Núñez (2009) argues, disrupt activity system dynamics, creating conditions which may induce change. Therefore, it is necessary to understand the implications of the introduction of new artifacts/objects into an activity system, or between multiple activity systems by reflecting on their relations to other activity system constituents and adjacent activity systems as well.

While the approach adopted in this study provides only an appreciation of specific aspects of EL, the contradiction/resolution/synthesis dynamic which informs the analysis of learning in startup work, I argue, represents a valuable and robust conceptualization of learning on trajectories of knowledge creation in relation to learning expansion. In this analysis, we begin to see an expansive view of learning emerging empirically in conditions of rapid change. Central to the activity-theoretical approach are the multidimensional struggles of individuals I draw upon to illustrate the pressures of change and growth on the front lines of the startup development in which important questions of learning and change emerge. In these contexts, we begin to more effectively understand the nature of contradictions in knowledge creation practices of startup work and unique aspects which permit an in-depth examination of the internal dynamics of development in learning with particular attention to its expansive forms.

2.7 A Triple-shift in the Re-conceptualization of Learning from the Vantage Point of CHAT/EL

The core purpose of this study is to develop an expansive view of learning by adopting an activity-based approach guided by an interest in the relations between the mediated, collaborative/boundary-crossing and contradictory dimensions of learning in everyday startup work practices for knowledge creation to more comprehensively understand how learning dynamics in activity is actively structured in startup work. In particular, conceptualizing the
different forms of *contradictions* as a source of change in learning enables deeper insights into individual *modes of participation* shaping participant experiences in relation to concrete activities in times of *rapid change*.

This analytic part of this study is constructed as a three-part analysis integrated under an overarching theme of *expansive learning* in relation to socio-cultural dimensions of startup work. In this study, I suggest that there is a need for an expansive view of learning to observe the complexity of *contradictions* embedded in the dynamic structure of intersecting/overlapping activities shaping socio-cultural dimensions of *knowledge creation* in *startup work*. Therefore, each analytic chapter (5, 6 and 7) focuses on a key analytic theme in relation to EL. Chapter 5 highlights the *mediated* nature of learning, emphasizing social structures and the interrelated mechanisms of *startup work* activity in the context of *knowledge creation* and development. Chapter 6 emphasizes *collaborative* aspects which relate to the formation of or engagement in communities with learning potential within and across organizational *boundaries*. Finally, Chapter 7 examines *contradictions* as a source of change in learning, with particular attention to different forms of tensions or challenges identified in the empirical data collected from participant narratives. Each of these chapters gradually build an expansive view of learning as socially situated, historically evolving and culturally mediated in practice.

The model of learning developed in this study, however, is not without limitations. As I will further elaborate in Chapter 3, balancing the focus on the individual as an autonomous subject with the complex social relational dimensions of activity represents a complex challenge which requires bridging situated dimensions of practice with the broader socio-cultural contexts in which activity is developed. Consequently, Chapter 5 focuses on the *mediated* nature of learning which places an emphasis on situated practices in startup contexts, whereas the application of the concept of *boundary crossing* in Chapter 6 offers a means to illustrate aspects

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11 The diversity of startups in terms of variables such as size, economic sectors or product focus informed and were informed by the different conceptual foci adopted in this thesis. Capturing the essence of learning phenomena under the conditions examined in the distinct environments of startups can be conceptualized in relation to Vygotsky’s approach, as recovered by Sannino and Engeström (2018): “In exactly the same way we are in need of an as yet undeveloped but inevitable theory of biological materialism and psychological materialism as an intermediate science which explains the concrete application of the abstract theses of dialectical materialism to the given field of phenomena. […] In order to create such intermediate theories — methodologies, general sciences — we must reveal the essence of the given area of phenomena, the laws of their change, their qualitative and quantitative characteristics, their causality, we must create categories and concepts appropriate to it” (Vygotsky, 1997 in Sannino & Engeström, 2018, p. 46). In a similar way, capturing the essence of learning in each of the organizations examined provided the foundations for an abstraction, which served as a foundation for a distinct conceptual focus on each KAT within a dynamic of change.
which transcend organizational limits into broader societal contexts of startup work activity. Finally, in Chapter 7, I converge these distinct aspects of CHAT/EL under the analytic theme of *contradictions* as a source of change in learning. Collectively, these elements provide an *expansive view of learning* which is relevant to the unique context of startup organizations in times of *rapid change*.

The application of the concept of *boundary crossing* in Chapter 6 provides an important element to the development of an expansive view of learning in startup activity, highlighting the socio-cultural aspects of learning embedded in *collaborative* activities of overlapping systems which often extend beyond the startup boundaries. These socio-cultural dimensions of learning are made visible by adopting an analysis of *boundary crossing* between the startup environments and other relevant organizations. Despite the main focus on startup organizations as the settings for analysis, it is nevertheless important to illustrate in detail the extended relationships which demonstrate the expansive nature of learning in the small, rapidly evolving organizations examined. In the context of providing a detailed analysis of interactions between these overlapping activity systems, we observe variations in individual *modes of participation* which are shaped by rules and the division of labor in situated contexts and which cannot be broadly generalized. The activity-based analysis of *boundary crossing* emerging from the empirical data collected provides a valuable foundation for an enhanced understanding of mechanisms and elements which are often obscured by qualitative or thematic approaches to the study of learning in IKM literature. Consequently, the activity-based approach adds valuable insights to an *expansive view of learning* in everyday *knowledge creation* practices in *startup work* viewed from an activity-theoretical perspective.

In order to understand the complex nature of the full significance of an *expansive view of learning*, I draw on the concept of *contradictions* from Engeström’s model of EL. Building on the previously outlined analytic perspectives, I apply this concept to develop an *expansive view of learning* which emphasizes the internal relations that enable a re-conceptualization of *startup learning* in networking activities, tool co-creation or professional accreditation activities. While participants typically conceptualized formal learning aspects as “training”, they acknowledged acquiring a diverse set of skills through informal or unconscious mechanisms in the process of engaging in activities within and beyond their startup organizational *boundaries*. These activities were not necessarily directly related to startup work, but on unplanned, unstructured, sometimes surprising events *mediated* in both physical and digital dimensions.
In this study, I argue that an expansive view of learning can enhance our understanding of knowledge creation in startup environments in times of rapid change, while opening up opportunities for broader examinations of startup learning both within and across organizational boundaries. Building on the idea that individual variations in modes of participation in activity systems part of the innovation ecosystem are shaped by social relations which structure individual orientations over time, I make the case that a dialectical approach to navigating the complexity of innovation ecologies adopting an expansive view of learning provides a valuable contribution to the understanding of learning in rapidly evolving work environments. Reflecting on these dialectical concepts and approaches beyond of the activity-theoretical frame of analysis, I argue, can translate socio-cultural experiences embedded in everyday work practices into valuable opportunities and strategies for learning and development. Building upon the indicative review of IKM literature, I outline the relevance of an expansive view of learning, suggesting that a dialectical conceptualization of startup work practices shaping individual modes of participation in activity can be achieved by navigating contradictory dimensions of everyday knowledge creation practices which shape situational contexts of work in times of rapid change. These perspectives can be described in terms of the analytic concepts (KATs) adopted in this study to effectively examine startup learning in relation to development and change.

Closely related to the expansive view of learning proposed in this study is a deeper analysis of dialectical mechanisms which shape variations in modes of participation, offering grounds for predictions of directions of development of individuals-in-activity. Building on the concept of EL developed by Engeström (1987), I demonstrate how this expansive conceptualization of learning can complement existing models in the IKM domain with an emphasis on socio-cultural aspects which are often neglected. In this study, I aim to develop a comprehensive understanding of socio-cultural aspects using an activity-based approach which, I argue, makes an important contribution to an understanding of important dimensions of startup learning in times of rapid change.

However, while the analytic concepts adopted in this study help to develop an expansive view of learning, they are not sufficient to easily transcend theoretical boundaries into the sphere of concrete practice. Theoretical conceptualizations of learning as dialectical in fact has an effect of increasing the complexity of analysis of aspects of learning in practice. Resulting from this assumption, the mediated relations in activity must be translated through situated applications into actionable practices, which I will elaborate on in later chapters.
Activity-theoretical research places emphasis on the *contradictions* shaping the stability/change dynamics in organizations, providing valuable concepts in understanding aspects of development which enhance conceptualizations of *startup learning* in the IKM domain. The indicative reviews of IKM literature in Chapter 2 allowed me to reflect on specific gaps which, I argue, are relevant for the analysis presented in subsequent chapters. In this study, I therefore suggest that the concepts of *mediation*, *boundary-crossing* and *contradictions* as a source of change in learning address areas in IKM literature which can benefit from an activity-theoretical re-conceptualization of a human face of learning in development as understood through a CHAT lens. This approach highlights the *mediated* structures, organization and subjective experiences of individuals which are largely omitted in existing studies of learning in relation to IKM. The distinct characteristic of learning as “expansive” described by Engeström provides a central element in examining the dialectical nature of activity as a means of understanding not only situated dimensions of *knowledge creation* in *startup work*, but also the potential for object transformations through mechanisms which extend in broader social, cultural and historical dimensions over time. These changes allow us to understand the broader significance of *startup learning* using an approach which bridges individual cognition to socio-cultural relations which are interrelated, situated, historically evolving, perpetually re-organized and transformed.

As I develop the arguments in support of an *expansive view of learning* throughout the next chapters, I focus on the three complementary analytic themes adopted from the activity-theoretical tradition to enhance current conceptualizations of learning in IKM scholarship presented in greater detail in Chapter 3. Framing these themes under an expansive view of learning, I argue, provides a useful and valuable means for a more comprehensive understanding of the complexity of human learning in the unique organizational contexts examined. In this chapter, I am not, however, trying to analyze the basic epistemological and ontological foundations behind CHAT. These concepts are related to philosophical theories as conceptualized in their own traditions, and thus the connections which have been elaborated though extensive empirical and theoretical work are complicated. My contention in this thesis is that the expansive approach is not the only complementary intervention to the conceptualizations of learning in IKM and that there are other approaches which give ample means to understand learning dynamics in organizations. However, in my view, this CHAT/EL perspective to the exploratory approach adopted could be one important step towards a better understanding of the expansive
nature of learning in human activity, in alignment with a socio-cultural perspective on learning in
development in complex learning environments.

2.8 Conclusion

The rationale and elements adopted and applied for the theoretical framing of the current study illustrated above provide relevant analytic justifications for the choices made to examine knowledge creation and learning expansion in startup work, complementing current conceptualizations prevalent in IKM literature. In this context, activity is the fundamental units of analysis in which this learning dynamic can be analyzed in the process of emergence and development (Kaptelinin & Nardi, 2006). While for experienced CHAT scholars this introduction may be conceived as a summary of key concepts, future chapters aim to further illustrate the complex nature of distributed activity within the context of IKM by extending and complementing the discussion of theoretical foundations initiated in the previous sections.

To summarize, learning is situated and embedded in socio-culturally constructed dimensions of activity developed in the context of complex interactions mediated by material and symbolic artifacts. The distributed, collaborative nature of activity complicates the analysis of activity in situated practices in part due to the diverging goals of different subjects constructing a range of shared meanings in contexts characterized by rapid changes within and across organizational boundaries. This interplay of mediation/boundary crossing/contradictions can be meaningfully described as a MBCC dynamic, orienting distinct and potentially divergent trajectories of development towards distinct types of knowledge creation, shaping development and change and learning over time. The more specific examination of the degree of translation of contradictions within this dynamic can be described as a contradiction/resolution/synthesis (CRS) dynamic in relation to variations in distinct modes of participation in activity, orienting learning and directions of development of individuals-in-activity towards distinct knowledge work futures. The activity-based view provides a useful lens for analyzing the complex nature of knowledge creation in startup work activity in relation to the three analytic themes and the degree of translation of contradictions, as an attempt to empirically operationalize interrelations of complexity using an activity-based view of learning in potential expansion. The framework developed in this chapter will be grounded further in relevant literature and empirically developed in future chapters.
Chapter 3: An Indicative Review of IKM Literature: Identifying and Evaluating Areas for Intervention

The goal of this chapter is to locate this study of learning dynamics in startup organizations in relation to the broader Information and Knowledge Management (IKM) literature by offering a review of key works with reference to important conceptual cues offered by a CHAT/EL perspective. This chapter provides an examination of selected and representative, or rather indicative, samples of IKM literature to build solid foundations for the analysis. Specifically, three lines of research are explored, and in turn aligned with or otherwise interrogated in relation to the three key analytic themes (KATs) derived from the Cultural Historical Activity Theory (CHAT) tradition discussed in the previous chapter.

3.1 Introduction

To identify potential areas for more expansive ways to conceptualize learning within the dynamic of knowledge creation, development and learning in startup work, I argue in this chapter for points of departure based on an interrogation of IKM literature vis-a-vis key analytic concepts grounded in CHAT. The lines of argument emerging from these points of departure address a lack of analytic attention to phenomena which are relevant for an activity-theoretical examination of relevant clusters of research in relation to learning dynamics in the organizations examined empirically later on in the work. These points of departure problematize the contradictory presumptions embedded in the IKM body of literature with regards to the mechanisms of knowledge creation which are implied, obscured, conflated or neglected, and which, I argue, need to be carefully scrutinized to illuminate the potential for more collaborative and transformative dimensions of learning. The CHAT approach in this context serves as an important compass for the investigation. Areas for intervention identified in this chapter, I argue, have the potential to address the essential challenge of learning at the nexus of uncertainty, limited resources and rapid change in startup development, area which I describe as a conundrum of IKM in startup development, or, simply, the development conundrum.

Consequently, to further solidify the importance of an activity-theoretical approach for an examination of more expansive opportunities for learning and the possibilities for meaningful participation in knowledge creation practices of startup work/life, it is relevant to recognize and
reflexively interrogate some of the dominant conceptualizations of learning in the body of literature to which this study aims to dialogically contribute to. Existing conceptualizations of notions of learning and knowledge creation across studies examined provide crucial indications of particular presumptions which suggest mostly static and unproblematic conceptualizations of knowledge and learning. These presumptions, however, should be further scrutinized to identify aspects which remained latent in the absence of CHAT approaches, but which, I argue, may enable possibilities for illuminating transformative processes within and across the relations which constitute startup work activity in times of rapid change. Directing a focus to the lack of analytic attention to these aspects which are inherently problematic can in turn enable attempts to challenge and transcend contradictions more expansively in practice. The recognizable clusters of research highlighted in this chapter offer useful points of departure for the activity-theoretical re-conceptualization of learning elaborated in later chapters with an emphasis on considerations which examine factors, processes or experiences of change and their variations in practice.

This section discusses how the KATs adopted will be used to inform the selection of studies for the indicative review (Johnston, MacNeill & Smyth, 2018; Trimikliniotis, 2004; Cheng & Gilbert, 2009). In seeking to reconsider the specific body of IKM research literature from the perspective of a more robust theorization of learning dynamics in context, this chapter will explore and identify what I argue to be key gaps in Information and Knowledge Management (IKM) literature as understood through the theoretical lens of Cultural Historical Activity Theory (CHAT) and specifically, from within this tradition, Yrjö Engeström’s (e.g. 1987, 2014) theory of “Expansive Learning” (CHAT/EL). Three core themes—or rather “Key Analytic Tools” (KAT) from this theory will be used to interrogate indicative examples of IKM research: a. mediated nature of learning b. boundary crossing/collaboration and c. contradictions as a source of change in learning. I argue that a focused, systematic interrogation of this type provides the bases for an original, meaningful and important contribution to the IKM literature from the perspective of Adult Learning. While a detailed rationale for the selection of CHAT/EL as a suitable theoretical perspective will be introduced in the next chapter, at this point it is important to underline that this particular tradition is widely recognized as offering a distinctly useful means of assessing complex, organizationally-based, relational (sociocultural) learning phenomena12 (cf. Engeström, 2011; Greeno, 2006).

12 Other theorists adopted and extended activity theory over time. Sannino and Engeström (2018) summarized the variations in the adoption and extension of activity-theoretical approaches as follows emphasizing the efforts of
The indicative review of IKM literature presented in this chapter provides an overview of relevant studies which center learning primarily around technical frameworks or the practice of management, among others, while individual experiences, and particularly situated, socio-cultural aspects of *knowledge creation* appear to be limited. This indicative selection, in other words, seeks to identify specific areas of IKM research which, I argue, can potentially benefit most from an activity-theoretical contribution in order to make visible more subtle, socio-cultural aspects of learning. In broad terms, the analysis of literature completed in this chapter suggests that learning appears to be generally conceptualized as a side-product of startup activity, embedded in amalgamated analyses of organizational dynamics in connection with an abundance of other factors including procedures or practices shaping the experiences of employees as they navigate the complex nature of their work. The indicative approach to the review adopted in this study provides the opportunity for more focused and detailed discussion of material vis-à-vis its selectiveness, but on the whole aims at clarifying themes which have traditionally been conflated or ignored, allowing new insights to emerge concerning noteworthy aspects of learning.

The indicative review of IKM literature completed in order to examine how learning is conceptualized in this body of scholarship suggests three interrelated areas where an activity-theoretical approach can complement conceptualizations of learning in the specific context of startup organizations in times of rapid change. To briefly review, I highlight that, first, socio-cultural dimensions, such as the concept of *mediation*, can balance the significant focus on technological aspects in IKM literature. Second, existing *collaborative* models focusing on capturing/recording knowledge are generalized and could be balanced by activity-theoretical approaches to concrete life experiences in relation to the concept of *boundary crossing*. Third, the conceptualizations of knowledge itself being transformed in multiple forms (tacit, explicit) could

“American scholars such as Urie Bronfenbrenner, Jerome Bruner, Michael Cole, Sylvia Scribner ja James Wertsch, as well as some European, Asian and Latin-American academics” (p. 44). They underlined that “[t]oday activity theory is pursued in multiple variations. In Germany, B. Fichtner, H. Giest and G. Rückriem and J. Lompscher have generated a line of research and theorizing that focuses largely on learning and tackles also the challenge of digital media in the development of human activities. In the United States, I.M. Arievitch and A. Stetsenko, drawing on the legacy of Galperin and other Soviet activity theorists, have formulated an approach that emphasizes activism in the face of critical societal issues and contradictions. In Australia, A. Blunden has built an inter-disciplinary theory of activity that is heavily embedded in philosophical debates. In the Netherlands, B. van Oers and his colleagues have developed a broad activity-theoretical approach to learning. These are merely a few prominent examples of the diversity of approaches within current activity theory” (p. 44). The distinct and specific CHAT/EL approach in this study was adopted in part due to the attention for expansion in relation to learning and the context of startups as workplaces where the creation of knowledge in development was a central guiding element for analysis.
be re-conceptualized in terms of change processes towards “societally impactful knowledge” (Sannino & Engeström, 2017) driven by the resolution of *contradictions* in practice.

From the review of previous research completed for this study, it is possible to observe that activity-theoretical facets of learning remain largely under researched in IKM literature. At the same time, the prevalent focus on innovation requires a re-conceptualization of learning in relationship to *knowledge creation* practices rooted in the very essence of activities at the basis of learning in startup work. In this chapter, I therefore highlight aspects relevant to an examination of learning in work practices of startup organizations as an exploration within the substantive field of activity-theoretical research with a focus on new and innovative forms of tool *mediation, collaboration* and the navigation of *contradictions* in times of *rapid change*, all in relation to the broader themes of adult education and community development. Simultaneously, this literature review builds the foundation of the thesis framework and focuses on presenting a comprehensive discussion of the key analytic themes examined, aspects which are particularly important for application to the analysis of empirical data.

In order to find a theoretical starting point for this dissertation, literature was reviewed along three lines of research. Therefore, this literature review is organized in three main sections aligned to the three themes which are examined from an activity-theoretical perspective: *a. mediation b. collaboration/boundary crossing and c. contradictions as a source of change in learning*. By examining IKM literature in relation to the three key analytic themes (KATs), this chapter presents conceptual, theoretical and empirical discussions of learning, in situated contexts representative for fast evolving professional settings. Recognizing the complexity of concepts defining relative dimensions of learning in *knowledge creation* practices of *startup work*, this literature review seeks to examine the three CHAT-inspired themes in order to better conceptualize areas for intervention in the conceptualization of learning dynamics in IKM literature in relation to Engeström’s model of expansive learning (EL). Based on the scope outlined previously, this examination builds on theoretical and empirical foundations of CHAT theory with relevance to the examination of learning in *startup work* relevant for a re-conceptualization of learning in IKM literature. I employ these concepts in order to better understand how participants in this study make sense of their own learning and how these experiences shape their aspirations or pathways towards *projections of professional futures* on trajectories within and across organizational boundaries.
This literature review is foundational in conceptualizing the areas where an activity-theoretical research can complement existing IKM literature. Consequently, this review was carefully designed to establish the bases of dialogue across CHAT and IKM, leverage the benefits of a solid theoretical grounding and in the final instance provide a foundation for what I argue to be the valuable empirical insights emerging from data themselves. Research literature aiming to support a better understanding of work practices in startup organizations is aligned with a growing recognition of a need to enhance current knowledge of relationships between evolving technological influences embedded in work practices on one hand and learning on the other. This more robust understanding of learning can be further expanded by examining different dimensions of activities while extending the theoretical, empirical and practical dimensions of knowledge in IKM literature.

In the following sections, I first introduce the three areas of interest by providing in-depth discussions of the CHAT-derived concepts adopted in this study. By carefully and intricately constructing the three analytic themes, I provide solid foundations for a critical analysis of IKM literature, in other words, rooted in the preoccupations of Engeström’s theory of EL. Following these explanations, I explicitly outline the step-by-step details of linkages between the concepts adopted from the CHAT tradition and IKM literature, outlining and articulating the gaps identified on the basis of the analysis of the IKM body of literature examined. In the first part of each section, the KAT’s are further defined and operationalized, building on the foundational elements presented in Chapter 2. In the second part of each section, the KATs are applied in a critical review of IKM literature to identify and evaluate areas for intervention, from which my three research questions are derived. In sum, aspects illustrated below help explain why an inquiry into socio-cultural approaches to learning can provide valuable contributions to IKM literature by developing an expansive view of learning. This contribution therefore addresses these interrelated areas for intervention systematically, with attention to mediational, collaborative and contradictory dimensions of learning and change. In this context, I suggest that the CHAT approach adopted in this study provides valuable contributions to the empirical development of conceptualizations for the potential for expansive learning in startup organizations in relation to activity in development, shaped by socio-cultural and historical elements in the context of development. The points highlighted in this literature review are vital for an expansive re-conceptualization of learning in startup work and offer fundamental insights into issues of knowledge creation, change and development. Shifting an emphasis from
generalized notions of knowledge towards situated, embedded and more contextualized discussions knowledge in change provides a backdrop against which the dynamic nature of learning in startup organizations can be revealed.

3.2 Theories, Models and a Triological Conceptualization of Knowledge Creation in IKM literature

The central aim of this section is to examine key areas of relevance in IKM literature to develop an overall appreciation of the challenges rooted in the complexity and interdisciplinary nature of this body of knowledge, in relation to learning. As the field of IKM continues to mature, discussions evolving around themes which include model-focused examinations of technological aspects, community-focused examinations of knowledge creation processes or evaluations of interactive aspects of knowledge creation have been of particular interest in the context of changing work and learning dynamics in diverse organizations. To grasp the essence of the field today, it is important to focus on each of these interest areas which appear more prominently in relation to IKM discussions and based upon which fundamental concerns over the potential for learning expansion can be raised.

As a multidisciplinary field of inquiry, IKM focuses on the processes, practices and tools involved in managing information and knowledge resources in diverse organizations in alignment with organizational goals which include performance and efficiency (Lee, Lee, & Kang, 2005; López-Nicolás & Meroño-Cerdán, 2011). Broadly conceived, IKM literature examines aspects related to the combination of the mechanisms, tools and practices related to the production, sharing and overall management of information and knowledge over time (Coakes & Clarke, 2006; Esterhuizen, Schutte, & Du Toit, 2012; McInerney, 2002; Swan, Newell, Scarbrough, & Hislop, 1999). As organizations develop in practice, they produce, consume or exchange knowledge, aspects which together shape the nature of development and change in these contexts. To understand how knowledge is managed, it is necessary, however, to understand the conditions which shape these relational dynamics at the basis of development, how these relations are produced, reproduced, and regulated, and the nature of knowledge itself.

In the context of IKM literature, there are significant ongoing debates revolving around the epistemological issues related to the nature of knowledge, as scholars increasingly recognize the mediating potentials of emerging aspects of technology as/tools shaping activity, and their relations to the creation of cognitive artifacts shaping individual participation in activity
To address these emerging challenges, scholars are seeking to understand the “various types of knowledge and how they are used and made to grow.” (Paavola & Hakkarainen, 2005, p. 536), and furthermore, ask “Who is the subject of learning? Is it the individual, or communities, or what? What kind of knowledge should be learned, and how?” (ibid., p. 535). Conceptualized at the intersection of the fields of information sciences, business administration, human resource management and others, IKM studies focus on knowledge as an important aspect of development and enabler of learning (Berkes, 2009; Stoll, 2010; Vestal, 2005). The field of IKM approaches evolving issues surrounding processes and practices in organizations which tend to focus on the sharing, storage or creation of knowledge within the structures of diverse organizations, aligned to their strategic capabilities for development. As Durst & Edvardsson (2012) pointed out, “companies have to find ways to adequately manage this aspect, which poses a particular challenge for smaller firms as they usually lack the resources needed to make full usage of their knowledge stock.” (p. 880). However, before examining some of the prevalent models in IKM, it is relevant to outline several areas of interest and perspectives in this body of literature.

Philosophical/epistemological/ontological approaches to IKM focus on the nature of information/knowledge, its objectives, values, ways of knowing, or more broadly, comprehending what constitutes knowledge in distinct contexts. Building on a main concern to understand aspects relevant in the ways organizations gather information, convert it into insights for practice, and the overall relation of knowledge to its sources, scholars who focus on these aspects examine and often challenge the beliefs or presumptions inherent in practices related to IKM. By examining the nature of information/knowledge through reflection, scholars in this group focus on building insights along the lines of questions related to what, how and why we know what we know in a variety of organizational contexts (Jashapara, 2005; Kimble, 2013; Land, 2009; Serenko & Bontis, 2013). Alvesson & Kärreman (2001) pointed out: “[i]t is argued that knowledge is an ambiguous, unspecific and dynamic phenomenon, intrinsically related to meaning, understanding and process, and therefore difficult to manage. There is thus a contradiction between knowledge and management.” (p. 995). Posing these questions allows deep reflections on the nature of knowledge in its tacit and explicit forms (Polanyi, 1966). For Polanyi, the tacit and explicit dimensions of knowledge represent essential elements which are inherent in human activity and which acquire significance in organizational contexts. A number of research studies examining these aspects of knowledge in IKM focus on the importance of
dialogue in supporting the strategic aspects of IKM with vital implications for the ability of organizations to find, use and transform knowledge in the developmental process (Prichard, 2002; Seidler-de Alwis & Hartmann, 2008; Stenmark, 2000). These studies emphasize the importance of relevance and meaning, or what might be considered “wisdom” in the context of IKM research (Bierly, Kessler, & Christensen, 2000; Rowley & Slack, 2009).

Considering the importance of information and knowledge as a valuable asset for organizations in relation to competitiveness, scholars focused on intraorganizational aspects of IKM examine how individuals and their groups engage in continuous efforts to solve problems, locate, store and use knowledge to derive opportunities from information and technology in knowledge intensive industries (Holsapple, 2005; Park, Ribière, & Schulte, 2004; Wild & Griggs, 2008). Viewed from this perspective, the value of knowledge is derived from the combination of information and practices oriented towards problem-solving or addressing business requirements. Building on predominantly positivist approaches which emphasize direct links between the effective IKM practices and desired organizational outcomes, knowledge is seen in related literature as measurable and manageable through specific procedures accounting for different variables, tools and policies. Prominent models aligned to this perspective on IKM include Nonaka & Takeuchi’s SECI model, Johnson & Blumeritt’s (1998) typology of knowledge processes, Carayannis (1999) meta-knowledge models, Earl’s (1998) state of knowledge, or Wiig’s (1993) model related to intellectual capital (Kakabadse, Kakabadse, & Kouzmin, 2003). Some theorists in this group argue that the re-utilization of knowledge and the processes, practices and policies implemented in relation to IKM shape the developmental potential of the organization and its cultural dynamic. By making explicit these aspects, it is argued, knowledge can be more effectively exploited through technology and tools designed to capture, store and codify information in databases or various portals individuals interact with. As emphasized by Kakabadse et al. (2003), however, these tendencies towards standardization and routinization can result in a range of challenges for organizations as knowledge can become obsolete in environments characterized by rapid change, and, achieving a “dynamic balance” between exploration and exploitation is rarely achieved in practice.

Ecology perspectives on IKM which focus on networks of organizations emphasize the importance of collaborative practices and aspects including knowledge transfer or acquisition. These perspectives emphasize the relations between individuals, their groups and organizations in the social, cultural and economic ecologies they are embedded, and consider knowledge as
distributed in the network (Bate & Robert, 2002; Hildreth & Kimble, 2005; Iverson & Mcphee, 2002; Sharratt & Usoro, 2003). Building on this conceptualization of knowledge residing across the organizational boundaries in the broader ecosystem, the relations emerging in the context of participation in these networks provide opportunities for acquiring new ideas or the creation of new groups facilitating the flow of knowledge for innovation and collaborative activities. Viewed from a collaborative point of view, the IKM aspects aligned to this ecology perspective are facilitated by the possibilities and abilities of individuals to engage in the networks, participate, contribute and learn, enabling possibilities for the emergence of strategic alliances between organizations around shared goals and interests. Given the complex nature of interrelated opportunities for participation in these communities, it is relevant to understand the feelings, attitudes or aspirations of participants, the knowledge they create in these ecologies, and the dynamically changing conditions they navigate through in these diverse contexts.

Models of IKM in general and knowledge creation in particular depict developmental processes as collaborative, often object-oriented towards innovative outcomes (Darroch, 2005; Lundvall & Nielsen, 2007). However, knowledge in the context of startup work can be more broadly conceptualized in relation to an object which is “impossible” and “incomprehensible”, as described by Jones & Spicer (2005):

[...] there is something peculiar about enterprise and entrepreneurship that is generally denied. What is denied is something central to the very object of the entrepreneur, something that, we have argued, is glimpsed by entrepreneurship research but is rationalized and hence pushed out of sight. We are suggesting that entrepreneurship discourse is not a coherent and stable discourse, held together around a stable centre. Rather, it is a paradoxical, incomplete and worm-ridden symbolic structure that posits an impossible and indeed incomprehensible object at its centre. (p. 236)

To achieve organizational objectives, broadly conceived, these models signify attempts to make processes at the basis of individual and social interactions explicit to increase the effectiveness of progression towards set goals. Reviews of different KM models describe different classifications including knowledge category models, intellectual capital models and socially constructed models (Mcadam & Mccreedy, 1999), mathematical models (Nakamori, 2003), object-based and community-based models (Lee, Tsai, & Amjadi, 2012). Central to the discussion of learning and knowledge creation in innovative knowledge communities is Nonaka and Takeuchi’s (1995) model of knowledge creation, which emphasizes the centrality of the concept from the particular
IKM perspective adopted. This model sheds light on aspects which can be complemented through an expansive view of learning in relation to the knowledge creation metaphor proposed by Paavola and Hakkarainen (2005). The centrality of innovation in organizations is examined by Nonaka and Takeuchi (1995) as a process of knowledge creation in which learning is not a central area of interest, instead, the interactive interplay between processes through which tacit and explicit knowledge are foundational to the mechanisms for development. The resulting “knowledge spiral” in this model involves distinct types of knowledge conversion: socialization, externalization, combination and internalization (Nonaka & Takeuchi, 1995), collectively shaping the emergence of innovative ideas and practices. This model takes into account the individual, group, organization and interorganizational relations with attention to the creation of knowledge specifically as the organizations strive to develop new products, ideas and ultimately grow. This shift from conceptualizations of knowledge in general to the active, participatory aspects of knowledge creation specifically provides a significant contribution to IKM models of knowledge creation overall. Consequently, in this model, the object is systematically developed through the interplay between the internalization/externalization/socialization/combination dynamic in relation to tacit and explicit knowledge.

These aspects of IKM models development, however, gain particular significance in the context of less formalized, or even informal practices shaping everyday practices are in small organizations:

Previous studies have shown that in many SMEs there is an absence of systematic knowledge management (McAdam and Reid, 2001; Wong and Aspinwall, 2005) and if measures are implemented, they may be regarded as less sophisticated. However, this does not mean that suitable approaches to tackle knowledge management problems are less significant to SME success. Rather it may be argued that a suitable handling of knowledge is a particularly important factor as to whether a firm survives or not. (Durst & Edwardsson, 2012, p. 880)

Overall, existing theories of knowledge and information management in IKM literature conceptualize knowledge creation and learning as important elements for the development of organizations over time. To grasp the relevance of these theories, the particular attention to the knowledge creation process in alignment a triadological approach as proposed by Paavola and Hakkarainen (2005) stands out. Viewing knowledge creation from this perspective, Paavola and Hakkarainen (2005) distinguish between knowledge acquisition at the individual level as a
“monological” approach and the participation/interaction of individuals as a “dialogical”, proposing a third alternative of “learning as a process of knowledge creation which concentrates on mediated processes where common objects of activity are developed collaboratively.” (p. 537) described as “trialogical” in nature. To transcend the dichotomy between the acquisition and the participation metaphors of learning (Sfard, 1998, Lave & Wenger, 1991), Paavola & Hakkarainen (2005) therefore propose a third metaphor which is described as the “knowledge-creation metaphor” of learning, aspect which is central for the dialogical approach between CHAT and startup learning in relation to aspects of IKM. In essence,

“[t]he knowledge-creation view represents a ‘‘trialogical’’ approach because the emphasis is not only on individuals or on community, but on the way people collaboratively develop mediating artifacts. [...] Characteristic of the knowledge-creation approach is to examine learning in terms of creating social structures and collaborative processes that support knowledge advancement and innovation; in this sense it becomes close to the participation view. Further, the knowledge-creation approach addresses the importance of generating new ideas and conceptual knowledge.” (Paavola and Hakkarainen, 2005, p. 539- 540).

This approach emphasizes the productive participation in knowledge-intensive work required to create opportunities and the knowledge necessary for innovative advancements which transcend individual efforts and re-focus attention on collaborative practices which are transformative. In search for applications for the trialogical conceptualization of knowledge creation to innovative organizational contexts, it is relevant to consider additional aspects which are relevant in IKM literature in relation to startups specifically.

Accumulating evidence demonstrates the implications of IKM models and practices for startup work, given that, in recent years, IKM research highlighted the pivotal role of knowledge creation and its significance for the competitiveness of these organizations in practice. Related literature examines the factors influencing IKM practices, barriers to the implementation of knowledge management and their impact on performance. Specifically in relation to IKM in startups, Centobelli, Cerichione & Esposito (2017) concluded that related literature is fragmented, offering significant opportunities for further theoretical and empirical exploration:

[...] we are witnessing an evolving process for startups. Today, they increasingly have access to new knowledge management tools, which do not need significant human and financial investments. Therefore, although startups are usually characterized by scarce
human and financial resources to achieve their scalability goals, they are able to overcome the barriers preventing the spread of knowledge management. (p. 15)

Literature outlined above examines issues which are relevant for startups and technology startups in particular. While the field of IKM continues to mature as new concepts and frameworks are developed, “there are still problems connected with both the diversity of the theoretical base and the gap between theory and its practical application.” (Aidemark, 2009, p. 1). The aim of this section was to offer an opportunity for an appreciation of IKM literature through a critical engagement with key focus areas across this interdisciplinary body of knowledge. These areas of interest illuminate opportunities for dialogical approaches which both build on previous accomplishments and complement aspects which have been understudied or neglected previously in IKM. The inherent challenge of perpetuating dominant conceptualizations of learning in this body of literature should be balanced through sustained discussions which can enable an appreciation of the multi-faceted nature of potentially more transformative approaches to learning in IKM as a whole, and expansive learning aspects specifically.

This section therefore presented a brief discussion of theoretical and conceptual aspects in IKM literature, relevant to the possibility of establishing key points of departure into the reconceptualization of learning from an activity-theoretical perspective. In this section, I reviewed literature which addresses relevant models, themes and in particular the issue of knowledge creation, focusing processes and practices in organizations, as well as the conditions for development with inherent potential in shaping experiences and orientations of individuals in relation to these aspects. In addition, this section outlined central themes relevant to the conceptualization of the interplay between the situated, individual and collective conditions relevant from an IKM perspective to development and the individual/collective experiences in startups as distinct from those in larger organizations outlining key aspects relevant in the context of this study for the identification of key entry points for the activity-theoretical re-conceptualization of learning in the context of startup work and practice.

3.3 Learning in Startups: Insights from Research Themes and Future Directions

To support the relevance of arguments proposed in this study in relation to an activity-theoretical re-conceptualization of startup learning, it is important to illustrate aspects relevant to contemporary debates surrounding learning processes and practices in startup organizations as
reflected in existing research studies. This section therefore presents a discussion of the aspects relevant in conceptualizations of learning in startups by summarizing existing empirical and theoretical facets related to learning in startups in general and technology startups in particular. I examine these aspects in order to provide the foundations for the activity-theoretical re-conceptualization in relation to learning experiences and aspirations of individuals who work in these environments in particular. I conclude this synthesis by highlighting key points raised in the course of this review in relation to implications for the examination of learning and the associated experiences of individuals in the context of startup work.

In recent years, a range of concepts from the fields of experiential or organizational learning have been applied to examinations of startup work and development in an attempt to extend existing knowledge in this domain of inquiry, focusing on diverse settings including semiconductor startups (Almeida et al., 2003), high tech startups (Midler & Silberzahn, 2008; Scarmozzino et al., 2017) or pharmaceutical startups (Mäkinen, 2002). Concomitantly, there is a growing literature on startup learning with attention to the distinct characteristics which can inform development practice. Consequently, over the past decades, researchers have examined the multifaceted and dynamic nature of startup work “[...] trying to unravel how entrepreneurs learn from experiences, and how the experiences further help the entrepreneur in enhancing the performance of the venture or in reducing the time to survival of the startup.” (Krishna & Subrahmanya, 2018, p. 56). These aspects are particularly relevant in understanding “how experience is transformed into knowledge, through the exploration of new possibilities and the exploitation of preexisting knowledge, which in turn influence the development of the entrepreneurs’ ability to discover and exploit entrepreneurial opportunities as well as coping with the traditional obstacles facing new ventures.” (Politis, 2005, p. 415).

Aldrich and Yang (2014) argued that the learning in startups is an essential element for the viability of ventures, that acquiring the knowledge necessary for development is predicated upon active engagement or “doing” and therefore that “understanding variation in levels of entrepreneurial learning and that entrepreneurial knowledge is critical to explaining the survival and growth of new ventures.” (p. 60). Furthermore, the high failure rates in these organizations have been described as follows: “Though entrepreneurship is purposeful, it is an evolutionary process of trial and error; and error is more likely than success.” (Loasby, 2007, p.1104 in Aldrich & Yang, 2014, p. 60). Given that “entrepreneurs must be exposed to the knowledge and find ways to learn it, or develop it on their own.” (Aldrich & Yang, 2013, p. 60), understanding
the knowledge creation processes and the ways individuals interact with the knowledge emergent in practice acquires increased significance. In contrast therefore to learning in established organizations in which processes and practices are mostly prescriptive and relatively well defined, learning in startups can be conceptualized as emergent in nature, as individuals in these organizations navigate the dynamically changing conditions of development.

The necessity of conceptualizing startup learning from distinct points of view is synthesized by Aldrich & Yang (2013) emphasizing that “[f]rom the viewpoint of the individuals involved, the issue is one of entrepreneurial learning, and from the viewpoint of the organizations they attempt to create, the issue is one of organizational learning.” (p. 60). Mediating the two viewpoints under the concept of “startup learning” in relation to everyday activity for development has the potential to transcend this dichotomy. Of particular interest to the examination of learning in startups is an attention to routines, given that previous research in general “studied routines already in place in organizations … but it has rarely examined the emergence of routines.” (Bapuji et al. 2012, p. 1588 in Aldrich & Yang, 2013, p. 60). An emphasis on individual experiences and the knowledge created under the diverse conditions of startup work therefore represents a key focus area which continues to require theoretical and empirical elaboration.

Research on learning in startups suggests that the knowledge external to the startup organization can be accessed through a variety of mechanisms, which include strategic alliances, participation in informal networks or the hiring of new employees, aspects which collectively enable innovative development in practice (Almeida et al., 2003; Baum, Calabrese, & Silverman, 2000; Neyens, Faems, & Sels, 2010; Shan, Walker, & Kogut, 1994), enabling opportunities for learning and innovation. In examining “the role of size in explaining which startups are best able to access and exploit knowledge opportunities via organization- and individual-level mechanisms” (p. 302), Almeida, Dokko and Rosenkopf (2002) pointed out that organizational characteristics are important elements which are relevant for the acquisition of knowledge. Furthermore, the relation between startup size and aspects related to the mobility of experts, associated networks and alliances possible in these contexts are particularly relevant, considering that these organizations are reliant on innovative developmental practices of exploration to support their dynamics of growth.

Conceptualized in the broader field of entrepreneurship, learning in startups and technology startups specifically examines aspects of practice and development which are highly
interlinked with the success of the organizations. Examining the experiential nature of the learning processes in entrepreneurial settings, Politis (2005) identified entrepreneurs’ career experience, the process of transformation and the effectiveness of entrepreneurial knowledge in coping with novelty in the developmental process as key aspects relevant for the learning process. Much of the learning which takes place in startup contexts is experiential in nature, which suggests the importance of past experiences in relation to aspects related to organizational performance (Minniti & Bygrave, 2001; Politis, 2005; Sullivan, 2000). Approaches to the examination of learning aspects in these contexts reveals that individual factors including the geographical location, market focus or characteristics of the organizations influence development shaped by exogenous factors including financial constraints (Zocco, 2015), strategy/industry structure (Sandberg & Hofer, 1987) or management strategies in relation to industry dynamics (Keeley & Roure, 1990). Approaches to understanding the role of learning in startup development can be considered as relatively limited if causal relations between different factors are considered in isolation from individual, situated experiences which enable individuals and their groups to recognize opportunities as they interact with the emergent knowledge in the context of development.

Startup learning is often described as a dynamic process which facilitates the development of the knowledge required for growth and development, through a variety of experiences and associated knowledge acquired by owner/managers and their employees. In addressing the complex task of describing learning in startup contexts, it is important to examine further key aspects relevant in literature in this field of study. While some scholars examine learning aspects in relation to the ability to recognize and act on opportunities (Alsos & Kaikkonen, 2006; Ardichvili, Cardozo, & Ray, 2003; Vaghely & Julien, 2010) others focus on learning aspects relevant in overcoming challenges in the process of development (Mitchell, Mitchell, & Smith, 2004; Shepherd, Douglas, & Shanley, 2000), or coping with and associated entrepreneurial attitudes towards failure (Cope, 2011; Politis & Gabrielsson, 2009). Using these aspects as additional points of departure into conceptualizations of startup learning, we might distinguish between two distinct, but interrelated perspectives which can be broadly conceptualized in relation to aspects related to identifying opportunities for knowledge creation in development and coping with the possibilities and limitations in developmental practices.

The key issue of recognizing entrepreneurial opportunities has been examined in literature by scholars including Ardichvili, Cardozo & Ray (2003) or Shane (2000) and theorized as a
function of aspects including “entrepreneurial alertness” (Gaglio & Katz, 2001; Tang, Kacmar, & Busenitz, 2012) or its “unbearable elusiveness” (Dimov, 2011). Inherent in related discussions, we can distinguish aspects related to debates focused on the identification and social construction of entrepreneurial opportunities (Fletcher, 2006; Vaghely & Julien, 2010) and distinctions between the abilities of experienced and novice entrepreneurs to identify/construct these opportunities (Ucbasaran, Westhead, & Wright, 2009; Westhead, Ucbasaran, & Wright, 2005). Developing an “entrepreneurial mindset” based on an accumulation of experience, interest in pursuing new opportunities and navigating turbulent and competitive markets has been linked to self-efficacy (Mauer, Neergaard, & Kerketerp Linstad, 2009), adaptive decision-making (Haynie & Shepherd, 2007) and more broadly to what Secundo, Vecchio & Passiante (2015) described as “knowledge-based regional development”. Prior experience learned in similar situations serves as the foundation for the interactions with new knowledge (Shook, Priem, & McGee, 2003).

Overall, literature reviewed on learning in startups highlights the importance of past experiences shaping the abilities of individuals to cope with the unique conditions of startup development, revealing aspects which provide insights useful in understanding the particular nature of learning dynamics in technology startup contexts. In particular, and as outlined by Politis (2005), startup experience, management experience and industry-specific experience are relevant for learning in startups, since these experiences are “likely to expose individuals to problems which they might encounter in running a new venture, and hence facilitate acquisition of knowledge that would help solve similar problems in the future.” (p. 406). Conceptualized as an experiential process, learning is a particularly relevant aspect of startup development especially in relation to an overarching goal in understanding how individuals and their groups learn to overcome obstacles, cope with the uncertainties of change and create possibilities for development. Arguments which assert that prior startup experience improves effectiveness in the pursuit of entrepreneurial opportunities, however, do not explain the variations in related processes, or, in other words, how entrepreneurs value or prioritize previous knowledge in their decisions in response to particular practices in the context of development. The ability to evaluate the utility of knowledge in relation to developmental opportunities is therefore essential in such contexts (Gatewood, Shaver, & Gartner, 1995). Cognitive factors including prior experience and the entrepreneurial mindset, broadly conceived, are therefore relevant in identifying and pursuing these opportunities to different degrees of effectiveness in practice.
Examined from the perspective of learning in relation to the ability to navigate or cope with the novelty and uncertainty in startup development, a number of studies focus on the social, cultural and economic factors relevant in the entrepreneurial process, including the impact of recessions (Brennan & McHugh, 1993), agency, emotional intelligence and affect in startup work (Goss & Sadler-Smith, 2018; Walton, 2016) and aspects related to work-family interfaces (Jennings & Mcdougald, 2007). The ability to cope with the contingencies of development can consequently be conceptualized in relation to the various ways entrepreneurs overcome obstacles by adapting to change, acting on opportunities or creating new partnerships in practice. In other words, entrepreneurs need to learn to navigate contextual constraints in their startup organizations despite limitations and uncertain situations inherent in developmental processes, creating or coping with the conditions necessary to overcome the barriers on their pathways to growth.

To conclude, learning in startups is an emergent phenomenon, positioned at the confluence of multiple bodies of literature, including entrepreneurship learning, business innovation and information and knowledge management, which, collectively, view the learning experience as a foundational element in the development of these organizations. To address questions related to startup learning, studies in general underline that individuals in these organizations need to cope with the uncertainty associated with the dynamic nature of their work and that, since, as Minniti & Bygrave (2001) pointed out “[i]t is the knowledge component that determines the entrepreneur's selection of the most appropriate course of action in any specific uncertain environment.” (p. 5). As individuals learn from both successes and failures in these contexts, they experience the developmental dynamics distinctively, orienting their participation towards distinct future choices and aspirations overall. Although the literature provides rich descriptions of learning practices in startups, there is significant room for more nuanced examinations of relations between situated practices for knowledge creation, and the adjacent possibilities for potentially more expansive approaches to learning in the complex and unique economic and cultural context of Canadian innovation ecologies. The conceptual foundation and insights which can be derived from studies reviewed in this section, provides the basis for complementary empirical examinations of learning dynamics which emphasize the individual subjective experiences of startup employees and their managers in conjunction with a contribution of a CHAT/EL approach adopted in this study overall.
3.4 An Indicative Approach to the Review of IKM Literature

Of particular importance for the research design adopted in this study is a careful and clear explanation of the indicative approach to the selection of IKM material selected for review. Specifically, in this section I briefly outline the criteria for the selection of studies for the review of literature by highlighting the rationale for the specific selections made. The indicative nature of the review of IKM literature conducted reflected an attention to the key themes adopted from CHAT/EL to construct an expansive view of learning in startup organizations examined. The presented review was not exhaustive despite its basis in a broader and deeper appreciation for the IKM literature as a whole (for recent summaries of this field as a whole see for example: Coakes & Elayne, 2005; Larsen & Olaisen, 2013; Schlögl, 2005; Varde & Pei, 2008. Rather, it aims to provide an overview of illustrative studies aligned to the KATs in the field of IKM, in peer-reviewed, academic journals that cut directly to the core of the focus of the present study.

Furthermore, the review was used in an effort to identify gaps or specific areas where an activity-theoretical approach could complement and enhance IKM literature through elements of an expansive view of learning constructed in this study. At the same time, the review of IKM literature concentrated on identifying some of the key elements which could be re-conceptualized in relation to a CHAT/EL lens in order to more effectively address aspects of learning and change in startups examined.

It is, however, important to emphasize again the exploratory nature of the study and that the approach taken in this thesis does not view the models, concepts or ideas in bodies of research stemming from IKM literature as inherently problematic. My hope is to illustrate that these conceptual and empirical elements are in essence relevant for the dialogical development of the analysis I apply in this study. Furthermore, the IKM themes and concepts examined in relation to learning dynamics serve as important guiding points of reference, and, in complementing associated conceptualizations of learning in IKM, I seek to contribute to a nuanced conceptualization of the human face of learning and organizational life embedded in the developmental conundrum of startup work.

The search process consisted of selecting and examining digital peer-reviewed journals in key databases accessed through the University of Toronto library portal. This search was complemented by a manual search of relevant references from articles identified as key studies. Inclusion criteria were: English language, peer reviewed nature of the paper, inclusion in IKM literature and close conceptual match to the key analytic terms. This indicative review (Cheng &
Gilbert, 2009b; Hatzinikita, Dimopoulos, & Christidou, 2008) of relevant IKM literature resulted in three clusters of over 100 articles overall which were reviewed and from which 6 were deemed eligible for inclusion. The stages for the indicative review, based on the approach suggested by Arksey and O’Malley (2005) were as follows. In the first stage, the scope of the review was defined, so that a strategy could be built in order to discover gaps in the alignment between the KATs and IKM literature, in order to lay a foundation for future work. Next, relevant studies were identified. At this step, a search strategy was developed and completed in consultation with the University of Toronto librarian. Several collections were searched for key terms as described below. Articles selected were in English.

Relevant studies were selected based on their contributions in addressing the central research questions. Following these steps, the articles were read in full and their data extracted into an Excel spreadsheet, strategy Arksey and O’Malley (2005) refer to as “data charting form” (p. 26). Focus areas included the KATs in relation to IKM literature relevant to the study questions. The next stage involved collecting and summarizing the results. Based on this summary, a chart was developed as a tool to organize the studies thematically and analyze alignment in order to identify areas for intervention into IKM literature (Appendix 5).

To assess the indicative nature of a study for the purpose of inclusion in this review, I developed a checklist which included a step-by-step exclusion process of relevant articles. First, potential articles were assessed based on their title, journal title and abstract, followed by an examination of the full-text article in relation to the KAT (1, 2 and 3) and learning. Given the vast and evolving nature of IKM literature, it is necessary to briefly point out some of the topics which can be mapped against this body of literature as areas of current or emerging interest. These include human-computer interaction, information systems, knowledge sharing, social media or digital governance. Relevant journals in this field include Information Technology & People, Journal of Knowledge Management or Journal of Systems and Information Technology. The examination of all potential indicative studies yielded three primary (illustrative) studies and three secondary (supportive) studies aligned to each of the three KATs adopted. To briefly sketch the rationale for inclusion as indicative of a source, the study by Pauleen and Yoong (2001) titled “Relationship building and the use of ICT in boundary-crossing virtual teams: a facilitator's perspective” provided relevant discussions of the concept of boundary crossing and was published in the Journal of Information Technology. Consequently, this study could be considered integral to the IKM body of literature and addressing one of the KATs adopted, from
which certain insights related to learning could be extracted. Since the study was not developed in the CHAT/EL tradition, learning could not be examined as *expansive*. However, this study illuminated an area where an activity-theoretical re-conceptualization of learning could complement existing IKM literature, broadly conceived.

Six articles were chosen based on their relevance and degree of detail determined to be necessary for inclusion in the present study. Many of the articles excluded discussed aspects related to IKM outside the scope of this review. A vast proportion of IKM literature was descriptive rather than analytic, focused on Information and Communication Technologies (ICTs), without extensive considerations for social and cultural aspects of learning, areas in which aspects related to the KATs, I argue, can provide meaningful contributions to the reconceptualization of learning in startup work in times of rapid change.

3.5 The KAT of Mediation in IKM Literature: An Evaluation from the Vantage Point of CHAT/EL

In this section, I address the following question: *How and how effectively does IKM research address the mediated nature of learning in enterprises?* In order to address the areas of IKM literature where the concept of mediation can offer valuable insights for the conceptualization of learning dynamics in startup activity, I begin this section by first defining KAT-1 in the CHAT tradition. This will be followed by an evaluation of IKM literature to identify areas of interest which can be addressed using an activity-theoretical approach and supported by specific examples from the IKM literature. Finally, I illustrate how the concept of mediation, conceptualized in a CHAT tradition, can address these gaps in IKM literature.

The concept of *mediation* is at the core of a CHAT-based view of learning dynamics viewed from an activity-theoretical perspective. Therefore, I begin this section by reviewing some of the foundational aspects of mediation which were introduced in Chapter 2 and which are relevant to the evaluation of IKM literature. As discussed in the previous chapter, the principle of *mediation* through artifacts and tools is central in the CHAT/EL tradition and activity is mediated through a variety of tools/artifacts and symbols which shape and can in turn be themselves shaped by the activity. In order to understand the processes of learning from a CHAT/EL perspective, it is foundational to examine how tools, language, norms or other elements mediate the relations between a subject, object, and the various elements of the cultural and historical contexts in which activities are situated. Relevant to this review of IKM literature is the
perspective that tool/artifact mediation plays a significant role in human interaction and the way practices are shaped, conceptualized or transformed in activity (Yamagata-Lynch, 2010a). The concept of mediation also has important theoretical implications for the use and application of activity systems in analyzing phenomena from a cultural-historical perspective. Consequently, artifacts/tools have the capacity to facilitate or hinder social interactions creating structural dynamics which influence learning processes (Yamagata-Lynch, 2010a). Mediators such as tools/artifacts also have the potential to shape the social and cultural conditions in which learning takes place. As Nardi (1996) points out: "activity cannot be understood without understanding the role of artifacts in everyday existence, especially the way that artifacts are integrated into social practice” (p. 14). The mediated nature of learning can be therefore conceptualized through a cultural-historical activity theoretical lens in which tools play a significant role in relationship to the context of an activity system overall as the basic unit of analysis.

In the following indicative studies from IKM literature, several areas may be distinguished where an activity-theoretical approach can contribute to a better analysis, understanding and expression of learning dynamics in IKM literature. First, IKM literature can benefit from a closer examination of socio-cultural tools (semiotic tools-language, symbols, norms, cultural practices) mediating learning dynamics in startup activity. Second, there is a need to better address rules as enablers/barriers (type of conversation, implicit rules, institutional strategies, status quo, policy) of learning dynamics. Finally, there is significant room for a better conceptualization of ways in which the division of labor (including sharing of duties, informal help offered by employees to each other, designing, implementing and evaluating, various stakeholders, etc.) mediates learning dynamics in the context of activity in information/knowledge intensive, innovation-focused startup organizations.

Based on the review of the selection and then review of the IKM studies which feature some level of awareness and analytic treatment of at least some aspects of the mediated nature of learning, it appears that the primary focus is placed on the technical nature of mediation through IKM systems and processes. Moreover, learning appears to be tightly associated with particular types and forms of organizational performance. The mediated nature of learning is reflected within broader discussions of organizational practices aimed at enhancing the efficiency of tasks in specific contexts, however, the emphasis is placed primarily on the outcomes and technical tools, and less on the broader arrays of socio-cultural processes facilitating the emergence of learning - or its inhibition. Overall, IKM literature related to KAT-1 appears to be characterized
by ambiguity in the conceptualization of learning. An evaluation of the IKM literature shows that there is no uniform agreement with respect to a single model conceptualizing learning in the field of IKM. In particular, and especially relevant in the present study are the processes by which activity is mediated by socio-cultural tools in the information and knowledge intensive contexts examined. In addition, tools embed cultural-historical dimensions, which originate from their inception and/or development. These are aspects which, I argue, can be more effectively addressed in IKM literature using an activity-theoretical approach such as the one adopted in this study.

An IKM study by Lytras and Pouloudi (2006) is a case in point. Read in the way I have proposed, it highlights key areas where an activity-theoretical approach can offer deeper insights into learning dynamics in IKM literature. In their paper, Lytras and Pouloudi (2006) examine IKM systems as to illustrate how learning practices can be supported in organizations using a taxonomic approach of IKM systems. IKM applications facilitate or mediate work practices. However, as the notion of learning is brought into view, we find a description and inclusion of the concepts of “behavior and attitudes” that merely need to “align” to “system requirements”. The logic of the conceptualization embedded in these comments in fact suggests an uneven conceptualization of the mediated nature of learning dynamics. Here the analytic emphasis is placed not simply on the achievement of relatively narrow outcomes (i.e. the “requirements of the system”), but more than this, analytic emphasis presumes direct relations of “behavior and attitudes” (subjects/learners) to systems (objects). In other words, there appears to be limited attention to the mediated (relational) character of the learning dynamics in context. Overall, there is limited evidence of research in IKM literature examining the role and purpose of semiotic tools—language, symbols, norms, cultural practices in mediating learning dynamics in startup activity. Furthermore, aspects related to rules as enablers/barriers (type of conversation, implicit rules, institutional strategies, status quo, policy) to learning dynamics are largely neglected. Finally, the division of labor (including sharing of duties, informal help offered by employees to

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13 The mediational dynamics discussed in this study demands a complex approach which includes both semiotic and material considerations for analysis. Conceptualizing this complexity requires an integrated view of mediation, which is referred to in the CHAT tradition as “instrumentality”. Engeström et al (1996) highlighted three implications of this conceptualization: “(1) The instruments form a system that includes multiple cognitive artifacts and semiotic means used for analysis and design, but also straightforward primary tools used in the daily work and brought into the Laboratory for examination, reshaping and experimentation. (2) In such a dense mediational setting, a set of interconnected new sociocognitive processes are called for - a new mentality generated. (3) The very complexity of the setup means that the instrumentality is constantly evolving; old tools are modified and new tools are created” (p. 8). Semiotic mediations therefore can be conceptualized as an integral part of this instrumentality.
each other, designing, implementing and evaluating, various stakeholders, etc.) mediating learning dynamics can benefit from an activity-theoretical reconceptualization.

In addition and building on these observations, a study by Grace and Butler (2005) provides another illustrative example key area where an activity-theoretical approach to the examination of learning can enhance IKM literature. Grace and Butler (2005) focus on learning tool mediation using the case of a Learning Management System (LMS) implementation. The authors argue that “the ability to learn, and to manage the learning process are key success factors for firms” (p. 54). Consistent with Storey and Barnett’s (2000) observations regarding barriers to IKM implementation, Grace and Butler (2005) note that “[t]he knowledge management approach to learning in organizations has achieved limited success, primarily because it has focused on knowledge as a resource rather than on learning as a people process” (p. 53). These aspects, I argue can be more effectively and comprehensively examined using an activity-theoretical approach. In conclusion, artifacts including the use of language, norms and practices mediating learning dynamics, rules as enablers and barriers, the development of policies around IKM and more elaborate conceptualizations of the division of labor through formal and informal knowledge sharing mediating learning dynamics in startup activity can offer deeper and more meaningful insights into relevant aspects of learning in startups, as I will illustrate in the following sections.

Building on the indicative review of IKM literature, the first area for intervention identified by means of KAT-1 concerns the limited discussions of socio-cultural/semiotic tools such as language, symbols, norms or cultural practices mediating learning dynamics in startup activity. In review, in the study by Lytras and Pouloudi (2006) the authors reflect on the “two of the most important resources of human beings – knowledge and learning” (p. 78), suggesting multiple loci of knowledge embedded in artifacts, but also teams and the organization overall. The gap identified in this instance based on these observations, reframed in relation to the CHAT/EL lens of interrogation suggests overlapping dimensions of knowledge and possibly theoretical confusion. Overall, IKM literature would be enriched through an enhanced focus on mediated forms of learning by embracing situated, relational, cultural and historical dimensions of evaluation in activity-based analysis of learning and development. By focusing on the processes of learning using activity-based approaches, it is possible to develop a deeper understanding of the dynamics of learning in relation to IKM practices in the startup contexts examined, with particular attention to expansive potentials of knowledge creation in
development. As CHAT researcher Nardi (1996) points out, "activity cannot be understood without understanding the role of artifacts in everyday existence, especially the way that artifacts are integrated into social practice" (p. 14), aspects which can enhance conceptualizations of the mediated nature of learning. Furthermore, we can examine how the different rules enabling or hindering learning dynamics, including implicit rules, institutional strategies or policies are reflected in the mediated nature of learning as a central aspect of development in the context of adopting activity-theoretical approaches to understanding learning dynamics from a cultural-historical perspective. In addition, the division of labor, as reflected in the way duties are shared and the informal help practices offered by employees to each other as forms of labor division mediating learning dynamics in startup activity can also be more comprehensively understood through a CHAT/EL lens, which offers valuable theoretical tools in analyzing situated aspects of learning in fast changing work/learning environments. This approach, I argue, represents a valuable contribution to a reconceptualization of IKM literature, providing potential new directions in research and practice in this evolving field.

3.6 Conceptualizations of the KAT of Boundary Crossing in IKM Literature and Implications for a CHAT/EL Re-conceptualization

The next question addressed in this chapter is: How and how well does existing IKM research assess collaborative and boundary-crossing learning dynamics in enterprises? In order to address this question, I begin this section by defining collaboration/boundary crossing as the KAT-2 in evaluating IKM literature from an activity-theoretical perspective. Following this section, I evaluate the degree to which the concept of boundary crossing is addressed in IKM literature in relation to learning dynamics overall. Lastly, I offer representative examples to illustrate how the dynamics of learning can be better conceptualized in IKM literature in relation to aspects related to the concept of boundary crossing from an activity-theoretical perspective.

As emphasized previously, collaboration and boundary crossing are central concepts in expansive learning and important aspects of the expansive view of learning described in this study. A CHAT/EL perspective on activity views boundaries between socio-cultural domains of activity in relation to their capacity to present both barriers to interactions, and opportunities for collaboration and learning (Yamagata-Lynch, 2010a, 2010c). Collaboration itself in fact entails the notion of boundaries, and boundary crossing specifically reinforces a central feature of learning dynamics that involves change: i.e., the need to transcend traditional dichotomies in
existing frameworks and disciplines, drawing on multiple fields and integrating individual-collective group theoretical dimensions in analysis (Engeström & Middleton, 1998).

Especially relevant in this regard is the aspect related to boundary crossing which refers to mechanisms for interactions in boundary zones at the confluence of domains of activity which are argued to present opportunities for collaboration with learning potential. From an activity-theoretical perspective, the process of boundary crossing often requires individuals to collectively re-imagine possibilities in existing practices (Engeström, 1995). This creates opportunities for different ideas and elements from different activity systems to interact in order to generate new meanings, facilitating learning and development (Engeström, 1995). Theoretical foundations in CHAT suggest that boundary zones are typically characterized by complex interactions and conflicting ideas or perceptions (Engeström, 2001b). Viewed holistically, the concept of boundary crossing therefore offers valuable theoretical and conceptual elements which are critical in the examination of learning dynamics in IKM literature from an activity-theoretical perspective.

There are several key areas where concepts related to the concept of boundary crossing, understood in the CHAT/EL tradition, can complement specific areas of interest in IKM literature. First, IKM literature can benefit from additional theoretical conceptual tools in examining potential shared objects facilitating learning dynamics. Second, factors influencing the development of potentially shared objects in the context of learning dynamics of startup activity can be enhanced by adopting an activity-theoretical approach. Furthermore, while IKM literature focuses at times on collaborative dynamics in general, there are very limited descriptions of boundary-crossing and discussions of specific collaborative activities in relationship to boundary-crossing as a source of learning and change. Despite broadly acknowledging the importance of collaboration as an enabling factor facilitating learning, most studies reviewed displayed emphasis on the functions and strategies embedded in social tools to extract and codify the knowledge from collaborative activities into knowledge pools. Overall, IKM scholarship appears to offer limited assessments of collaborative and boundary-crossing mechanisms, and consequently, limited insights into ways in which learning takes place in collaborative and boundary-crossing contexts. In this section, I review the theme of collaborative and boundary-crossing learning dynamics in relevant IKM studies and offer insights into re-conceptualizing or complementing this body of research through using a CHAT/EL approach.
An illustrative IKM study highlighting areas where an activity-theoretical approach can enhance the understanding of learning dynamics in boundary crossing activities of startups is a research study by Kane, Robinson-Combre, & Berge (2010) which looks at collaborative practices in the context of IKM. Kane et al. (2010) underline in their study the importance of social networking for both formal and informal learning. The authors argue that an integration of IKM with social networking “would allow an organization to learn from its most valuable asset – its employees” (p. 62). According to the authors, collaborative processes facilitated through social networking in online media may enable individuals to transcend (cross) spatial boundaries and facilitate communication, sharing and collaboration, yet the precise mechanisms by which these artifacts facilitate, or hinder collaboration are not extensively elaborated, especially in relation to cultural aspects. The authors explain that “[k]nowledge management gets at the knowledge that is in an employee’s head, and social networking tools are a way to collect it. eLearning then takes this information in one person’s head and turns it into knowledge other can use” (p. 69). Notable in this explanation, as in other similar IKM studies, is the view of tool-based knowledge transformation for transmission-related purposes, while the boundary-crossing mechanisms in relationship to specific cultural contexts of organizations are mostly neglected. This illustrative study Kane et al. (2010) highlights several key areas where an activity-theoretical view of boundary crossing can enhance the understanding of learning dynamics in startup contexts. Specifically, by developing an understanding of potentially shared objects such as win-win situations, factors associated with the development of shared objects and the resulting creation of shared meaning at collective levels in startup activities can greatly advance IKM literature and open new directions for meaningful research.

Similarly, a study by Pauleen and Yoong (2001) illustrates other areas where an activity-theoretical approach can enhance IKM literature. Pauleen and Yoong (2001) address aspects related to collaboration in organizations by exploring opportunities for boundary crossing in the context of virtual teams, focusing on implications for facilitators. From these authors’ perspective, information and communication technologies (ICTs) are viewed to bridge spatial and temporal dimensions, yet potentially limiting effects of certain ICTs in specific contexts do not appear to be discussed in detail. Overall, the study by Pauleen and Yoong (2001) illustrates areas including the development of potentially shared objects, their associated factors in development and the creation of shared meaning as potential areas where an activity-theoretical approach can enhance the understanding of learning dynamics in IKM literature.
In conclusion, the second level of intervention in IKM literature concerns the development of potentially shared objects for boundary crossing in learning dynamics of startup activity. KAT-2 adopted in this context from the vantage point of CHAT/EL can address the weak elaboration of mechanisms for boundary crossing which facilitate or hinder learning in relation to creating, nurturing or developing shared objects in practice within and across organizational boundaries. In particular, specific aspects related to the concept of boundary crossing, such as the creation of shared meaning and the associated factors influencing the development of shared objects in the context of startup work offer valuable concepts for a deeper and more comprehensive analysis of learning dynamics in activity from an activity-theoretical perspective. Overall, this review suggests that the IKM studies examined, and IKM literature more broadly conceived, could benefit from a reconceptualization of elements of boundary crossing in startup activity through a CHAT/EL approach. An enhanced understanding of mechanisms for boundary crossing can facilitate deeper conceptualizations of learning emerging in the dynamic startup contexts examined and beyond, contributing to the expansive view of learning constructed in this study.

3.7 The KAT of Contradictions: Evaluation and Illustration in IKM Literature

This section addresses the question of: How and how well does existing IKM research address the source of change in learning in relation to the concept of contradiction in activity? In order to illustrate the importance of the concept of contradictions in examining learning dynamics in startup activity to address important areas of IKM literature, I begin by first defining the concept of contradictions from the vantage point of CHAT/EL. Following an elaboration of important aspects in relation to contradictions from a theoretical perspective, I evaluate IKM literature with a focus on the relation between learning and the concept of contradiction, as it is conceptualized in this body of knowledge specifically. Lastly, I illustrate areas for intervention into IKM literature using the concept of contradiction to make meaningful and valuable contributions to this field and potentially illuminate new areas for future research beyond the current project.

To better understand learning dynamics in activity, I begin by explaining significant aspects of and elements related to the concept of contradictions from a CHAT/EL perspective. The concept of contradictions in activity represents a central source of change in learning, which
has been discussed in previous studies in various organizational contexts (Engeström, 2011). Critical to dialectics as a philosophical tradition, *contradictions* are central to the conceptualization of change and the emergence of new forms of work and learning. An analysis of activity systems in the CHAT/EL tradition is tightly connected to the historical connections which influence the dynamics of the activity. Furthermore, contradictions within or between activities are foundational in understanding human learning and development (Engeström, 2011). However, it is important to note that contradictions are embedded in the structural conditions which emerge from the tensions in activities rather than simple individual-oriented problems (Engeström, 1987). It is also important to remember that the different forms of contradictions between components of activity systems can drive change processes within and between activity systems as they support or hinder the development of the organization in practice, aspects I will further examine in future chapters.

From a CHAT perspective, the resolution of *contradictions* in activity can facilitate emergent learning processes which represent a potential source of learning and development. Given that contradictions arise from socio-cultural and historical foundations, they act to destabilize activities which enter a state of recursive and evolving transformation. Therefore, as Cole & Engeström (1993) pointed out, “equilibrium is an exception and tensions, disturbances and local innovations are the rule and the engine of change” (Cole & Engeström, 1993, p. 8). Recognizing contradictions provides insights into factors and conditions which may offer potential opportunities for change interventions. Sources of *contradictions* may include inefficiencies, disconnections or barriers in processes and activities, offering potential opportunities for restructuring and change (Engeström, 2000a; Engeström & Sannino, 2011). Conceptualizing these tension points as dynamic opportunities for interventions instead of static, rigid phenomena represents a paradigm shift in discovering new modalities for change and learning in diverse contexts. Contradictions can be also be conceptualized as loci which may facilitate transformative processes through problem resolution, enabling more effective alignments between activity systems and allowing new forms of activity to emerge.

The issue of identifying contradictions has been a significant area for research in recent years in the CHAT literature. The difficulty of researching contradictions is primarily based on the fact that they are present in collective activities in subtle ways, and often must be made visible in the mediated structure of activity. Since contradictions “can only be identified through their manifestations (Engeström & Sannino, 2011, p. 369), their continuum and different
Typologies can often be difficult to conceptualize” (Engeström, 2014, p. 74). The conceptualization of the precise locations of contradictions in activity represents a significant contribution of the activity-theoretical approach adopted in this study to analyze learning in the context of rapid change and development. The concept of contradictions as a source of change in learning therefore represents a key lens for interrogating IKM literature in probing for sociocultural aspects of learning dynamics in startup-activities, aspects which, I argue, offer deep and meaningful contributions to IKM literature.

There are several key areas where an activity-theoretical approach to the study of contradictions in IKM literature can offer meaningful insights into learning dynamics associated with change in activity. First, a more precise conceptualization of the location of contradictions in the structure of learning dynamics of startup activities can be much better conceptualized using an activity-theoretical approach. Second, the various factors involved in the process of navigating contradictions can offer deeper insights into learning dynamics in startups. Third, there is a need for a more refined distinction between the different types of contradictions which may have different levels of influence on learning dynamics and ultimately the emergence of expansive learning in startup activity.

Based on the studies explored in search of learning practice in relation to the concept of contradiction in activity and change, an observation can be made that only few research papers appear to even begin to address this concept in IKM scholarship. From a CHAT/EL perspective, contradictions within or across activity systems often arise due to different object orientations necessitating mediation of contrasting goals and expectations, yet such processes do not appear to be extensively discussed in IKM literature, suggesting a potential opportunity for sociocultural approaches to fill important gaps in the vast area of academic scholarship represented by IKM.

A study by Cousins, Robey, & Zigurs (2007) looked at the hybrid nature of work teams in multiple locations as a source of contradictions which required effective management. The authors suggest that “managers influence cognitive processes that paradoxically emphasize remoteness and closeness, cultural uniformity and cultural diversity, rationality and emotionality, and control and empowerment” (Cousins et al., 2007, p. 460). In this study, an argument is made that there were multiple types of contradictions embedded in the structural fabric of the organization. In relation to learning and the contradiction of control-empowerment, the authors found that “[t]eam management recognized the need to restrict empowerment in the short term to facilitate learning, so as to progress toward their long-term goal of facilitating simultaneous...
control and empowerment” (Cousins et al., 2007, p. 471). The conceptualization of contradictions as a source of change in development discussed in this paper could be enhanced by adopting a socio-cultural perspective, looking at the various manifestations of the phenomena discussed in relation to learning specifically. In this study, Cousins et al. (2007) localized contradictions in various forms, yet a more precise framework would clarify specific contexts and relations among constituents, therefore better describing the dynamics of learning in the contexts examined. The source of learning in relationship to emerging and evolving types of contradictions at the confluence of previously more polarized domains can therefore represent an important and parallel process of knowledge creation, as illustrated in the article by Cousins et al. (2007), yet in-depth descriptions of mechanisms facilitating this kind of emergent learning are largely missing from this article.

Similarly, an illustrative example of an examination of contradictions in the context of business process re-engineering was proposed by Boudreau & Robey (1996), offering insights into the value of BPR (Business Process Reengineering) in business improvement through an analysis of contradictions. This approach was chosen as a method in generating greater understandings of processes which are often contradictory in nature in development. Four contradictions were identified in the data, offering insights into complex processes of dynamic contexts examined. Despite the identification of these contradictions overall, references to a robust framework could have enhanced possibilities for comparability of findings in other settings. In addition, conceptualizing the precise loci of contradictions in reference to a model or framework could help to better narrow down and visualize the processes interacting to facilitate or hinder learning dynamics. While some types of contradictions are similar to the ones which emerge from an activity-theoretical approach, others could benefit from an activity-theoretical re-examination to make visible elements in the structure of work practice in the context of change, analyzed in meaningful way from the vantage point of CHAT/EL. Using this type of analysis, there is a solid potential for enhancing IKM literature from an activity theoretical perspective, goal I aspire to achieve in this study.

In conclusion, the third and final level of intervention in IKM literature addresses the largely neglected concept of contradictions as a source of change in learning. In particular, there are several areas where an activity-theoretical approach can elevate the understanding of learning dynamics in startup activity. First, a more comprehensive understanding of the nuances of contradictions and their multiple forms or manifestations can offer a higher resolution and more
precision in the analysis of *contradictions* as a source of change in learning in IKM literature. Second, IKM literature could benefit from a more comprehensive understanding of different socio-cultural factors involved in learning dynamics in the process of navigating contradictions in activity. Finally, more accurately locating the loci of contradictions can facilitate a better understanding of learning dynamics in startup activity in a CHAT tradition. From a CHAT/EL perspective, it is known that contradictions can emerge from a variety of sources. For example, tools such as e-learning systems may become objects generating contradictions in activity, enabling the emergence of expansive forms of learning. Furthermore, the social media in which activities take place offer opportunities for networking, but also potentially generate tensions or contradictions which may serve as the basis for change and development. I therefore argue that IKM literature can benefit from an enhanced application/analysis through the central concept of *contradictions* as a source of change in learning, which represents an original and valuable contribution to the field of IKM in both theoretical and practical dimensions.

### 3.8 Summary of Gaps

In summary, this review has identified several key areas where basic elements of an activity-theoretical approach to the study of learning dynamics are indicated in IKM literature, and through a review of these exemplars it provided new and meaningful directions for future research. Based on this indicative research overview, existing IKM literature appears to adopt or at the very least make room for certain socio-cultural considerations, although it does so only to a limited degree.

This observation illuminates three interrelated areas where a CHAT/EL-based approach can enhance the understanding of learning dynamics in IKM literature. First, the existing conceptualizations of mediation in learning dynamics are limited in both scope and depth, often vaguely defined from a theoretical perspective and typically examined in amalgamated forms in relation to other terms and concepts. Addressing socio-cultural artifacts including semiotic tools, language, symbols, norms or cultural practices; rules as enablers/barriers; institutional strategies and policy; division of labor including informal help, and the different stakeholders, can enhance IKM literature using activity-theoretical concepts and approaches which are not used extensively in this field. Second, aspects related to boundary crossing in the process of developing potentially shared objects such as win-win situations; associated factors influencing their development and the process of creating shared meanings are aspects which can be more effectively explored using
activity-theoretical approaches in order to more effectively understand learning dynamics in the process of boundary crossing in developmental activities of startup organizations in general and technology startups in particular. Third, a more elaborate examination of *contradictions* as a source of change in learning can greatly enhance the understanding of learning dynamics in IKM literature. Specifically, an increased attention to the multiple types of contradictions, socio-cultural factors involved in the process of navigating these contradictions and the conceptualization of precise locations of these contradictions in activity dynamics can illuminate the complex nature of learning facilitating the potential for development in activities of startup organizations in times of rapid change. I argue that examining these contradictions using a systematic theory-informed approach facilitated by CHAT/EL can offer valuable contributions to IKM literature overall. In this chapter, I aim to develop a model to address aspects of contradictions described in this chapter, which can benefit from an activity-theoretical reconceptualization. Consequently, the specific areas for intervention in a CHAT/EL tradition are outlined at the end of each section of KAT analysis of IKM literature highlighted above.

The emphasis on technological tool mediation in IKM literature appears to focus more on the development of strategies in aligning with developments and innovation, while the critical and analytic approaches examining deeper level social and material relations which are historically rooted, situated and culturally developing over time receive more limited attention. Using an activity-based approach in examining these relations aims to address the areas in IKM literature identified which can benefit from critical views providing relevant concepts in relation to developing trends with relevance to learning in rapidly developing work environments.

From this literature review, it can be inferred that most IKM models offer limited insights into learning in situated contexts or activities specifically, as conceived in the CHAT/EL tradition. No single model, however, can encompass the multitude of learning dimensions and the complex interactions among different factors and constituents relevant for fast evolving professional environments. To address this complexity, IKM scholars often draw upon multiple models to conceptualize the processes and interconnections at the basis of learning, many of which appear to view learning as implicit in analysis. To address these limitations, I will elaborate on ways in which the CHAT/EL approach adopted in this study can have a significant contribution to the understanding of situated, evolving, socio-cultural dimensions of learning as they relate to aspects of IKM. Using concepts from Engeström’s theory of *expansive learning* as a point of departure into an examination of IKM literature through a CHAT lens, I seek to
understand how or to what degree aspects related to the KATs adopted may support certain dynamics of learning practices and how activity-theoretical aspects of learning influence and are influenced by *contradictions* in order to potentially generate expanded, transformed objects in activity.

Despite a widespread interest and acknowledgement of the importance of learning for organizational success in IKM literature, broadly conceived, there was a surprisingly limited amount of research devoted to the study of startup contexts specifically. This growing interest can be addressed, at least in part, through the application of a CHAT/EL-based approach in exploring relevant aspects related to knowledge creation as conceptualized in the unique contexts of startup organizations in times of rapid change. This review of IKM literature discerned between three different areas where an activity-theoretical approach can enhance an understanding of learning as situated, historically constructed and socio-culturally mediated phenomenon. Overall, the increased emphasis on technological aspects, limited attention to socio-cultural, interorganizational elements of learning and the few conceptual tools in examining learning dynamics dialectically, collectively provide opportunities in areas for intervention where an activity-theoretical approach can provide a more robust conceptualization of learning which emphasizes the complexity of relations orienting startup development in practice.

The literature review completed in this chapter revealed that there are relatively few studies examining learning dynamics or activities in IKM literature, and even fewer that either adequately or accurately grasped key analytic concepts or terms which can provide a robust grasp of learning. The findings from this review in fact clearly reveal that the existing IKM body of knowledge could benefit from additional case studies examining learning dynamics and the potential for expansive learning in relation to startup work both generally and from an activity-theoretical perspective in particular. The application and re-conceptualization of Engeström-inspired, CHAT/EL-derived KAT’s in evaluating IKM literature therefore forms the basis for original, empirically-based contributions to this specific body of literature in this study and beyond.

### 3.9 Conclusion

The review outlined in this chapter provided several important background elements to the analysis presented in later chapters, facilitating an indicative discussion of IKM literature aligned to the key analytic themes of *mediation, boundary-crossing* and *contradictions* as a source of
change in learning and identifying three areas for intervention which address significant aspects related to the conceptualization of learning in this distinct body of literature, broadly conceived. Using a mapping process to align the CHAT-based concepts to areas for intervention in IKM literature relevant for a re-conceptualization of learning from an activity-theoretical perspective, this study takes into account socio-cultural, collaborative and dialectical aspects into account, areas which have been largely understudied in IKM literature.

In this literature review, I shed light on the challenges of examining aspects of learning, proposing new approaches in identifying, extracting and analyzing enabling and hindering factors relevant to the context of startup work practices for *knowledge creation* using a CHAT-based approach. This examination was motivated by a need to conceptualize and expand an understanding of learning in relation to IKM with attention to influences on broader interrelated organizational processes in startups examined. Central to this analysis was a consideration of cultural-historical aspects of learning and the productive participation in activities, both addressing challenges and augmenting learning experiences in startup contexts examined. Stemming from this literature review, a representation of relationships between KATs and the IKM literature was developed to frame areas of focus reflected in both instrument development and subsequent analysis. This indicative review guided the study by incorporating considerations regarding significant and original contributions to the IKM body of research. Research questions were therefore aligned with this framework and utilized to guide the development of arguments presented in a systematic and organized fashion.

While there are a variety of ways to approach the topic of learning in IKM literature, the activity-theoretical approach adopted in this study based on the work of Engeström provided a useful and robust foundation in understanding socio-cultural aspects which are largely neglected in other traditions. This approach, I argue, plays a key role in examining situated organizational relations with *expansive learning potential*, complementing existing forms of analysis in IKM literature. The activity-based approach focuses on the social relations, historical and cultural elements which are embedded in work and which become visible through mediated interactions of individuals with artifacts/tools, rules and division of labor in social contexts made visible through a CHAT lens. Resulting from these considerations and the empirical contributions in this study, the expansive conceptualization of learning proposed in this research opens up the possibility of viewing learning as a socio-culturally constructed and mediated practice in rapidly changing work environments.
From the literature review, it was evident that few researchers draw on the rich potential of CHAT in IKM literature and even fewer effectively addressed learning aspects explicitly in an activity-theoretical tradition. In particular, transformative aspects of practice in relation to contradictions as a source of change in learning have so far remained elusive, which provides an opportunity for valuable contributions to the re-conceptualization of learning in IKM scholarship as evaluated through a CHAT/EL lens. This study takes the stance that knowledge creation and learning are interrelated and yet poorly conceptualized in IKM literature; relation which, under an overarching framework of cultural historical activity, can be assessed more productively as socially mediated, culturally evolving and historically situated practice. With its primary research audience being IKM researchers who, I argue, would benefit from this type of theoretical intervention, this thesis ultimately focuses on the generation, application and development of insights about practices which influence developmental processes that facilitate or hinder knowledge creation and learning in startup work.

Despite their ability to shape the cultural dynamics of situated contexts, it is paramount to remember that when considering the mediated nature of learning in IKM, the entire organizational context of the activity should be evaluated instead of focusing on the individual elements. In summary, the key analytic term of mediation derived from the CHAT tradition/Engeström’s model of expansive learning represents a useful and valuable concept in interrogating IKM literature through a socio-cultural lens, generating new points of interest in analyzing learning dynamics in startup contexts examined.

Building on the activity-theoretical framework developed and supported by definitions of key concepts adopted to operationalize the unit of analysis, empirical data will be analyzed in the following chapters. In the model developed for this study, the three key analytic concepts are applied by emphasizing their correlations and mutual complementarity in developing the expansive view of learning proposed in relation to the potential for expansive learning evaluated in later chapters. The model offers a view of learning and startup development in times of rapid change from an activity-theoretical perspective, enabling a systemic view of interdependencies among the different constituents of activity and their mediational influences in relation to the dynamic nature of practices shaping startup work development over time. The aspects emphasized in this chapter in relation to areas for intervention for a re-conceptualization of learning in IKM from the vantage point of CHAT/EL illustrate how these complex activity-theoretical connections are mapped in preparation for the empirical analysis.
Chapter 4: Methodological Approach and Research Design

The previous chapters explained the rationale for an activity-theoretical approach for a re-conceptualization of learning from the vantage point of CHAT/EL and examined IKM literature to identify areas for significant and original contributions in alignment to key analytic themes (KATs) relevant for an expansive view of learning (EVoL). Along the themes of mediation, boundary crossing/collaboration and contradictions as a source of change in learning, I discussed how this goal will be accomplished in relation to the conceptual framework employed. In this chapter, I describe the methods and methodology in detail, justifying the choices related to participant selection, setting and approach taken to facilitate an effective activity-theoretical analysis in order to extract valuable insights from the empirical data collected.

4.1 Introduction: Startups as the Research Context

This study aims to contribute to activity-theoretical conceptualizations of learning in startup contexts as examples of, what Engeström & Kallinen (1988) refer to as, model systems for an examination of learning in the activity-theoretical tradition. The setting for the current study was startup organizations in the medical/healthcare technology sector in Canada. Startup organizations were used as the setting to provide insights contributing to an understanding of learning in a sector of the Canadian innovation economy in times of rapid change (Do & Huynh, 2016; Huynh & Do, 2016). I argue that startups represent increasingly important sites for the study of learning and key sites for innovation providing rich opportunities for the examination of a wide range of contradictions related to expansive learning (EL). These include both competition and collaboration, entrepreneurship, sometimes rapid expansion or global reach. Startups therefore represent relevant contexts for the study of rapidly evolving organizations, which, however, have not been examined extensively from an activity-theoretical perspective in relation to knowledge creation and the potential for expansive learning in times of rapid change.

Startups also have some unique characteristics that make them particularly interesting for studies in expansive learning. Typically, startups are portrayed as highly innovative (Do & Huynh, 2016; Huynh & Do, 2016), and important constituents of local or regional innovation ecosystems (Reis, 2011). From this perspective, startups are complex organizations, despite their small size, with characteristics which are not typically found in other contexts. Their tendency to
reject traditional modalities for organizational practices creates opportunities for uniquely innovative models and practices. Existing conceptualizations of the nature of learning in startups suggest that emerging business models provide opportunities for growth and transformation, yet these concepts appear not to be effectively addressed once we shift to activity-theoretical, socio-cultural perspectives. While principles of innovation and informality may still be prevalent, the limited amount of established formal knowledge to rely on in general requires an elevated focus on startup learning as a construct embedded in knowledge creation practice to examine related phenomena from the perspectives of participants in situated contexts.

The choice of startups in this study is therefore based on their representative qualities in this domain of research. There are several reasons underpinning the choice of startups as the setting for an activity-theoretical approach. First, startups provide highly dynamic environments characterized by complex interactions among individuals supporting innovative processes aligned with growth and expansion. Second, while the emphasis on innovation agendas over the last three decades has created an increased interest in startups as strategic settings for economic development in the context of developing innovation ecosystems, emergent forms of learning for startup employees have not been explored as effectively or as deeply as is possible. Lastly, startups represent unique and valuable settings for an examination of diverse innovation-related learning activities which are often analyzed in other theoretical paradigms with limited attention to socio-cultural dynamics of transformation related to aspects of learning. Startups are therefore valuable sites for an examination of the potential for expansive learning due to their unique nature of characteristics related to knowledge creation and rapid change. Their dynamic nature is reflected in relatively accelerated forms of practices directed towards objects/goals based on a collective motivation at the confluence of multiple activity streams in distributed activity in which different constituents interact. Startups possess distinctive characters, often being illustrated in terms of informality, agility and adaptability in development. Consequently, startups provide representative settings in which the dynamic nature of activity is distributed, yet often rapidly progressing on trajectories of development in practice.

Furthermore, startups are constantly under pressure to perform in competitive ecologies demanding goal achievement either in response or anticipation to market conditions (Feld, 2012). These pressures to innovate have profound impacts on learning. Given the centrality of goal achievement, learning may acquire different priorities in situated contexts. The centrality of learning in dynamic startup work environments thus provides a useful research context in
examining the potential for expansive learning as perceived by employees navigating complexity in dynamically changing organizational contexts. The variations in modes of participation\(^{14}\) of professionals working in startups are relevant, since they may shape the nature of activity through a navigation of adoption/resistance, compounding the problems addressed previously. Learning therefore can be conceptualized in the context of mediating different factors shaping activity in relationship to competing demands in knowledge creation practices of startup work in times of rapid change. Developmental practices are therefore navigated by individuals-in-activity in relation to the social, material or cultural conditions of situated activities providing unique and valuable opportunities for an exploration of learning in the context of rapid growth and change.

Based on these rationales, startups provide a valuable context and setting for an examination of learning from an activity-theoretical perspective. While this study focuses on learning in technology startups, it can also be relevant to an understanding of learning in other similar organizational contexts. Despite their economic importance and the broader emphasis on innovation in the broader economy, research related to learning in startups remains limited and underexplored. Furthermore, while existing activity-theoretical research focuses primarily on larger organizations or public sector institutions (Audretsch & Thurik, 1999; Faems, Van Looy, & Debackere, 2005; Fagerberg, Mowery, & Nelson, 2014), startups can provide new and original insights into forms of learning which may inspire broader learning agendas for innovation in other dynamic organizational contexts. The complex nature of learning in technology startup environments specifically may therefore be relevant to other startup sectors. This study therefore contributes to enhance the current understanding of learning in the context of knowledge creation practices of technology startups, area which, as I demonstrated in the literature review, has not been studied extensively in IKM literature from an activity-theoretical perspective.

\(^{14}\) The practices of “participation” is an under-theorized issue which can be contrasted to traditional views of learning which focus primarily on individual cognition (e.g. Fenwick 2012). As Fenwick (2012) explains, important questions emerge in relation to this concept: “[w]hat different forms of participation (and partial or non-participation), on the part of both human and non-human actors, are possible in holding together a practice? What forms of participation bring about change or dissolution of a practice? What different modes of participation are linked with different forms of learning? How do different locations of participation, from outside or inside a practice, affect learning? Taken further, the question of participation’s relation to practice invites questions about the distinction between a practice, the process of practicing and the state of being practiced: What does it mean to participate in these different modes, and what are the implications for learning?” (p. 68).
4.2 Activity-Theoretical Research: Ontological Considerations

Understanding the essence of the nature of learning examined in this study from the vantage point of CHAT/EL requires an attention to its constituent and inherent dimensions and their relations in practice. Furthermore, to “overcome the divide between, on the one hand, human mind, and on the other hand, culture and society” (Kaptelinin & Nardi, 2012, p. 13), we need to consider aspects of learning which build on foundational considerations in connection to “the social nature of human mind and inseparability of human mind and activity” (Kaptelinin & Nardi, 2012, p. 14). It bears emphasizing that understanding knowledge creation and learning in relation to the continual transformations in startup environments requires an attention to the inseparability of work and learning in practice, contextualized, and actively constructed in the fabric of everyday work practices of startup organizations. This understanding of learning as inseparable from practice and human development in its complex, contextualized and evolving forms requires a view which reflects an orientation towards what Stetsenko (2008) refers to as “relational ontology”, and a recognition of the active, agentive production, development and transmission of knowledge over time. Consequently, the integrative conceptualization of work and learning in relation to knowledge creation in development I refer to revolves around recognizing the relations between continuity and change, adaptation and transformation or structure and disorder. Building on this type of approach, I argue, we can begin to gain an appreciation of the complexity of learning embedded in relations of a dynamic and complex type of work in times of rapid change and potentially transformative rather than adaptive perspectives.

An attention to concrete, situated conditions of change within historical, cultural and social practices reveals the complexity and inseparability of dynamic relations in organizational practices in motion. In discussing activity-theoretical analysis methods in complex learning environments, Yamagata-Lynch (2010a) emphasized that:

Understanding human interactions in real-world complex learning environments often involves complicated data collection, analysis, and presentation methods, which can make communicating findings from these investigations difficult (Collins et al. 2004; Hoadley 2004). (p.8)

Yamagata-Lynch’s observations provide a useful introduction to the complex nature of activity-theoretical research and the broader aim to balance the examination of micro-level interactions and the socio-cultural relations shaping activities in practice. While simultaneously a strength and limitation, the focus of a CHAT/EL approach in the re-conceptualization of learning in IKM
literature represents a specific and valuable contribution to a discrete body of literature, avoiding potential theoretical confusions prevalent in other more integrative methodological approaches. After reviewing the three lines of research in IKM literature related or relate-able to the KATs employed, this section builds on ontological and epistemological considerations in order to explain and justify connections with study goals in relation to the methods/methodology adopted. As previously mentioned, the activity-theoretical approach frames the study, informing the methodology and grounding the research empirically.

Following the guidelines of Yamagata-Lynch (2010), the results of the literature review previously conducted were integrated into this phase. Literature reviewed provided a deep understanding of the topic and informed the development of the interview guides as elaborated in this section. To understand learning in startup work activity, individual interviews were conducted with participants at a location and time of their convenience. Considerations related to the sample size are based on what Onwuegbuzie and Leech (2007a) refer to as non-random, theory-based sampling:

If the goal is not to generalize to a population but to obtain insights into a phenomenon, individuals, or events, as will typically be the case in qualitative research, then the researcher purposefully selects individuals, groups, and settings that maximize understanding of the phenomenon. As such, the most common method of sampling in qualitative research is purposeful sampling. Here, individuals, groups, and settings are considered for selection if they are “information rich”. (p. 111)

Specifically, as Onwuegbuzie and Leech (2007a) point out, “[i]n theory-based sampling, individuals, groups, or settings are selected because they help the qualitative researcher to develop a theory. This sampling scheme also is used to expand a theory” (p. 112). In this study, I aim to extend and complement the theory of EL in the CHAT tradition. Furthermore, qualitative research requires researchers to be familiar with and immersed with the data analyzed. After an in-depth familiarization with the data, an activity-theoretical analysis was completed with focus on relations shaping the dynamics of development and knowledge creation in relation to learning. Data collection continued until saturation was achieved, which was understood when no new themes or ideas emerged from data (Yamagata-Lynch, 2010a). The next sections further elaborate on the research design and rationale, as well as the methodological choices made to examine the potential for expansive learning in relation to knowledge creation within and across startups examined.
From an activity-theoretical point of view, the approach adopted involved reflexivity, interpretive data analysis and acknowledging a multiplicity of perspectives. Consequently, the context is acknowledged to play a significant role in the conceptualization of complex phenomena examined (Ness & Fusch, 2015). The qualitative methodological design adopted in this study was interpretive and facilitated a reflexive examination of participant experiences with emphasis on illuminating the variations and diversity of conceptualizations of learning in the discourses examined viewed from the vantage point of CHAT/EL in alignment with the areas for intervention related to the KATs applied. This approach was predicated on the assumption that there is a multiplicity of interpretations in relation to these experiences, needed to explore the range of elements that constitute learning. By exploring the diverse ways in which startup practitioners experience the changing conditions development and knowledge creation in their organizations, this approach enables an understanding of aspects which emphasize the human face of learning and organizational life and the contradictory nature of the reality these practitioners experience as situated, socio-culturally mediated, dialectically negotiated and historically evolving over time. The use of a case study approach enables an exploration of diverse ways in which individual experiences shape and are shaped by startup practices in conceptualizing relationships between different constituents of activity (Yamagata-Lynch, 2010a, 2010b). This objective was achieved through rich interpretations of cultural and historical constructions of learning and an examination of related artifacts in situated contexts in relation to change dynamics within and across organizational boundaries, which could be effectively captured through CHAT-based research.

Data triangulation through the use of field notes, although limited, contributed to an appreciation of the complexity of startup cultures, which in turn assisted in the interpretation of data. Furthermore, to maintain trustworthiness in activity systems analysis, I applied Schoenfeld’s proposed guidelines for researchers using novel methodologies, as highlighted by Yamagata-Lynch (2007):

1. Establish the context, describing the issues to be addressed.
2. Describe the rationale for the method.
3. Describe the method in sufficient detail that readers who wish to can apply the method.
4. Provide a body of data that is large enough to allow readers to (a) analyze it on their own terms, to see if their sense of what happened in it agrees with the author's, and (b) employ the author's method and see if it produces the author's analyses.
5. Offer a methodological discussion that specifies the scope and limitations of the method, as well as the circumstances in which it can profitably be used, and that treats issues of reliability and validity. (Schoenfeld, 2004, p. 181 as quoted in Yamagata-Lynch, 2007, p. 478-479)

In alignment with these overarching considerations, I aimed to maintain qualitative trustworthiness by providing an extensive overview of the context of startups in the innovation economy, emphasizing the relevance of an in-depth examination of learning dynamics in startups. The second criterion was addressed through a detailed description of the rationale for adopting an activity-theoretical approach to the study of learning in startup organizations. Background information on CHAT/EL was also outlined. The third criterion was addressed by explaining the procedures adopted in the process of activity systems analysis. Outlining the methods involved in the analysis in detail provides a useful example of an approach which could be modeled in future studies in either similar or different contexts. The fourth criterion was addressed by offering as much information as possible about the data collected to establish a foundation for relevant discussions in relation to design strengths and areas for potential improvements. While the amount of data which can be presented in a dissertation is limited, this requirement was maximized through an attention to detail and relevance to enhance the quality of insights which can be discussed on the basis of data presented. Finally, the fifth criterion was addressed through a discussion of both advantages and limitations of an activity-theoretical approach to the study of learning in startups, highlighting the theoretical contributions of this method as a useful and original approach in the contexts examined, especially as related to the KATs adopted to better understand the complexity of learning in situated contexts of startup organizations in times of rapid change.

By exploring the diverse experiences of participants, we begin to understand how learning can emerge through diverse mechanisms within and across startup activities of startup organizations over time. In this thesis, I move beyond the abstract ideas about formal learning and explore the accumulation of experiences within the cultural context of learning and social dynamic as a function of often contradictory organizing principles of activity in startup knowledge creation practices. In this sense, learning originates from the ubiquity of rapid change, or is influenced by and through the processes of knowledge creation themselves. What these connections and surprising contradictions may teach us about future learning modalities is beyond concepts rooted in abstraction and can have tangible implications in startup practices.
This discussion therefore helps us to better understand alternative perspectives on possible approaches to learning through a development of deeper understandings transcending formal and informal ways startup employees learn in activities towards potentially expansive ways.

I therefore draw on activity theory to present data that show the complexity of learning in startup work and demonstrate how startup learning is mediated by the intersecting concepts and principles of startup practices for knowledge creation. One of the contributions this thesis is making to the IKM body of knowledge is a novel application of the three KATs, allowing multidimensional conceptualizations of artifact mediated, boundary crossing and contradictory dimensions of learning converging in daily work practices of startup organizations, allowing a better understanding of the essence of a more expansive dynamics of learning in relation to its social nature and inseparability to activity in the context of startup work/life.

4.3 Epistemology, Methodology and Methods of the Study

The philosophical paradigm guiding this study is linked to the CHAT tradition, the school of thought in which this study is positioned, building on the foundational consideration that the “concept of activity, the prototype of which is work, constitutes a basis for understanding the nature of knowledge and reality” (Miettinen, 2006, p. 389). Addressing the ontology and epistemology guiding this study locates the approach adopted in domains which encourage socio-cultural conceptualizations in learning, with a particular focus on socially embedded processes and assumptions linked to cultural and historical dimensions of practice. Recognizing the influence of subjective conceptualizations of variations in and multiplicity of individual experiences in relation to interpretations of developmental practices in the context of startup activities, I aimed to reflexively approach the inquiry process through constant comparative evaluations of relations and practices orienting participation and change in human activities, in relation to learning.

It is well known that social phenomena require appropriate methods to best understand their intrinsic complexities (Yamagata-Lynch, 2007). In this dissertation, the activity-theoretical design was used to achieve methodological goals and examine relevant themes. This design is an activity-theoretical approach in which the qualitative data are collected to address in-depth, illustrative questions which provide deep insights into the issues examined and an appreciation of the uniqueness of the context examined (Yamagata-Lynch, 2010a). As Creswell, Plano Clark, Gutmann & Hanson (2003) explain, “case study research studies an issue explored through one
or more cases within a bounded system (i.e., a setting or a context)” (p. 245). The activity-theoretical research design was selected for several reasons. An explanation of the importance of case study research understood in the context of dialectical development and the historicity of activity was highlighted by Ilyenkov (1982), who pointed out:

> It is not induction directed at the search of abstractions expressing the general features of all the particular cases but in-depth analysis of one particular case aimed at revealing the process under study in its pure form that has been the method of philosophy whenever and wherever it really arrived at objective discoveries. (p. 171)

Consequently, the activity-theoretical approach selected within the broader paradigm of qualitative research allows an examination of phenomena in their situated contexts with attention to changing relations shaping the dynamics of development in relation to individual experiences of practitioners and the broader overarching cultural, social and historical dimensions in which they occur. In other words, the case study approach enables insights into the transformative processes in startup development at a specific historical moment within the conditions of a rapidly changing situated social, cultural, economic and geographic context. Given the interpretive nature of activities, this approach helps to examine phenomena through participants’ experiences and explore feelings, perceptions and attitudes as well as concrete practice with regards to the topic addressed.

The qualitative methods for data collection employed in this study, I argue, provide a view into the complex and conflicting organizational lives of practitioners in startups, their experiences and aspirations in the specific context of the innovation ecologies examined. The complexity of individual experiences on one hand and the overarching socio-cultural dynamic were conceptualized dialectically to illustrate the significance of interactions within and across these organizations in relation to ongoing struggles for meaning because and despite of conditions at the basis of a nexus which I described in terms of uncertainty, limited resources and rapid change. Methods and data collected, however, can offer only a partial representation of the wholeness and complexity of the socio-cultural dynamics of learning in startups. Instead of seeking to achieve a complete representation of the complexity of the world of startups, I instead focus on the dynamics of development as a “moment-to moment, interactionally achieved production” (Suchman, 2012, p. 35) of work and organizational life which builds on rigorous data analysis to develop a robust understanding of the expansive potential of learning in startup work, in the specific innovation ecology examined.
Relevant for the activity-theoretical approach adopted in this study, interviews provided insights into the collective nature of startup practices, which involved both individuals and the communities they were part of progressing historically through the socio-cultural fabric of innovation ecologies in constant change. This unified view of activity in development provides, I claim, a coherent conceptualization of learning processes as embedded in the structure of organizational life, while maintaining an awareness of individual variations, interpretations of development and distinct experiences of change. These perspectives on the complex conditions of startup work are significant in the context of an overarching objective of this study to re-conceptualize the dynamics of learning in the work of startups examined.

Epistemological considerations guided the selections of methods in relation to the scope of the study and their validity/trustworthiness in relation to study goals. Consequently, building on an assumption of subjectivity in participant narratives as the object for the examination in relation to aspects of learning, I sought to explore how individuals made sense of the changing conditions of their organizational practices for development. Narratives of change highlighted by participants and the stories they chose to share during the interviews reflect the importance of personal experiences in relation to struggles in their everyday work lives, the creation of the distinct organizational cultures they were part of and an active construction of socio-cultural practices within and beyond their organizational boundaries. My familiarity with the innovation ecologies participants were part of, in my view, contributed to insightful conversations, allowing themes to emerge which encompassed issues of relevance for both the distinct organizational contexts of startup organizations and the broader socio-cultural contexts of innovation ecologies overall. Consequently, experiences shared by participants and their interpretations highlighted in their narratives illuminated a broader range of subjective as well as objective structures in relation to learning not only in their organizations, but also in relation to family life and the broader communities they were part of.

Previous studies using activity based analysis have demonstrated the interrelated nature of interactions between individuals and their communities in situated contexts, examining change processes or identifying contradictions relevant in developmental processes of organizations or groups examined (Engeström, 2014). In this study, qualitative data were used to investigate learning dynamics in startup organizations. Participant organizations and individuals were assigned pseudonyms to preserve anonymity. The analysis of activities in startup organizations offers insights into aspects of learning conceptualized in the context of dynamically changing
work. In particular, I investigated how activities of startup employees develop through the navigation of contradictions in practice. Following the example of Yamagata-Lynch (2007), data were collected using naturalistic inquiry techniques (Lincoln & Guba, 1982; Yamagata-Lynch, 2010a), including semi-structured interviews and field observations. Following data collection thematic analysis was conducted on qualitative data obtained (Lincoln & Guba, 1982; Yamagata-Lynch, 2010a). The qualitative data were used to identify and construct activity systems graphically by constantly reflecting on the different constituents and the relationships among them. As highlighted by Yamagata-Lynch (2007), the process of constructing activity systems from qualitative data is highly dynamic, unstructured, requiring reflexivity throughout. This iterative process required multiple drafts as new connections emerged in conceptualizing interactions among different activities. Patterns observed in alignment with the KATs and the IKM areas for intervention, enabled insights into an expansive view of learning at the basis of the evaluation of the potential for expansive learning.

The research design draws upon activity theory, which contends that activities represent the context for an examination of situated, symbolic and material dimensions of learning, while comparative case study represents the research design for data collection (Yamagata-Lynch, 2010b). These methods, taken together have the purpose not only to facilitate the understanding of phenomena examined, but also to assist in enhancing a reflexive approach in relation to knowledge creation processes and learning aspects embedded in the structure of complexity in development within and across startup contexts examined.

4.4 Ethical Considerations and Methodological Rigor

Ethical considerations were followed with care in this study, using a reflexive approach, as suggested by Guillemin and Gillam (2004) to ensure both rigorous and ethical research practices as required in social research. Ethics clearance for this project was granted by the University of Toronto Research Ethics Board. Consent was obtained through consent forms detailing relevant aspects of the research including goals and approaches to the use of data. Participant information related to the study was kept in a secure location on a password encrypted medium. Participants received information about the study including conditions for participation, potential benefits/risks, and details regarding confidentiality in accordance with standard research regulations of University research ethics protocols. Participants were advised that the information they provide would be treated confidentially, that participation was voluntary and that not
participating would not result in any negative consequences. Participants were assured that data will be treated confidentially, names of their organizations would not be disclosed, and any withdrawal from the study would not result in any penalties.

In maintaining the privacy and confidentiality of data, privacy protocols were ensured at all times. As emphasized by Grossoehme (2014), “[t]o protect participants’ privacy, all data should be anonymized by removing any information that could identify individuals” (p. 119). In addition, privacy refers to the freedom of research participants to decide how much to share, the circumstances in which the information is shared and which attitudes beliefs or opinions to share (Bartlett & Vavrus, 2016). In this study, participants were informed that their participation was voluntary, that they could withdraw from the anytime without penalties, and that their information would be used in accordance with protocols for privacy and confidentiality, information which was included on the informed consent form. Confidentiality refers to the management and sharing of information from and about participants. This requirement was achieved by taking all the necessary steps to ensure the security and confidentiality of personally identifiable information, ensuring that participant information was not shared with other parties, not identifying specific participants in the quotations used in the study results/analysis, anonymization of identifying materials using study identification codes, offering assurance for participants about information non-sharing, and reporting data in an aggregate form to protect privacy.

De-identification was completed manually from an encrypted Excel spreadsheet with a unique identifier ID. Participants were anonymized using identifiers included on a password protected Excel spreadsheet. Access to research materials was restricted to the student researcher. When not in use, electronic data were stored on a secured, password-protected, encrypted computer and non-electronic data were stored in a locked cabinet. Throughout this study, participant risks, if any, were minimal. No sensitive data collection took place. Participants were aware of their role in the research and had the freedom to withdraw anytime. Informed consent was used to inform all participants about the study goals and background.

In addition, establishing a solid foundation for study credibility and validity was a priority in this study, both at the level of preparation, design and implementation, and the analysis. Several methods to increase study validity were used. One method, member-checking was used to consult with interested participants in order to ensure that their views, opinions and ideas were accurately represented. This step was complemented by a peer debriefing exercise. Triangulation
was used to ensure rigor by comparing themes revealed in interviews with literature review (Kelman, 1977). *Dependability* was addressed by developing an audit trail, offering readers the ability to examine research design, collection and analysis (Onwuegbuzie, Johnson, & Collins, 2009). By providing detailed information about research, participants, procedure or context, readers can draw conclusions regarding transferability in relationship to the information collected and analyzed. Rich description of data collection analysis was provided, in addition to quotes from transcripts to ensure transparency and offer readers an ability to assess effectiveness. Confirmability was achieved through the effective recruitment process, theory- and literature driven interview guide and data analysis (Creswell & Miller, 2000; Morse, Barrett, Mayan, Olson, & Spiers, 2002). These considerations and attention to aspects of methodological rigor enabled a robust examination of learning in *startup work* in relation to an *expansive view of learning* examined.

### 4.5 Case Sampling, Participant Selection, Instrumentation and Data Collection

An important consideration in relation to data sources is the need for gathering data which can serve as the foundation for a comprehensive, detailed analysis of phenomena examined (Yamagata-Lynch, 2010a). Engeström (1987) stressed the importance of data for a study, pointing out that “in theoretical research, just like in all empirical research, the selection of data is crucial for the credibility of the outcome” (p. 11), highlighting the importance of justifying selections made comprehensively and in a way which articulates the relevance of choices made with regards to setting, case sampling and participant selection.

In aligning with an overarching goal to gain insights into the essence of learning dynamics in startups, the data selection was based on a systematic analysis of theoretical foundations relevant to the research question, as well as a review of relevant literature. Conducted in the province of Ontario, Canada, this study considered aspects related to diversity in case selection oriented by theoretical and practical considerations. Participant selection was guided by CHAT theory and was emergent in nature. This approach, as described by Patton (2002a) "permits the sample to emerge during field-work" (p. 240). Consequently, data were gathered through interviews carried out with startup employees and their managers and focused on aspects which included their experiences and perceptions of change and learning in relation to daily practices for and of learning within and across their organizational contexts. The purposive sample of
startup employees and their managers included both male and female participants of ages ranging from 22 to 65 years, reflecting a diversity of experiences in work and formal education. The study of these specific organizational dynamics conducted promote a new level of understanding in developing insights into startup learning dynamics in order to advance theory and activity-theoretical understandings of relationships at the basis of more expansive forms of learning within and across startups examined. CHAT-based concepts which link learning to social structures and practices in the startup communities examined, from micro- to the macro-level conceptualizations of learning and change guided the approaches adopted to illuminate the human face of learning at the core of startup development embedded in the structural/relational dynamics described previously.

Within this research paradigm, it was important to move forwards and backwards between theory and practice in a recursive and reflexive manner, making constant comparisons between theory and data in an iterative process, while probing emerging themes for consistency and relevance in relation to the guiding study questions (Ingleby, 2012; Patton, 1990). This methodological approach taken in concurrently triangulating data in this study represents a comprehensive modality in examining the research problem while allowing a range of questions to be examined (Ingleby, 2012; Patton, 1990). The activity-theoretical design was adopted for this study to provide solid foundations for CHAT-based analysis, which I argue provides a solid tool for translating complex phenomena of actual work/life practices and group experiences into useful conceptualizations of learning with broad and important relevance for theory and practice.

In providing further information for our understanding of the character of development in the socio-cultural conditions of the innovation ecology examined, this research captures insights related to conceptualizations of learning in startup environments at a time of high interest in startup organizations as significant contributors to the innovation economy in Canada. The empirical basis of the study was a set of semi-structured interviews carried out with a purposive sample of individuals employed in startup organizations from three different firms. This study used a multi-case study design to address research questions concerning learning in work practices related to knowledge creation in participating startup organizations. In order to explore aspects of learning from the vantage point of CHAT/EL, purposeful sampling was used to select participants. These were considered information rich cases, able to provide relevant information about the central questions addressed (Teddlie & Tashakkori, 2003). Several strategies to recruit information rich cases were used. Critical case sampling was therefore considered an appropriate
approach (Patton, 2002b, 2005). This sampling strategy seeks to identify individuals who can offer deep and relevant insights surrounding the questions examined by analyzing issues critically, raise important points for consideration and are in a position to answer questions addressed (Patton, 2002). Aspects of learning viewed through a CHAT/EL lens in the context of a multiplicity of events, networks or artifacts emerging from participant discourses analyzed provided access to the intricate structure of relations inextricably linked to both the macro structural dynamic and the situated contexts historically evolving in practice.

To understand these relational processes of learning in startup practices understood in an activity-theoretical way, individual interviews were conducted. This method was chosen in order to allow a wide variety of perspectives to be heard and integrated in alignment with the principle of multivoicedness which is at the core of the CHAT/EL approach. According to Murphy and Rodriguez, “[c]ase studies are a favoured research design in the study of contradictions in general and in contexts of technology use in particular” (p. 447). In this context, a multi-case study approach in the CHAT tradition provides a widened understanding of the complex and dynamic relationships between learning and IKM in the different innovation-focused technology startup organizational contexts examined. I argue that the concept of activity as the fundamental unit of analysis employed represents a useful analytical tool in examining these complex structural and socio-cultural relations in situated startup contexts. Related to this, the methodological stance adopted in this research effectively enables a deep exploration of related dynamic learning transformations from a socio-cultural perspective, aspects which are underdeveloped in IKM literature. Consequently, the CHAT-inspired framework adopted in this study reflects a distinct approach, which supports an exploration of ways in which startup activities ultimately facilitate, hinder or otherwise shape learning in start-up contexts examined, and are themselves shaped in this process.

Given the ongoing focus on innovation as a driver for economic growth, the small organizations examined aimed to develop and grow through multifaceted approaches focused on partnerships, research & development, and marketing, among others. It is important to note that the cases can be conceptualized on a continuum of maturity and size, however, they collectively shared the challenge of effectively mediating practices related to knowledge creation in times of rapid change in relation to growing amounts of information and complexity in practice. Undergoing rapid development created additional pressures which manifested as forms of contradictions in practice. Since thee three startups were part of the same innovation ecology,
they shared a similar economic and policy environment, increasing their comparability. While the startups had different sizes and goals, they had similar practices which provide useful insights into learning dynamics in these environments. Employees were placed central to the research study. Data were collected and triangulated with field observations to complement and guide analytic strategies and develop the conceptualizations of learning and development described. Data were analyzed by generating codes and themes, then analyzed in relation to literature, constantly reflecting and making connections between themes and concepts (Alvesson & Sköldberg, 2017). Excel was used in supporting the coding process in order to structure emerging findings. Through an iterative process, contradictions were used primarily as entry points into activity systems analyzed in search of new insights into the potential for expansive learning within and across organizations examined.

Before proceeding to discussions related to the analytic approach it is relevant to briefly introduce some general features of the organizations examined and outline a description of the rationale for case selection. To preserve anonymity, the three cases will be referred to as ORG-A, ORG-B and ORG-C. While the startups examined displayed similarities in their goal orientations related to growth and rapid development, as well as a shared innovation ecology, they pursued different strategies in their everyday startup work practices which resulted in very different dynamics, outcomes and learning. Specific learning issues were identified in each of the cases, highlighting the object/goals of each activity, illustrated by specific empirical examples from data collected. A preview of the differences involved—partly a reflection of case selection although also reflecting empirical-analytic confirmations still to come—can be summarized here as follows. The first case centers around a more formally mediated learning environment where the introduction of an artifact resulted in a cultural shift in approaches to learning. The institutional setting described is characterized by specific developmental practices at the intersection of the fields of healthcare and insurance, providing insights into aspects of learning which are largely managed through ongoing self-directed training. Participant descriptions of developmental practices provide an understanding of social relations as actively constructed and in constant transformation. Processes of negotiation provide an overview of learning as highly

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15 The degree of formality of organizations examined can be conceptualized as a function of structure and a distinct cultural dynamic which places emphasis on the presence and adoption of certain policies or procedures in organizational work practices undergirded by the force of organizational legitimation. At the same time, formality, as understood in this context, is a relational concept used to differentiate the distinct cultural dynamics between each of the organizations examined.
mediated in practice. The second case involves an organization with institutional collaborations with a partner in the public sector focused on the co-development of medical/surgical products. This institutional context adopted different strategies for learning which facilitated collaborative practices, demonstrating the importance of boundary crossing for learning and development in interdisciplinary teams. The third case highlights aspects of learning in a micro-enterprise, providing insights into practices which are actively and organically developing in the situated institutional context in times of rapid change. In this institutional context, learning was largely unstructured and experiential. The dynamic structuring of knowledge creation as emergent is seen to shape the learning process as individuals struggle to navigate time pressures and competing goals within the small organization and across its organizational boundaries. Both similarities and differences can be distinguished in relation to the organizational contexts examined, which are shaped by both developmental relations and individual participation leading to distinct outcomes and experiences in practice. Building on distinct perspectives coexisting in conceptualizations of development and learning, subsequent chapters provide a more detailed account of how individuals in the smallest of startups accomplish organizational goals by navigating complexities of startup work. This examination of actual practices and collective experiences helps to shed light on issues relevant for the study questions examined. At this small scale, micro-interactions magnified through a CHAT lens illustrating relevant aspects of mediation, boundary crossing and contradictions as a source of change in learning become especially relevant for an activity-theoretical analysis.

<table>
<thead>
<tr>
<th>Focus area for startup development and/or object of activity</th>
<th>Healthcare insurance technology and services</th>
<th>Specialized medical device technology</th>
<th>Media technology and advertising in the healthcare domain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mediational structures</td>
<td>Learning Management System with metrics and completion tracking</td>
<td>A popular cloud-based information sharing environment; co-working spaces</td>
<td>Consultant, no formal tool</td>
</tr>
<tr>
<td>Boundary Crossing</td>
<td>Patients/Insurance - Meeting demands of multiple stakeholder domains</td>
<td>Hospital R&amp;D Innovation</td>
<td>Networking / relationship building for growth</td>
</tr>
<tr>
<td>Contradictions as a source of change in</td>
<td>Predominantly noticeable in routinized practices</td>
<td>Dominant in collaborative practices for</td>
<td>Across actions/operations in</td>
</tr>
</tbody>
</table>
Table 3 Summary of organizational contexts under examination

<table>
<thead>
<tr>
<th>Number of employees</th>
<th>Corresponding KATs</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-19</td>
<td>20-49</td>
</tr>
<tr>
<td>Identifier</td>
<td>Constant change</td>
</tr>
<tr>
<td>ORG-A</td>
<td>ORG-B</td>
</tr>
<tr>
<td>ORG-C</td>
<td></td>
</tr>
</tbody>
</table>

The three cases are comparatively examined in relation to the three KATs and ultimately the EL framework. Despite taking place in distinct institutional settings, the startup organizations examined showed several important insights into learning processes with expansive potential. This section provided an introductory overview of the three cases examined. Three strategies for knowledge creation identified in each case provide nine practices which will be analytically examined using an activity-theoretical approach. The next sections further elaborate on relevant aspects related to the approach for analysis and data collection adopted in this study.

Smith (1987) described the distinct nature of research in everyday practices with attention to the relations of social organizations shaping individual perceptions as follows:

The simple notion of the everyday world as problematic is that social relations external to it are present in its organization. How then are their traces to be found. We do not expect them to speak of social organization and social relations. The methodological assumptions […] are that the social organization and relations of the ongoing concerting of our daily activities are continually expressed in the ordinary ways in which we speak of them, at least when we speak of them concretely. How people speak of the forms of life in which they are implicated is determined by those forms of life. (Smith, 1987, p. 188–189 as quoted in Sawchuk, 2013a, p. 21)

Adopting an active listening approach (Sawchuk 2013, Smith 1987) in relation to these everyday practices in development, interview data were collected with a particular emphasis on allowing participants to share their perceptions, observations and perceived significance of processes, artifacts or practices in change. These practices and interactions make explicit contradictions at the basis of learning as inseparable from the structure of activity and deeply embedded in the macro structural influences orienting startup work. Consequently, this approach enables deeper insights into situated, micro-contextual dimensions bridging everyday work-life relations within and across organizational boundaries of startup organizations in times of rapid change.
Semi-structured interviews containing both closed and open-ended questions with eleven participants provided an opportunity to gain insights into the context of development within and across organizations examined and the situated contingencies in the everyday social life/work of startups. These methods involved the development of an original research instrument designed to speak to the themes identified as areas of intervention based on the review of IKM literature. The instrument was intended to facilitate empirical explorations of mediation, boundary-crossing and contradictions as a source of change in learning within and across developmental practices for knowledge creation while recognizing ontological features of activity on a continuum of formality/informality in learning dynamics. These interviews were used, in other words, to deepen an appreciation of perceptions, attitudes and indicators of change and learning with respect to existing or potential tools, processes and practices in startup work from an activity theoretical perspective in participating organizations. Examining aspects of learning in relation to the social organization of daily life in the startups examined required an attention to both details of development, as well as their broader significance in relation to the occupational lives of participants. These interrelated dimensions of development and change provide key starting points for interrogating matters of learning, work and knowledge creation within an amalgam of individual and collective activities shaping everyday work/life in the situated contexts where they emerge, evolve and/or dissolve over time. Overall, I therefore argue that the research approach adopted in this study has the potential to begin to answer the analytic concerns identified, while acknowledging the complexity of embracing the multitude of processes across individual, cultural and social dimensions in constant motion.

The selection of participant organizations was based on their self-identification as startups and a willingness to participate in the study. In fact, community events related to networking and professional development provided valuable opportunities for the initiation of conversations related to the study and potential participant recruitment. Through conversations initiated at these events, I introduced the research project to prospective participants and scheduled meetings. The startups selected had between 1 and 50 employees. The primary aim of this sampling strategy was to explore both the breadth and depth of experiences of participants in relation to everyday work practices and their conceptualization of learning in the specific and unique context of startup environments. Personalized emails were sent to members of startup organizations to confirm their interest and set up interviews. The time of the interview was chosen by the participants. Interviews were available in person or by telephone. A follow-up reminder email
and phone call were made to remind participants about the interviews. Participants contributed to the research by responding to the semi-structured interview questions through relevant examples grounded in lived experiences reflecting individual perceptions of learning and change in everyday work practices related to knowledge creation/development in their organizations.

Selective methods were applied depending on specific elements determined by emerging elements, to complement each other and paint a complex system of interactions, contradictions, linkages - formal and informal, creating diverse meanings and interpretations of processes, systems and phenomena observed. The purpose of data collected was to enrich the understanding of phenomena explored rather than achieve complete objective representations claimed by techniques of data triangulation. Through a rigorous process of analysis, the study took a specialized approach to examining the research questions, while generating extensive descriptions of complex interactions in relation to abstract conceptualizations of learning embedded in startup everyday knowledge creation work practices in times of rapid change.

Supporting the central goals of the study, the interview instrument was developed to address the research questions which encouraged participants to highlight their experiences, attitudes and perceptions of activities as well as individual and collective practices in organizational life in relation to knowledge creation practices in times of rapid change. Specifically, the research instrument was designed to address the key analytic themes stemming from the CHAT perspective adopted in this study. These themes, in turn, were applied to gain insights into dynamic processes of learning and development. Interviews were scheduled at mutually agreed upon locations, were recorded, transcribed, reviewed and when necessary clarified or corrected by participants. Instruments were therefore designed to facilitate the analysis of the dynamic nature of activity in relation to the mediating artifacts/tools, goals, object-orientation or their conceptualizations of the work environments overall understood as a zone of proximal development from an activity-theoretical perspective. Within each organization, up to four interviews were completed with participants in order to gain insights into startup practices relevant to learning dynamics viewed through an activity-theoretical lens. The semi-structured nature of interviews enabled participants to reflect on their own experiences and express ideas which they perceived as being most important (Galletta, 2013; Wengraf, 2001). Participants reflected on their experiences both retrospectively as well as in relation to future projections and current practices in relation to learning.
At a preliminary stage, a limited number of ethnographic observations were used to achieve an initial sense of promising analytic points of departure into the complex issues addressed, complemented by reflexivity throughout. Observational data included field notes documentating descriptions of settings, people or events, followed by reflections on their relevance, and articulated in detail later in the process of analysis, although to be clear a full ethnographic study was not conducted by any means. Still, this limited or semi-ethnographic approach was conducted in environments representing relevant and illustrative practices of startups part of the ecology for innovation in which participating startups were situated. Observations were recorded to inform the development of questions at the basis of the semi-structured interview and subsequent activity-theoretical analysis. Semi-structured interviews explored interpretations of experiences of participants as they reflected on their role and contributions in startup work activities in relation to aspects of learning which are often invisible in practice. Participant narratives helped to construct the exploration of the potential for expansive learning as experienced by participants in relation to their stories and perceptions of learning, change and development relevant to the KATs examined.

Attending innovation related events provided opportunities for an appreciation of the diversity of opportunities for learning in the ecology startups were part of. Participants were, in part recruited at these events, allowing observations of aspects of boundary crossing participants referred to during the interviews and which were subsequently made visible in analysis. However, these ethnographic aspects were not analyzed specifically, limiting the scope and nature of the research method to an analysis of participant narratives exclusively. Interviews were conducted in locations chosen by participants in public spaces including coffee shops or community settings. These locations provided further opportunities to observe innovative settings where startup employees gather to socialize or network in the broader innovation ecology, further illustrating a broad range of learning opportunities for boundary crossing between startups and other organizational contexts. To address difficulties in researching phenomena in the highly dynamic and changing environment of the innovation ecosystem, preparatory work was completed. In preparation for the interview, relevant information about participants and their

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16 Throughout the period of the research study, I attended events related to innovation, learning, business and technology, and had the opportunity to attend a range of free presentations, exhibitions, workshops and networking events. In these contexts, I learned not only about, but also with startup employees/owners/managers as they participated in these activities.
organizations was researched in order to establish rapport and lead stimulating conversations. Cognizant of limited time allocated, interviews were kept within the limits indicated below. Audio recordings and notes were reviewed before interviewing next participant to help anticipate relevant information or add new questions based on emergent ideas or concepts discovered based on previous interviews.

The research instrument was designed to address the themes stemming from CHAT/EL to gain insights into the deeply embedded nature of learning in dynamic and interrelated practices of startup organizations, as conceptualized from an activity-theoretical perspective. The use of in-depth, semi-structured interviews provided the empirical data for an examination of contradictions as a source of change in learning in startup organizations examined. From this perspective, the CHAT-based concepts in the activity-theoretical approach provided a sensitizing set of concepts, which assisted in examining the dynamic interplay of relational factors orienting knowledge creation in development and shaping learning in startups. Semi-structured interviews provided depth in examining the specific areas of interest (Galletta, 2013; Wengraf, 2001). This method was chosen as an appropriate strategy due to its open, flexible, interactive approach, providing a valuable method for gaining interpretive data. This format is characterized by dialogue and exchange of ideas using an informal style while allowing new and unexpected themes to emerge (Galletta, 2013). In the context of the semi-structured interview, a systematic process was followed. The first step consisted of creating a list of areas of interest that required further illustration, or additional clarifications in achieving a better understanding of the phenomena explored in this study. Themes which emerged from preliminary questions were explored as well as topics or ideas which displayed a significant variance in responses.

Overall, in-depth, semi-structured interviews provided rich descriptions of participant experiences with a particular focus on individual and differentiated conceptualizations of social, cultural and historical aspects of startup work in relation to the situated, micro-contextualized aspects of learning examined. Based on an awareness of interview limitations, the research was approached with a heightened sensitivity and attention to social relations embedded in participant narratives emerging in their descriptions of work practices. The purpose of conducting interviews was to collect information from participants who had in-depth knowledge about their organizational work practices, context of startup work and potential conceptualizations of their position within the organizational structures (Yamagata-Lynch, 2010b). Interviews therefore provided valuable insights into the socio-cultural dynamics of learning either explicitly
perceived, implied or more deeply embedded into practices. Probing questions were designed using an open-ended format and were derived specifically based on the areas for intervention identified in the alignment between IKM literature and the KATs adopted.

In the initial stage of the interview, general questions were used to understand the participants’ roles within the organization and their familiarity with the broader ecosystem context. Up to 4 interviews were conducted for each of the startups examined. Interviews took place between July and October 2018 and lasted 45-60 min. Questions from the semi-structured interviews were developed based on the themes identified to be relevant in literature and the overarching questions for this research study. To assess the clarity of the questions, two sample interviews were conducted with volunteers. Interviews were recorded following participant consent and assigned an identifier. Transcription was completed verbatim. Throughout the research process, reflexivity on process improvement supported the goal of facilitating positive participant experiences.

The approach outlined in this section and chapter, I argue, has the potential to address the analytic concerns proposed in this research study. Integrating the different levels of generality addressed with an attention to both the overarching macro-structural dynamics reflected within, beyond and across the individually experienced practices participants described represented a difficult goal to achieve within the limitations of the research effort presented in this thesis. However, the attention to contradictions as a source of change in learning represented a valuable entry point into the dynamics of development, illuminating distinct variations at the basis of organizational change, at a higher resolution compared to previous approaches, as I will further elaborate in the next chapters.

4.6 Analytic approach to Argumentation and Interpretation

Through reflexive analysis, this study aims to unfold complex layers of learning conceptualizations in activity, illuminating themes grounded in theoretical foundations of participants’ narratives of transformative change processes, through which learning is constructed and reconstructed in startup practices. The study of informal, everyday events cannot be separated from situated contexts, aspect which provides an essential reminder of the importance of perspective in guiding understandings of startup learning in relation to knowledge creation in startup organizations examined. Illuminating the most subtle learning phenomena embedded in the fabric of startup activity requires a process of reflexivity for both researcher and participants,
as previously unexplored conceptual dimensions, especially contradictions, are made visible by the CHAT lens in order to understand dynamic phenomena relevant to EL in startup contexts examined. Seeking to view the learning process at the center of development in the context of technology startups as social activities, thereby this approach develops insights into enabling and hindering factors for the potential for expansive learning in the contexts examined. Social situations examined provide the media for human development, offering opportunities for individuals in developing mediational or collaborative competencies. These processes are characterized by a complex set of relations of social and environmental domains influencing the translation of contradictions at the basis of expansive learning in practice.

Data sources presented above resulted in rich data which was analyzed thematically through a recursive process by progressively deconstructing the KATs to allow specific contradictions to emerge. By deconstructing data along the three KATs, deep insights could be gained into learning dynamics at the startup activity level. The first central question concerned how learning is mediated in startup activity. The second dimension examined boundary crossing/collaborative practices in startup activities through multiple iterations aligning and deconstructing narratives along the patterns facilitated by the KATs. Finally, the third dimension analyzed concerned conceptualizations of contradictions in relation to the potential for expansion in learning. Throughout the analysis process, data was examined to cross-validate synergies across cases and interpreted through an activity-theoretical lens to enable insights to emerge from patterns observed in empirical data. The analytic process was manual and enabled the organization and coding of data recursively until saturation was reached. This goal was particularly important for constructing an expansive view of learning in startup work.

The research started by identifying the key analytic themes used to interrogate IKM literature in search of areas where the activity-based approach can offer meaningful contributions for a more robust conceptualization of learning in the startup contexts examined. Findings were used to develop the interview protocol, which was based on solid theoretical foundations derived from the CHAT tradition addressing the areas for contribution identified previously. Subsequent alignment of empirical data were substantiated by relevant literature and theory in analysis.

Following data collection, transcripts were labeled, deconstructed into emerging themes and further aligned to the three KATs in preparation for critical reflection and analysis. Data were analyzed in an activity-theoretical tradition to identify indicators of contradictions as entry points into areas for intervention in IKM literature aligned to the KATs introduced and operationalized
in a previous chapter. Stages were cyclical and iterative. Interviews were transcribed verbatim. A notation syntax was developed to record “how things are said” not only what is said (Galletta, 2013; Wengraf, 2001) so that markers of contradictions could be identified. The analysis grounded by CHAT techniques consisted of several nonlinear, iterative stages and Excel software was used to organize the data. The following stages illustrate the analysis process as a “continuous and iterative process” (Ritchie, Spencer, & O’Connor, 2003, p. 219) with attention to detail, refining categories over time.

As Ritchie et al. (2003) pointed out, “[f]amiliarization, though it may seem as an obvious step, is a crucial activity at the start of analysis” (p. 221). Consequently, the first step involved verifying transcript quality and immersion in the data. The audio was reviewed to gain an overall view of data, identifying discrepancies and recording a first impression about data or participant tone perceived during the interview. Next, open coding was performed, line by line or by paragraph, depending on how the ideas were developed. Following this stage, the coding scheme was reviewed, and initial codes revised. Some of them were renamed to better reflect narratives. Next, subcategories were created as hierarchical relationships started to form. The purpose of this stage was to synthesize and reorganize concepts, leading to the discovery of new concepts. The fifth stage involved further revision of categories to support the development of a coherent analytical format. Lastly, in the final stage, categories were merged into overarching themes. Theme development was inspired by both inductive and deductive analytic approaches: deductive based on predetermined factors originating from literature and theoretical reviews, and inductive based on themes emerging from analysis using a grounded theory approach.

Data across the three cases was examined and analyzed thematically primarily using indicators of contradictions as entry points into activity system dynamics leading to potential object changes. This technique was inspired in part by previous studies using participant narratives grounded in concrete activities offering access to internal activity system dynamics of startup work practices in relation to learning (Yamagata-Lynch, 2010b). The KATs adopted enabled expansive elements to emerge, providing a means of re-constructing an expansive view of learning in the highly dynamic work environments of startup organizations in times of rapid change.

The process of conceptual data alignment between the KATs, IKM literature and empirical data required multiple recursive attempts. By repeating the process described above, it was possible to both delimit specific activities as bounded systems and visualize how they shape
learning dynamics in the startup contexts examined. Engaging in this reflexive process was foundational in ensuring that the activity theoretical synthesis aligned with qualitative data was a robust representation of activities as described by participants. Given the relatively short timeframe for the study, there were no major changes in the organizations which may have had a significant impact on the nature of the study or their criteria for inclusion. The case studies were chosen on the basis of amenability and their ability to provide sufficient variance in analysis (Poland, 1995). Variance in case study selection for theory building research is important in order to provide different facets of concepts examined (Seawright & Gerring, 2008). The differences in the three case studies provided distinct contexts in studying the learning dynamics in highly innovation-focused startup environments. Preserving the anonymity of participants and cases examined was ensured throughout the study.

Applying the analytic apparatus described illuminated the differentiated character and dynamics of knowledge creation in everyday practices. Distinct trajectories were recognizable in the data and emerged as a result of different connections and similarities in approaches to change and development as observed across organizations examined. This analysis made it possible to analyze forms of *contradictions* embedded in organizational change efforts, revealing shifts in practices characterized by highly partial forms of resolution/synthesis in efforts at translation. These tendencies about the nature of learning in activity dynamic could be effectively described in terms of dialectical trajectories, providing new conceptualizations of learning in change processes in highly dynamic work environments.

In seeking to contribute to the debate within CHAT between attention to individual subjectivity and collective subjectivity, it is relevant to examine aspects pertinent for the interpretation of variations in modes of participation in activity emerging in this study of learning in startup work with attention to both conscious and less conscious aspects inherent within it. Viewed from this perspective, the choice of alignment or divergence from the collective subject through individual modes of participation in activity can be viewed in relation to the particular experience more or less agentively constructed and applied to the situated context by an individual subject in relation to the object of activity. To complement this discussion, Goffman’s concept of framing can be applied to, at least in part, explain the variations in individual modes or participation in activity and their relevance for the directions of development they shape for individual subjects in practice. Overall, the rationale for the attention to distinct “modes of participation” in activity in relation to individual and collective subjectivity at the basis of distinct
and potentially divergent trajectories of participation in object-related activity is predicated on interrelated aspects which, in conjunction with the concept of trajectories, and the empirical case studies in this case, can provide additional insights to this dilemma.

Drawing on CHAT/EL to provide a framework in support of analytic inquiry into the learning dynamics described helps to move beyond static or generalized conceptualizations of learning in development, shifting focus towards complexities of social interactions, changing orientations and differences at the basis of shifting practices in motion. The aim of the activity-theoretical approach adopted in this study is to seek to understand how learning expansion can progress on dialectical developmental trajectories through a contradiction/resolution/synthesis dynamic in knowledge creation practices of startup work, in times of rapid change. This approach places emphasis on mediated, collaborative/boundary crossing and contradictory/dialectical aspects of socio-cultural conditions. The concept of trajectories suggests that knowledge production is a dynamic process which is shaped by a contradiction/resolution/synthesis dynamic both within and across organizational boundaries in the context of knowledge creation. In this context, developmental trajectories described by these relational variations are aligned to socio-cultural dimensions of innovation prevalent in a knowledge-based economy, determining variations in modes of participation of individuals in activity. From this perspective, learning appears to be deeply embedded in the evolving dynamics of knowledge creation of everyday startup work and life in times of rapid change.

4.6.1 Framing: addressing the micro-macro divide

In this context, the application of the concept of framing to aspects related to learning dynamics provides a useful extension of the CHAT/EL approach adopted and applied in this study. Goffman’s *Frame Analysis* (1974) provides a means to conceptualize the structural relations of interactions in startup work activity at high levels of magnification using a CHAT lens with attention to the differentiated experiences of individuals, shaping variations in their modes of participation in situated contexts. Although frame analysis is a distinct analytic tradition of its own, nevertheless here I suggest that, broadly conceived, a conceptual awareness of frames allow a CHAT researcher to make the multi-dimensionality of reality more visible as understood by individuals engaged in particular activities (re: Goffman and CHAT: cf. Sawchuk, 2013). This approach to analysis can be described as a form of inquiry into what Scheff (2005) describes as the “structure of context”, enabling an understanding of ways in which individuals make sense of
unfolding events and activities in practice. Yet, as Sheff (2005) highlighted in relation to Goffman’s definition of the concept, “[…] frames are only a part of a still larger structure, the definition of the situation. The definition of the situation is the actors' largest subjective response; frames are a part of this subjective” (p. 370). Indeed, these subjective elements of individual framing in situated contexts are inextricably linked to the broader organizational, socio-cultural and historical aspects which can be meaningfully addressed through an activity-focused CHAT/EL approach. Deepening the analysis of learning dynamics in complementary ways, this method facilitates the development of a model for framing startup learning as a mediation-boundary crossing-contradiction (MBCC) dynamic, establishing a specific vantage point for defining problems as issues of dialectical development in learning without neglecting the variations of individual subjective experiences in changing and situated contexts over time. Viewed from this perspective, the type of framing I adopt in this study seeks to identify elements of organizational life governing individual modes of participation in activity in both direct and more indirect ways. In particular, people’s active participation in activity systems can be framed to better conceptualize the active production of variations in situated contexts in which changes and development take place, aspect which “[…] might also help us construct a chain that links discourse, in the moment, with the highest institutional levels of society, the micro-macro pathway” (Scheff, p. 384), addressing the micro-macro divide described previously.

While these differences can be often subtle in activity, they allow an appreciation of the subjective nature of activity under specific conditions and the tremendous variations which organize individual modes of participation over time. In other words, framing of activity offers insights into elements which are emphasized, while other are ignored under conditions of change and development. We can therefore understand activities either within their broader cultural contexts, using Goffman’s notion of “primary frameworks”, or as perceived or experienced by individuals in specific, situated contexts. This approach is significant in explaining how participants interpret their activities and evaluate their possibilities for modes of engagement in activity or the potential for change in a number of different ways. Relevant to the theme of contradictions as a source of change in learning is the notion of “keying”, which refers to the transformation of frame. Goffman describes keying as "the set of conventions by which a given activity, one already meaningful in terms of some primary framework, is transformed into something patterned on this activity but seen by the participants to be something quite else” (Goffman 1974, p. 43-44 as quoted in Kreinath, Snoek, & Stausberg, 2007, p. 152). An
appreciation of these factors represents an important element in the rationale for the complementation of the activity-theoretical approach with Goffman’s frame analysis.

Goffman’s approach to contextualizing the significance of subjective experience draws attention to the multiplicity of potential interpretations which link the micro-level dynamics of context with levels of awareness which are relevant to a conceptualization of individual engagement and modes of participation in activity. In particular, this modality of studying the social construction of reality in situated contexts facilitates a multifaceted analysis of activity developmental specimens I discuss in this study to understand how participants make sense of their activities at different levels of awareness, which include less conscious operations under certain conditions, and more conscious goal-oriented actions within object-oriented activities. Consequently, this approach enables an understanding of certain situated dynamics of development which guide change. Overall, frame analysis in this context enables a detailed examination of the dispositions and relational structures in startup work activity by deconstructing the different forms of mediation, such as metaphors or stories to illuminate the human face of learning understood in an activity-theoretical way.

These foundational considerations regarding framing and keying are both conceptually and methodologically significant in providing the foundations for the notion of knowledge-in-activity, complementing the activity-theoretical approach adopted\(^{17}\). As may be recalled from previous chapters, activity-theoretical analysis is a means of understanding a range of mediated interactions within and across organizational spheres of activity. On the other hand, notions of framing and keying provide a means for gaining an appreciation of the variations in individual

\(^{17}\) Although it is not a major conceptual resource I draw upon in this study, it still may be helpful to note that drawing on Goffman’s concept of frame analysis in subsequent analytic chapters, we can begin to understand the production of differences and variations in individual accounts as both lived and perceived by participants in relation to the complexities of work and development. In other words, we gain insights into “unique dimensions and dynamics of variability within activity that are typically only hinted at in either CHAT research” (Sawchuk, 2013, p. 189; emphasis added), or, what Goffman (1974) describes as the “frame of activity” (p. 247). Unfolding structures of activity identifiable in participant talk, for example, offer insights into both conscious/reflexive aspects of learning which are explicitly expressed, but also those which cannot be self-consciously reported, but which are nevertheless present in interview talk (Sawchuk, 2013). This approach provides insights into the moments and dynamics of learning in everyday work/life – specifically, the interrelations between the details which are often neglected/ignored/obscured and their broader cultural/historical/social significance in practice. Building on these methodological and interpretational assumptions in relation to the study of learning in everyday work/life, we can observe and distinguish elements which are relevant for the emergence of the trajectories of knowledge creation and learning from the amalgam of individual, social, cultural of historical elements of development in organizations over time. Viewed as a source of variation in relation to different modes of participation in activity, this complementary approach illuminates distinct trajectories between and within organizations examined.
modes of participation in activity, shaping distinct trajectories for individual and collective trajectories of development in practice.

4.6.2 Rationale for and selection of activity-developmental specimens

The detailed, framed, activity-theoretical analysis of interactions emerging from participant narratives of change and learning remembered provides insights into tacit elements which are relevant to the analysis of expansive learning and knowledge creation adopted in this study (Engeström, Kerosuo, & Kajamaa, 2016). As Engeström et al. (2016) highlighted, “[r]emembering as a social action is often carried out in narrative form, and much knowledge is mediated through narratives in the organizational world” (p. 324). Several key themes emerged from the analysis of different specimens in this research studies, including how startup employees and manager/owners experience activities and insights into their learning under conditions of rapid change in development. The case studies presented therefore serve as a source of “specimens” in facilitating a solid understanding of structural relations in startup work and learning in the organizations examined, which I refer to as activity-developmental specimens. In this section, I focus on the rationale and methodological bases for the selection of the specific specimens over other possibilities.

The identification of relevant activity-developmental specimens was based on a thematic grouping of activities identified across participant narratives. The analytical groups developed shared a similar dialectical thematic (e.g. structure/change, individual/community), from which illustrative specimens were identified. This process was iterative-reflexive and involved the application of the constant-comparative method to ensure that the activity-developmental specimens were representative of features and common characteristics prevalent in the clusters they were part of. The three clusters of practices which emerged in the process of analysis are conceptualized in this study as indicative of trajectories of development in times of rapid change, in the distinct contexts examined. The first cluster of practices in development was characterized by a dialectical theme which can be described as continuity/change, in which different forms of mediation played a significant role. This cluster of practices will be illustrated by the activity-

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18 Dorothy Smith (1990) described the selection of “specimens” in relation to the practice of botanizing features of social analysis in order to reflect “How people put the social together in their actual practices” (p. 59 in Eastwood, 2013). More specifically, “its interest is in learning from and about the same world that sociology is written in. Botanizing, as a simple method, works with the idea that you can go out and ‘look’ and find specimens or examples of what you are interested in and ‘bring them back’ to analyze them” (Dorothy-Smith, 1990 in Eastwood, 2013, p. 59)
developmental specimens presented in Chapter 5. The second cluster of practices can be described by the dialectical theme of individual/community, in which the crossing of boundaries in activity were particularly relevant. This second cluster is illustrated through activity-developmental specimens in Chapter 6. Finally, the third cluster of practices can be meaningfully described in terms of a breakthrough/crisis dialectic and analyzed based on the third KAT adopted, contradictions as a source of change in learning. This cluster is illustrated through the activity-developmental specimens presented in Chapter 7. Taken together, these distinct dimensions provide the foundations for an expansive view of learning in relation to which the potential for EL could be described.

Each specimen begins with the specific context of activity within the developmental practice of the startup under examination, with attention to overall managerial expectations shaping the cultural dynamic of the change process. The introductory considerations are followed by an evaluation of activity in relation to employee experiences, providing approximations of the characteristics of the type of knowledge created. Employee perceptions, feelings or beliefs are included as indicative elements of tacit dimensions shaping individual modes of participation in activity. In each of the cases, we can observe how the process of learning expansion is initiated when different forms of contradictions are confronted within and across organizational boundaries. Each specimen analysis concludes with a summary and evaluation of the characteristics of knowledge created, indicative of tendential development of the organization examined. The three specimens provide a strong foundation for the subsequent discussions of divergent trajectories of learning and knowledge creation in relation to the human face of startup learning and organizational life this research study seeks to provide.

4.6.3 Trajectories of development and knowledge creation
The three analytic chapters are indicative of three trajectories of development which reflect how individuals are oriented by different factors in startup work shaping distinct and divergent modes of participation in activity. These trajectories are inferred from the distinct natures of MBCC (mediation, boundary crossing, contradictions) dynamics in each of the organizations examined. The distribution of participant views and experiences provide the basis for an appreciation of the distinctiveness of participant insights into their awareness surrounding development and change. These trajectories appear to enable distinct forms of knowledge-in-activity as a relational construct at the basis of possibilities for expansive learning and learning of individuals-in-
activity. By examining the relevance of mediations shaping the different trajectories, we can begin to see a clear picture of the relational dynamics of contradiction-driven development both within and across organizational boundaries.

In the contexts examined, the examination of practices and activities in development suggest the heterogeneity of startup organizations in times of rapid change. While organizations in this study share relatively similar social and economic conditions within their ecologies for innovation, they display distinct orientations in their tendential development. These distinct and potentially divergent trajectories are shaped by broader socio-cultural factors, including the demand for their products in the historical context of their development, and circumstantial, situated factors which include the availability of funding or access to talent and capital. This heterogeneity is reflective of unique situated challenges and individual responses to pressures of contradictions of development in times of rapid change.

Reflecting what Turner (2001) described as a “web of contradictions” in relation to the everyday startup practices at the basis of development in this study, I present three comparatively distinct cases to enable an analysis of the potential for expansive learning and change in development, as viewed from the vantage point of CHAT/EL. The characteristics of each of the emerging trajectories are developed based on an evaluation of the MBCC (Mediation, Boundary Crossing, Contradictions) dynamic in relation to three distinct and interrelated considerations: (1) the general theme of the trajectory (2) the dominant element of the dynamic of knowledge creation (3) the dialectical nature of development and change. As Ilyenkov (1982) pointed out in relation to the significance of dialectical approaches, “that is why dialectics is the area where conscious, intentional coincidence of the inductive and the deductive moments takes place, the two constituting indissolubly linked and mutually assuming moments of inquiry” (p. 160). The dialectical nature of development within each of the trajectories is further examined as a CRS (contradiction, resolution, synthesis) dynamic to illuminate variations in learning expansion

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19 The activity-theoretical approach adopted provided both an inductive and deductive analysis of dialectical development, based on foundational assumptions of CHAT and the Davydov’s method of ascending from the abstract to the concrete as a method of inquiry. As Sannino and Engström (2018) explained: “Ascending from the abstract to the concrete is a method of grasping the essence of an object by tracing and reproducing theoretically the logic of its development, of its historical formation through the emergence and resolution of its inner contradictions. A theoretical concept is initially produced in the form of an abstract, simple explanatory relationship, a germ cell. This initial abstraction is step-by-step enriched and transformed into a concrete system of multiple, constantly developing and expanding manifestations. In other words, the initial simple idea is transformed into a complex new form of practice” (p. 51). This dialectical approach in conjunction with the CHAT assumptions elaborated previously, served to guide the analytical reasoning presented in this study.
(realized, under-realized and unrealized) orienting individual projections of learning for individuals-in-activity. These cases represent distinctive trajectories of development and knowledge creation in activity, are analytically explanatory and offer an appreciation of the diversity and human face of startup learning and organizational life.

4.7 Conclusion

By providing a thorough account of methodological aspects and analytic procedure, this chapter demonstrated a rigorous approach to the examination of learning dynamics in contexts examined, helping to validate and enhance the relevance of findings presented later. Taken as a whole, I argue that the qualitative, activity-theoretical design provides a strong foundation for addressing the research questions examined in this study while balancing the complex nature of the CHAT approach with the advantages of a focused, specialized scope addressing a re-conceptualization of learning in the specific IKM body of literature. This chapter highlighted the analytic procedures used in this research study and their rationale, presented and justified in the comparative multi-case study design as a suitable method of studying learning in startups from an activity-theoretical perspective, and described the methods of data collection appropriate for the qualitative design including semi-structured interviews and field notes. This chapter also outlined the sampling strategy and process, which represented a combination of purposive and opportunistic sampling strategies (Neergaard, Ulhøi, & Neergaard, 2013). It also elaborated on the importance of selection criteria used when generating knowledge about experiences of adult learners in "complex learning environments" (Yamagata-Lynch, 2010a).

Described and discussed was also the approach to data analysis. One of the challenges was managing the large amount of data which emerged from the empirical data. A plan was devised for rigorous data analysis using case profiles to manage growing amounts of information. Lastly this chapter described advantages and disadvantages of methods used. This study speaks to the fact that making explicit aspects of learning in IKM literature is possible through a CHAT lens by focusing on contradictions as a source of change in learning to illuminate the socio-cultural dynamics of a contradiction/resolution/synthesis dynamic largely neglected in IKM.

20 While this chapter emphasizes primarily strengths of the approaches employed in the examination of learning dynamics in this case, limitations will be further addressed in the concluding chapter. Limitations inherent in the methods employed can be attributed to aspects associated with the semi-structured nature of interviews as well as the analytic framework applied in the analysis.
Methodological choices outlined in this chapter therefore provide important means to re-conceptualize learning in IKM literature from an activity-theoretical perspective. In times of rapid change, learning may often be obscured by internal or external developmental influences yet understanding how developmental trajectories influence progression represents a key aspect of expansion in practice, which can be more effectively examined from a CHAT/EL vantage point. In this regard, the activity-theoretical perspective adopted in this study sheds light on interrelated pathways which guide activity towards distinct destinations. By adopting a critical perspective of learning grounded in socio-cultural dimensions of analysis, it is possible to transcend generalized claims about the nature and scope of learning in the innovation economy, in times of change.

This chapter also described the three case studies adopted in this research study. Startups represent important and relevant settings for activity-theoretical research related to learning due to their dynamic nature, focus on innovation and unique professional characteristics of participants. All these characteristics present unique opportunities in examining forms of contradiction in knowledge creation practices of startup work in times of rapid change. Consequently, these complex work environments require a socio-cultural view of issues through a CHAT lens, amplified through activity-theoretical analysis. Contradictions as a source of change in learning were identified in alignment with the KATs adopted to examine the potential for expansive learning. Empirical cases of startup organizations examined represent the empirical basis of the study, based on which startup work practices were examined in the following chapters to develop an empirically-derived, theoretically-based framework for the conceptualization of the potential for expansive learning in startup contexts as outlined in this chapter.
Chapter 5: Mediation and Knowledge Creation in Startup Work: Development on a type-s Trajectory

In this chapter, I mobilize the activity-theoretical lens in order to develop new insights into the mediated nature of learning in relation to a specific type-s startup trajectory of change and development. Using empirical data in relation to the mediation/boundary crossing/contradictions (MBCC) dynamic described previously, I demonstrate how the concept of mediation, understood in the CHAT/EL tradition, enables an elevated level of understanding about aspects of knowledge creation and learning which complement, deepen and extend existing IKM scholarship. Specifically, I examine forms of mediation in ORG-A related to strategies and practices shaping a distinct and potentially divergent type-s trajectory in practice. Consequently, the novel insights, which derive from the adoption of an activity-theoretical approach in examining developmental strategies in this context provide solid foundations for an understanding of knowledge creation which includes intricate variations and contingencies as illustrated in this and subsequent chapters. The evidence that follows initiates the claim that startup learning is socio-culturally mediated by a range of strategies shaping/structuring the distinct cultural dynamics within and across organizations examined in development and rapid change.

5.1 Introduction

In this chapter, I draw primarily on the concept of mediation in the MBCC dynamic of knowledge creation in development to analyze how learning is shaped by “seen but unnoticed” (Garfinkel, 1967 as quoted in P. H. Sawchuk, 2013, p. 294) forms of mediation in startup work from an activity-theoretical perspective. These forms of mediation are embedded in and inextricably related to the structural relations of startup life and development. More precisely, I aim to explore how learning is mediated in the context of rapid organizational development of startups as a function of socio-cultural dynamics functioning at both individual and collective levels within the specific contexts of startups at the specific historical moment of the study and in the specific cultural conditions available at the time of the research. This approach is based on an underlying recognition that this conceptualization of learning reflects situated, activity-based startup practices, shaped by developing trends in work and learning over time.
Building on these basic considerations, I extracted relevant insights directly from the empirical data provided by participants as they reflected on their learning experiences. Problematizing aspects of learning which are recovered from participant perspectives offers insights into practices which are embedded in individual cognitions and perspectives of learning and change. This approach, in turn, enables a deeper understanding of activity-based forms of learning as reflected in narratives of work practices of startup organizations examined, remembered. Evidence suggests more formally mediated strategies in development of socio-culturally mediated trajectories connected to the dynamics of change in relation to object expansion and changing instrumentalities. The empirical data presented in this chapter suggests the formation of a type-s trajectory of development and knowledge creation. In relation to this trajectory, structure and administration were recurring themes evident in participant narratives, creating tensions/contradictions in the process of development. These contradictions also represented entry points into internal activity dynamics in motion which will be analyzed in relation to variations in individual modes of participation in activity, in the final chapter.

In previous chapters, I discussed how, from an activity-theoretical perspective, human activity is mediated by tools, rules and division of labor (Yamagata-Lynch, 2010a). I argued that making visible and examining elements which reflect the mediated nature of learning in startup organizations from an activity-theoretical perspective can offer insights into learning dynamics in rapidly changing work environments. As the arguments in this dissertation unfold in subsequent chapters, it will be increasingly clear how different permutations of artifacts and their often-contradictory nature or situated use in practice shapes learning experiences for individuals in both symbolic and material dimensions. Their significance must, however, be magnified through a CHAT lens to provide insights which can make visible more nuanced aspects of socio-cultural importance in relation to expansive views of learning in startup work activity on trajectories of change and development.

The goals of the following sections are as follows. First, I aim to show how development/change unfolds as a learning-in-activity dynamic using an analytical-empirical approach in examining mediational dynamics, dynamics of boundary crossing and dialectical/contradictory nature of the dynamics of change within and across organizations examined. Second, based on observations related to the dynamics explored, I suggest tendencies about the nature of the knowledge creation on trajectories of development. Third, and building on the findings in the empirical data and variations of modes of participation in activity, I provide
predictions of the directions of development of individuals-in-activity in relation to *projections of professional futures*. The analysis suggests highly partial forms of translations of contradictions, and high levels of individual variation in terms of different *modes of participation* in activity. These variations and the interrelatedness of distinct modes of participation in activity provide startup practices collectively overall trajectories of change which I claim can be usefully described on a continuum of formality in change. The following sections outline some of the strategies illustrating this trajectory of change and development.

5.2 Established/Mature Startup Organization: Process-orientation, Efficiency and Structure: Struggles to Improve Efficiency and Scale Up

In the first case of an illustrative trajectory of development and knowledge creation, the focus on the first organization as an established\(^\text{21}\) startup organization which, at the time of the research was undergoing rapid change as a result of the acquisition of new clients illuminates relevant aspects of the more formally mediated dynamic of learning and change. In this context, the work environment of the first startup can be characterized in terms of notions related to order, structure, specialization and predictability providing a more stable dynamic of development, one which placed emphasis on routines and well defined practices. Predictability was a key characteristic of the overall cultural dynamic in this organization. The overall orientation of the organization towards processes, frameworks and systematic approaches to development provide indications of a startup that I argue we may accurately describe as *mature*. This descriptor, however, does not necessarily mean to indicate this organization as the oldest of the startups examined, but rather reflects the predominantly *formalized* cultural dynamics emerging in the empirical data from this organization. To achieve developmental goals, this startup placed emphasis on consistently improving operational efficiency through administrative routines or regular review of metrics (key performance indicators – KPIs). Work practices were process-oriented, *mediating* the interactions and practices within a *structured* work environment and orienting its development on a distinct trajectory in practice.

\(\text{21} \) The term ‘established’ in this context refers to the relatively more stable and formalized (see earlier footnote) cultural dynamic in the organization. Formalization refers to the extent to which activities in an organization are structured by defined, explicitly specified procedures, rules or responsibilities, and has been associated with administrative efficiency and influence (Walsh & Dewar, 1987) The degree to which rules and procedures govern the actions taken in organizations, how these practices are coordinated, specified, or implemented mediate the possibilities of work, interactions and overall cultural dynamic of an organization.
These approaches may not be surprising, considering the nature of the work, industry and the clients served. The organization worked closely with the insurance sector, processing client cases through a standardized approach involving several defined stages, strategy which was designed to reduce complexity and variability. A central goal of the organization was to ensure efficient operations while maximizing profitability, maintaining customer satisfaction and minimizing the time required to process the individual cases. Attention to detail, quality, careful planning and minimizing any disruptions were key elements of the overall strategy to ensure efficient operations. One of the policies associated with ensuring customer satisfaction was to collect feedback by means of a survey to clients after each case was processed. Punctuality and responsiveness were key focus areas reflected in organizational policies: a client had to be contacted within 24 hours. An example of this policy in practice, as mentioned by one of the participants, was the use of an automated email for client-facing employees, thanking the customer for their email and promising to follow up within this timeframe. Furthermore, there was a clear emphasis on the improvement of processes, the quality of client interactions and the quantity of cases processed. By adopting a highly structured approach in daily work practices overall, ORG-A adopted and developed systematic activities for collecting feedback data, analyzing trends and projecting improvements.

This organization was undergoing major transformations in three respects. First, the rapid acquisition of new clients required changes in operational practices related to the digitization of information and associated policies for data management in alignment with client requirements. Secondly, the pressures of rapid growth demanded new approaches to the differentiation of specific roles, the hiring of new employees and specialization in specific areas which were relevant for meeting the new requirements. Thirdly, the implementation of a new system for the management of client relationships while maintaining continuity in existing operations added an additional layer of complexity to the organizational structure. The structured practices and policies which were developed over time in this organization had been proven to be effective for the development of the organization. To grow, this organization had to change, adapt and transform. It had to transcend the nexus of uncertainty, limited resources and rapid change, while generating new ways to cope with new levels of complexity in development.

The case of ORG-A illustrates more formalized knowledge creation practices reflected in the struggle for growth and development, the reproduction of administrative practices of a more traditional organization and the implications of strategies adopted in response to these struggles.
shaping its developmental trajectory over time. Work practices recovered from participant narratives in this organization provide insights into strategies shaping the orientation of what is termed as the type-s trajectory described in this chapter. In comparison to the other startups examined, ORG-A stood out in terms of an increased attention to metrics, standards and overall quantification of indicators, enabling its leaders to conceptualize and visualize progress by means of reports and detailed charts mediating decisions for development and growth.

As we will see in greater detail below, despite the similarity in the structure of job requirements, there was significant variability embedded in the work activity of ORG-A and the ways in which individuals acquired new skills/knowledge on this type-s trajectory in practice. Adding to this complexity were different forms of instrumentality which provided distinctive modes of participation in activities characterized by changing conditions in work practices. To understand this level of complexity in skill/knowledge creation, it becomes helpful to focus on concepts related to mediation which will assist to clarify processes in highly fluid and dynamic work contexts characterized by rapid changes. Therefore, in this chapter, I will highlight processes which shape or shift work/learning and test/complement their conceptualizations in the specific, situated environments of participating startup organizations examined. These conceptual tools, I argue, provide valuable articulations of the complex meditational processes characterizing distinctive forms of activity in which skill/knowledge are created. As I will elaborate further in relation to the empirical data themselves, the particular CHAT-based lens in Engeström’s work addresses the co-existence of mediations at multiple levels (activity, actions, operations), offering an effective means of making visible subtle aspects of learning which have largely been neglected in the examination of startup work and IKM literature in particular. The variations in developmental trajectories which can be distinguished in the empirical data provide an important means of examining the development of participating startup organizations, which can be understood primarily as unfolding from their most incipient forms, expansively towards resolution in practice. Therefore, by applying Engeström’s particular CHAT-based lens to the argument introduced earlier in this chapter, we might say that learning expansion is rooted in an actively mediated cultural dynamic of change which is shaped and re-shaped/transformed to create alternative modes of participation in activity and changing instrumentalities over time.

Improving the efficiency of development in this organization was a stated priority for the leadership in ORG-A, challenging in the context of limited resources and rapidly changing conditions in development. The leadership team had to oversee the everyday activities of the
business, while at the same time ensuring stakeholder engagement and customer satisfaction. These difficulties required an increase in efficiency and improvement in systems and processes. In a very competitive industry, many companies, like ORG-A aim to adopt structured approaches to achieve business goals, to different degrees. In this organization specifically, the nature of most of the jobs required specific job descriptions, which enhanced clarity in communication. Communication was specific and clear, creating a specific work culture in which structure and process were dominant. Improving efficiency was linked to measuring the number of cases processed per day or monitoring the punctuality of employees in various tasks. Systems had to be highly reliable: any downtime would have meant an inability to complete the targets for cases processed. Flexible schedules were not conducive to the nature of this type of work. At the same time, employees were working relatively independently, following set work schedules. The leadership in this organization cared about employees and were forward-thinking, struggling to find ways to increase the flexibility of work in order to avoid high turnover, and offer employees a stable work environment. The disciplined approach to development yielded promising results for the company, which was growing steadily and was on track to achieve set goals. Despite this growth, however, the pressures of improving efficiency and any changes in business conditions may have a destabilizing impact on the fragile structures of the organization. Some of the past strategies are described in the next sections, illustrating the distinct approaches adopted by this organization, implications for the distinct trajectories of knowledge creation in development and distinct trajectories for development.

5.3 Forms of Mediation in the MBCC Dynamic of Knowledge Creation: Examining Indicative Activity-Developmental Specimens in Startup Development

In order to describe the particular forms of knowledge creation and learning emerging from developmental practices in ORG-A specifically, it is necessary to remember the mediated structure of activity as the primary unit of analysis and the contradictions embedded within or across activities in the interconnected fabric of startup work. Everyday activities in ORG-A focused primarily around the development of the innovative product, serving clients, and developing new opportunities for growth. The organization underwent several major changes which included the adoption of new software, resulting in new processes, additional employees and overall re-distribution of work among individuals in the organization. The attention to
metrics or standards mediating work practices represented some of the major differentiating elements of strategies adopted, shaping the distinct developmental type-s trajectory in this case. These strategies oriented towards formalization had a significant impact on the structure of activities in this organization and the overall culture of ORG-A over time.

In the analysis in this chapter, I will highlight narratives through which I trace developmental strategies mediating work practices, producing stabilization knowledge and fragmented forms of learning, to better understand the mediational dynamic of activity in this organization in times of rapid change. We will observe distinct characteristics of a developmental trajectory reflecting stability and replicability, as well as metrics in the measurement of specific KPIs in response to rapidly changing conditions embedded in situated socio-cultural relations over time. To conclude this first analytic section concerning the mediated nature of developmental startup work activity, I will highlight the importance of the different strategies examined in shaping development through an activity-theoretical lens. The orientation towards stabilization knowledge and continuity in development in this case reproduced contradictions over time as the organization navigated struggles for efficiency improvement and vertical scaling, as further illustrated in the next sections.

5.3.1 Tool mediation of startup learning capacity and the MBCC dynamic of knowledge creation in development: digitization

In order to theorize elements relevant for a conceptualization of the type of trajectory described in this chapter, I examine relevant activity-developmental specimens by drawing on the notion of tool mediation to extract the implications of mediation for learning and empirically derive some of the main characteristics of the type of knowledge created in the specific context examined. Tool mediation, from this perspective, represents a key dimension, central to the analysis of startup development which structures knowledge creation and learning in everyday practice. In this chapter, I focus on the mediations in the structure of startup work activity. From the data, I directly recover elements relevant to the trajectory of development used to organize and illustrate the distinctive nature of this type of development. The specimen examined in this section supports Gedera’s (2014) findings which suggest that learner engagement is affected by tool mediation, while further extending the understanding of socio-cultural elements of this type of engagement in the distinct context of the startup organization examined. This discussion is particularly relevant in describing the complexity of tool-mediated startup development, as
reflected in everyday work practices in times of rapid change. The in-depth analysis of the conditions for development conceptualized in relation to the startup zone of proximal development illustrates a more formal learning environment in which evolving social relations mediate the specific goals and actions of individuals, contributing to a distinct type of MBCC dynamic we can observe in this context. Furthermore, I will refer to strategies for development as the dominant official script in development (Engeström, 2016), which describes a distinct orientation in development guided by formalization tendencies in practice.

A relevant element in relation to the notion of formalization embedded in relations of development provides insights into the distinct character of the learning in the organization. Given that an investment in “talent” represented a significant strategy for the development of ORG-A, this strategy lead to the adoption of a Learning Management System (LMS). Part of this strategy was the implementation of a LMS to support employee learning of job-specific content and reduce the need for email-based delivery of training materials for employees. The content in training materials for employees was centered around industry standards, best practices and other useful information which could facilitate the completion of job duties for employees. The challenge is described by an owner/manager in this organization, who points out:

On one hand we were sharing news and information, on the other hand we didn’t know if people were actually reading and understanding. So, what we have done from an organizational point of view is we created an educational portal, where all the learning gets documented. Most videos are about 3-5 min in length, and also, we can monitor, who has seen the video and the feedback from it. So, this is the dynamic structure that we implemented in our organization is done on an ongoing basis. The overall result is very positive, people like that approach and that gets everybody involved with the new components that we are developing, either directly involved within that task, or indirectly, so that everybody understands, how products could be used and so on. (P54T6545)

This entry point into an analysis of knowledge creation in relation to the dynamics of change in this organization will allow us to gain insights into the tool-mediated change processes at the basis of knowledge creation in times of rapid change in this organization. Before, however, further examining these processes, it is relevant mention that the LMS was implemented both as an investment for talent development, as well as a tool designed to centralize and automate the training function by storing and monitoring the information relevant for employees. These factors
represented compelling reasons for the adoption of the LMS from the leadership/management standpoint and were designed to facilitate an ability to track or measure learning effectiveness. The specimen discussed in this section is used as an illustrative example of other similar examples in the organizational practices, reflecting a need for more elaborate socio-cultural examinations of the mediated nature of learning in IKM literature. The potential of tools in shaping the cultural dynamic of an organization in relation to learning in the context of development can be understood from an activity-theoretical perspective as an opportunity to examine both the relations embedded in the structure of everyday practices orienting development and knowledge creation, but also as an opportunity to analyze possibilities for change in learning. In the third chapter, I explained why the concept of mediation is a useful and valuable point of interest in initiating activity-theoretical analyses of learning in startup organizations, viewed from an activity-theoretical perspective aspects which I will further discuss in connection to the major role tools play in the reproduction of relations in development, especially as they shape and themselves are shaped by localized variations in conditions of change.

We can infer in this context a pronounced correlation to organizational performance and the enhancement for efficiency with emphasis on tool mediation, and a more limited emphasis on socio-cultural dynamic of practices in relation to learning and the potential for change in the context of more formally mediated practices in the development of the organization. In particular, as discussed previously based on the IKM exemplar by Lytras and Poulidi (2006), an alignment to “system requirements” suggests an uneven conceptualization of tool-mediated learning in developmental dynamics of change, which, as analyzed below requires a relational approach to analysis of learning in context. Shifting the focus from “knowledge as a resource” to “learning as a people process” (Rajala & Sannino, 2015, p. 32), requires an attention to mediated relations of learning and knowledge creation framed in the context of activity-in-development. Building on the considerations above, I argue that the infrastructure of development in startup work which is designed to mediate how knowledge is created, stored and made available for use and skill development can be meaningfully described as the startup learning capacity of the organization to capture the fragile, dynamic and changing character of learning the context of rapid development.

To better understand the relevance of the role of the LMS in the development of ORG-A from the vantage point of CHAT/EL, it is necessary to focus the analysis on some of the
subordinate standpoints reflected in the options available to participants in relation to the LMS mediating knowledge creation in relation to the situated conditions reflecting the more formalized character of development in this context. One of the employees described:

The system has an option to build my profile and describe my skills. This is actually funny, and I just put a smiley face in that field. My manager knows me, and we speak every day, and we are a small company, we know each other well. You know, I have to do so many things, a bit of marketing, a bit of research, and so on. I have lots of skills and learn something new every day. Things are changing fast, and my skills are changing too. (P3S43234)

Observable in this excerpt is evidence of informality in navigating change in practice, although, as will become increasingly visible, this re-action to the implementation of more or less formal requirements did not represent the norm, but rather an exception manifested through a deviation from the official script (Rajala & Sannino, 2015). In this description of LMS features, the participant highlighted an aspect of the LMS which was relevant in further conceptualizing the role of the tool in shaping the cultural dynamics of the organization in this case through a process we might refer to as maturation. Overall, however, the implementation of the LMS shaped the structural dynamics of organizational practices, which became increasingly formalized.

Supporting this observation, work practices were structured in a number of ways beyond the LMS, suggesting that the tool implementation was the starting point of a broader organizational strategy to accelerate the pace of maturation in transitioning to a more formalized work environment where information and knowledge were actively and more formally managed in conjunction with the learning function. This process was supported through an increased attention to metrics and application of additional rules to internally managed processes, practices which are prevalent in more established organizations. Despite the initial disturbance/contradiction, this transition appeared to progress in incremental steps, accompanied by a stepwise adaptation to change. The LMS therefore appeared to play a significant role in the reproduction of routine-based mediational dynamics prevalent in more mature organizations, reflecting procedural approaches which were comparatively structured in nature.

While initially approached informally, the implementation of LMS in ORG-A appeared to induce a process of maturation which was conceptualized by participants in oppositional ways. In the context of examining educational technologies in relation to learner engagement, Gedera (2014) noted that LMS can affect active participation in learning activities. Adopting a similar
analytic approach, I extended the examination of tool mediation in startup contexts to identify additional forms of mediation which I suggest contribute to a more elaborate image of an expansive view of learning in fast changing organizational contexts. The context of ORG-A examined in this study represented an environment where the LMS was an integral part of the learning experience. In ORG-C, there was no LMS, while ORG-B adapted a digital storage system, which was transformed into a LMS.

Broader macro structural influences on the situated orientation of activity further shaped orientations towards structured approaches in development. Considering the following excerpt from the interview data, we can observe another example which illustrates several key observations relevant for the conceptualization of more formalized forms of knowledge creation in everyday work practices of ORG-A influenced by temporal pressures and aspects of efficiency:

We have implemented the learning management system to document learning and consolidate some of our learning resources, such as videos or tutorials. We track the completion of certain modules which are important. Completing them on time is important and this system [the LMS] shows clearly who has completed what and when. This way we don’t have to go to each and every employee and ask: Did you complete it? We just know and that makes everyone’s lives easier. (P54T6545)

The adoption of the LMS presented some challenges for individual employees, often conceptualized in relation to time management. As one of the employees pointed out “You simply forget that you have to complete the education modules, there are simply too many things to do and often I am not even in front of the computer, I have to run from here, there. You know, everywhere, all the time”. Managing content in the LMS also required a structuration of the learning content with technological guidelines for organizing data in alignment with object/goals.

The centrality of considering the LMS as a tool bridging work practices requires a particular recognition of tensions between physical/digital dimensions of learning in development. As one of the participants described: “It is hard to remember everything in these modules and I tried to write some key ideas on paper, but then I can’t find my papers and I forget the sequence, so I need to go back to the video, and re-learn”. In this example, the participant had learned the module content in the LMS, and passed the test required to confirm completion, yet capturing completion appeared to obscure some of the human factors, creating a contradiction in essence between learning as experienced by employees and reporting/leadership expectations.
Clearly then, the LMS in this context captured a transitory state of learning, *mediated* by process formalization and the operational conditions affording *continuity* in goal-progression. Central to this evolving process was the mechanism by which individuals navigated the learning process as they brought into awareness personal/organizational dimensions of meaning creation in activity. For startup professionals like the participant quoted above, the interlinked nature of mediated relations of knowledge creation in development was transcended in the learning process through a process of meaning making in activity constrained by material conditions of change over time.

The mediated digitization of knowledge creation in the context of the orientation of startups towards continual improvement represents a key element for the CHAT/EL analysis adopted in this study. The approach adopted provides the foundation for an understanding of social relations mediating startup work by means of tools and artifacts in development, while the LMS adoption in this case illustrates an important form of tool-mediated activity in the context of startup development in times of rapid change contributing to the structural formalization of learning practices overall. From the CHAT/EL vantage point discussed in this section, the LMS appears to mediate knowledge creation in startup work by facilitating asynchronous work and shaping the dynamic of work in a distinct way. The example highlighted in this chapter provides relevant insights into the evolving functionality of digital mediation in the workplace in relation to learning oriented towards more formalized practices over time. The learning management system provided both affordances and constraints for learners in startup environments. Similar to Gedera (2014), flexibility in asynchronous learning represented a significant factor in the adoption of the tool. As the completion of different learning modules was documented, both employees and the leadership team were able to assess, quantify and monitor progress towards learning goals, aspects which mediated personalized learning experiences while at the same time creating additional pressures in the areas of completion and standards of achievement.

The analysis of the activity-developmental specimen examined in this section contributes to the conceptualization of a more formally mediated trajectory of development and knowledge creation, which expands our perspectives of learning in relation to startup organizational strategies for growth, while reflecting the distinct tendential development of the organization in practice. Socio-cultural aspects of the different forms of mediated learning in the dense fabric of everyday startup work experience have generally not been the focus of sustained empirical research in IKM literature and represent key issues this ADS analysis seeks to contribute to. The tensions of rapid growth in startup work appear to correlate with pressures towards formalization
in learning and development mediated by social and material aspects in the local production of activity. What we begin to see is an image of knowledge creation which was highly fragmented, as employees had to complete modules individually. Perhaps closely related to these aspects is a consideration of the potential for new possibilities in balancing the formalized practices with resources with potential to mediate ease of use, interactivity and engagement over time in changing modes of participation along the mediated trajectories of change in learning. Describing this dynamics and complexity, however, requires more than just a recognition of the significance of tool mediation in learning, but also underlying notions of skill in transformation, supported by relevant practices providing a pivotal role in elevating professional competence for innovation. The conceptual shift to a more expansive view of learning (EVoL) in everyday practices for development represents a significant area for theorization this chapter and research seeks to contribute to.

5.3.2 Artifact mediation of startup learning capacity and the MBCC dynamic in knowledge creation and development: quantification

Drawing on the notion of artifact mediation, in this section I examine the relation between artifact mediation in the MBCC dynamic of ORG-A using an illustrative activity-development specimen (ADS) from the dense structure of startup work in this organization with attention to aspects related to metrics and KPIs. Specimen analysis illustrates elements mediating a distinctive trajectory of development characterized by tendencies towards formalization, quantification and efficiency. Understanding how artifacts in the specific context of ORG-A mediate the startup learning capacity in activity is foundational in examining the relations between extended relationships of tools, division of labor and the community the startup is creating, with attention to social interactions shaping socio-cultural conditions of learning and change in the situated organizational context. In the course of development, employees developed their own personal sense of the official script, as they searched for meaning and purpose in their everyday practices. The specific contextual structures of the startup, however, influenced the development of the personal sense, illuminating struggles of change in differentiated ways, and often merely reproducing the structural relations or localized variations of knowledge creation in the situated ecology of the organization.

The complex nature of the object-goal of increased operational efficiency and growth in relation to the adoption of the LMS cannot be neglected, and is in fact reflected in the steps
reflective of the mediation of the learning capacity in ORG-A. Guided by the particular organizational strategy for development and the vision for growth, metrics/KPI’s adopted in relation to the LMS were aligned to the broader organizational plan to meet certain milestones within specific temporal timeframes. These constructs mediated the startup learning capacity and type of knowledge created, while at the same time becoming the subject of negotiation and structural tensions in the MBCC dynamic I describe.

Driven by the tendential formalization in development and structured approaches to change, the use of metrics in relation to KPIs and organizational goals represents an important element of business strategy for many organizations. The knowledge associated with business activities can be systematized to establish baselines for comparison and track developments in quality improvement, customer satisfaction of overall progress towards object/goals. In the context of organizational development and change, it is however important to take a moment to reflect on some of the most essential aspects related to the adoption of metrics: their purpose, origins and the way they orient priorities in an organization. In particular, I argue that it is important to reflect extensively on the ways in which the relations in activities as building blocks of overall daily practices, are affected, enabled or constrained in practice. In addition to providing focus for the organization, metrics/KPI’s represent significant elements which provide direction in organizational change efforts. Measuring progress is in many ways, essential to the continual development, yet can become the source of a range of contradictions in development as the needs of a business evolve and change.

Conceptualizing the role of metrics/KPIs as artifacts mediating the startup learning capacity in ORG-A requires several introductory considerations. The use of metrics in the performance measurement of business practices is not a new phenomenon, yet the advancements in automating the collection of operational data to generate insights directly integrated to the KPIs delivered to organizational leadership teams represents a significant element in the evolution of performance-driven practices in organizations. Supporting the KPIs were metrics, which could be used to measure LMS-mediated activity for the purpose of comparison and tracking. This more structured approach to development can be understood as a mechanism to reduce the multiple variations of learning to concrete descriptors and quantifiable measures used to assess progress and change. From the standpoint of the leadership team in the organization, the adoption of metrics was relevant in supporting work intensification for growth, offering directionality in purpose of activities in development. In the context of change, employees sought
meaning and purpose in their activity, as will be increasingly clear in this section, developing their own differentiated perspectives and standpoints in relation to the official script. As Rajala and Sannino (2015) point out, “meanings exist only in relation to one’s personal sense” (p. 32). Consequently, the personal sense developed by employees in their search for meaning in times of rapid change shaped their individual modes of participation in activity.

A careful analysis of this strategy illustrates the emergence of a developmental contradiction, leading to the realization that significant customizations were needed. While the organization responded by customizing the tool in order to make it more “user friendly” and easy to use, its adoption in practice added new levels of standardization-oriented mediation which supported formalization in the form of quantification of learning in change:

We have metrics. One is completion of the courses, who is taking and who is completing it and to what level of completion. Some courses are meant to be 100% passing marks, anything around security education, you cannot pass a security test unless you get 100% and we set it at 100% - it is a difficult thing to have a 100% mark, but reality is in security either you pass or you fail. So 90% pass is a still a failure. Whereas some other courses a 90% pass is acceptable. So it depends on the topics. We do get good feedback from people based on what they like and what did not like. (P2343F35)

From the excerpt above, we can notice an attention to high standards of achievement in relation to object mediation. The example illustrates the development of new instrumentality and a formalized channel for communication based on feedback related to what individuals “like and [...] did not like”. Again, we can observe an quantified approach to the process of feedback processing through which the learning capacity in startup development was mediated by process artifacts in the form of metrics directly linked to KPI’s (Key performance Indicators). In other words, learning was operationalized in practice, and task-oriented to support development. While metrics associated to completion, time spent and achievement are useful markers of achievement, they do not capture the individual perspectives and perceptions of individuals in relation to the learning content. This element appears to be reflective of formalization in startup work practices, guided by tendencies of quantification in relation to the broader rationale of the object/goal, mediating the intricate and dense fabric of organizational structures in change and leading to specific forms of skills and knowledge which reproduce administrative forms of learning in the context of rapid development.
The set of metrics adopted in conjunction with the LMS implementation indicate the emergence of forms and mechanisms for formalization of practices in the context of development, which mediated the learning capacity in the organization. At the same time, these forms of mediation were reflected in further examples illustrative of the quantification of knowledge in development and change, as highlighted by another manager/owner in ORG-A when he described:

We can see who is completing what in real time, and that is important since we couldn't see that in emails. Maybe we could have seen who was opening them but we couldn't see if they were reading them and most important- if they were actually understanding the information we were communicating. I could only make assumptions about completion. We have many things to do and I just want to know that people know what they need to know. At least the important information, and I don't just have to run around and ask people- did you complete this or that. (P54T6545)

In this excerpt, the participant highlights aspects which align to a logic prevalent in more formalized work environments, emphasizing content knowledge, while aspects of creativity and collaborative forms of change in learning appear elusive. From this point of view, the LMS tool appears to mediate a formative approach to learning and standardization. A key feature of the system in this case was the detailed tracking of learning completion, including time spent, interactions and specific questions addressed, allowing a fine-grained overview of learner activities in the bounded system created. Learners were able to complete set learning tasks during or outside the workplace as long as specific tasks were completed and acknowledged in the tool.

A tension embedded in tool mediation highlighted the compulsory nature of learning as a pressing and inevitable requirement in work practice, as viewed by the owner/manager in this case. This was a significant aspect indicative of a pronounced degree of formalization in learning mediation on this distinct trajectory of development.

A distinct strategy of ORG-A represented the robust, metrics/KPI- mediated roadmap for development which shaped practices associated with development in several interrelated ways. Having a concrete plan for development was significant for the leadership team in this organization, who valued proven models and overcoming obstacles through structured approaches which had to be measurable. At the center of the growth strategy was the organization's mission, which was to provide a unique service to optimize client experiences in the medical system. Consequently, the approach to scaling up in this organization was a
transformational process which involved high attention to detail and professionalism in work activities. Embedded in the growth roadmap were specific milestones which the company had to meet in order to achieve the projected growth expected by the leadership team. To accelerate development, ORG-A created a MVP (minimally viable product), intended to address a specific need identified in the market. Through a recursive learning process, ORG-A perfected the product and increased the number of users. Remembering the process of development from the MVP to the current stage, participants repeatedly brought up the idea of urgency in development, emphasizing the goal of responding to an identified need in the areas where the startup product/solution was intended to fill an important gap/need. Based on this approach, ORG-A was developing another MVP to expand the portfolio. One of the manager/owners from ORG-A pointed out:

We need to work fast to develop this product. If we don`t do it, someone else will, and we want to be first. The analysis we completed shows that we are in a good position to address the need in the market, so we are developing an MVP (minimally viable product). We learn as we progress, make mistakes, correct them and try to be as agile as possible. The key idea is to focus on the development now. Scaling up and the rest will actually come later, but for now it is a race against the clock to get this done and get it done fast. (P2343F35)

The central idea in the excerpt above illustrates a particular form of time perspective, in this instance a compressed time frame which was creating both a tension/temporal pressure and mediated opportunities for expansion. The metaphor of “race against the clock” is illustrative of the theme of urgency in development, which appeared intermittently in participant narratives. The relativity of time, however, must be considered as a mediator of learning and change. The time perspective in this case appears to be relatively condensed and there appears to be limited evidence of temporal expansion into the past in relation to a historical analysis of the object. Similarly, an extension into the future in relation to object expansion may inform developmental innovation processes in the context examined.

The mediated quantification of knowledge creation in development represents a key component of the orientation of startups towards continual improvement and growth. In the case of ORG-A, quantification of learning by means of metrics in relation to broader KPIs was adopted to improve the startup learning capacity and support evolving growth within the organization. This approach contributed to the directionality of the trajectory of development of
the organization and was characterized by pressures towards formalization in practice. The emergence of new sets of rules provide frameworks for compliance and accountability, while establishing new relations of authority and the emergence of hierarchical structures. Furthermore, tendencies towards specialization and division of labor could be distinguished. This more structured approach to development captured by the activity-developmental specimen discussed in this section is indicative of the broader theme of formalization prevalent in everyday development related activities in the organization. These considerations provide supportive and interrelated elements at the basis for the conceptualization of the distinct developmental trajectory of ORG-A and the creation of more administrative/managerial forms of knowledge characterized by quantified measures and increasing demands for performance in learning.

5.3.3 Process mediation of startup learning capacity and the MBCC dynamic in knowledge creation and development: automation

The distinct type of developmental trajectory in knowledge creation and learning described in this chapter can be supported through robust empirical elements derived from the analysis of aspects of automation in development and change. In this section, I deepen the discussion of the tendential aspects startup development in the organization as mediated by forms of automation building on insights derived from the analysis of an activity-developmental specimen illustrative of pressures towards formalization in the MBCC dynamic of knowledge creation introduced in the previous chapters. To achieve this goal, it is relevant to recall that contributing to the structured mediation of development in ORG-A was a pronounced attention to strategies for automating repetitive practices. In the case of the LMS, the strategy resulted in shifting from manual, email-based communication to on-demand delivery of educational materials, which could be stored, developed or improved. In the LMS, information was entered, stored and integrated, resulting in the implementation of completion tracking and standards of achievement. Analytic findings suggest that evolving social relations we observe in this context rarely deviate from the official script, supporting and reproducing the more formalized approach to development in ORG-A.

By making proven processes and practices more predictable and repeatable, organizations can increase their operational efficiency, however, the same processes which are scalable and structured can hinder innovation (Adler & Borys, 2006; Adler et al., 2009). In other words, these structured, optimized or automated approaches can both enable development through consistency
in execution and potentially lead to challenges in adaptability to changing economic or more contextual, situated conditions over time (Adler et al., 2009). This evolving dynamic of routinization in development builds on the replicability of knowledge which enables organizations to develop confidence in proven practices and guides activity. However, knowledge in rapidly changing environments can have what might be described as “limited half-life”, degrading during development and conditions of change. Adler et al. (2009) describe this relational dilemma as follows:

Organizational routines are a form of knowledge that guides organizational activity (R. R. Nelson & Winter, 1982). When organizations solve problems, they acquire knowledge that can be reused to solve similar problems in the future. This knowledge captures the essence of what worked (or did not work) in the past, enabling organizations to take shortcuts and avoid dead ends, thereby abridging the problem-solving process (R. R. Nelson & Winter, 1982). The more such accumulated knowledge guides organizational activities, the more routinized—i.e., stable, predictable and repetitive—those activities become. Routinization enables organizations to exploit their accumulated knowledge, increasing efficiency. At the same time, routinization creates a risk: when organizations are guided by old knowledge, they do not create new knowledge. If the environment has changed, the locations of shortcuts and dead-ends may have shifted and more attractive destinations may have appeared or become accessible. To adapt to environmental changes, organizations must seek out new knowledge. The choice between applying old knowledge and seeking new knowledge is often characterized as a choice between exploitation and exploration (March & Simon, 1993). Exploitation leverages existing knowledge and capabilities, resulting in stable and efficient performance. Exploration creates new knowledge, enabling organizations to innovate and adapt to changing conditions (March and Simon, 1993). (p. 99-100)

In dynamic work environments of startup organizations, this aspect acquires increased significance, especially in relation to aspects related to automation in mediating everyday practices, knowledge creation and learning dynamics, orienting tendential development towards formalization in practice. From an activity-theoretical perspective, mediations require an examination of practices at multiple levels in relation to activity overall, actions and less conscious operations to understand how they shape distinct orientations of development at a higher level, and variations in modes of participation of individuals more specifically in relation
to learning. Consequently, the evolution of more structured development appears to more easily facilitate the automation of operations under conditions of rapid change when quantified expressions of work practices are reduced to repeatable tasks. It is possible to perceive that automation appears to be linked to the operationalization and quantification of learning, resulting in orientations towards increasing demands for performance and continual improvement. Prior to the implementation of the LMS, employees had to confirm completion of specific learning tasks by email, yet the new tool allowed automatic tracking of such tasks.

As described previously, in anticipation for growth, ORG-A implemented software, focusing on scalability and predicting an increasing need to manage a larger amount of information about employees, customers and re-usable knowledge assets in general. The organization appeared to be preparing for rapid growth adopting a proactive strategy in anticipating future IKM needs. In other words, a major developmental concern was to effectively mediate the production of knowledge primarily by means of technological tools. Strategies adopted, however, were characterized by a series of dilemmas, tensions or contradictions as the organization struggled to navigate between continuity and change.

The key strategy of automation can be viewed as related to the implementation of the LMS and linked to broader organizational goals to increase efficiency, oriented by a rationale of time savings through the automation of repetitive practices and aligned to the particular organizational vision for growth. Overall, the goal of LMS implementation was linked to an overarching goal to increase the efficiency of the delivery of learning material. For employees, this was reflected in an implicit assumption of higher flexibility in the completion of training materials. Expressions of the pressures to increase productivity by reducing the time to perform repetitive tasks can be seen in the activity-developmental specimen introduced in the following sections. The automation of tasks can be viewed from a managerial standpoint as a means to increase productivity and reduce the time required to complete work, however their implementation may lead to different forms of contradictions and change in the relational structure of startup work activity, in the context of development.

Before analyzing the activity-developmental specimen in this section, several brief considerations in relation to the trend of automation are required. The use of automated functions in measuring business practices in general and learning practices specifically, as reflected in the analysis in this chapter is indicative of more structured approaches in the development of ORG-A. Automation, from the standpoint of the leadership team in this organization, was viewed as a
mechanism for accelerating development. Repetitive tasks in developmental practices provided a certain degree of stability in startup work by routinizing everyday tasks, however, to enhance startup learning capacity, the repetitiveness of tasks had to be evaluated, operationalized and automated. Digitization and quantification/operationalization represented key prerequisites for the automated form of process mediation we can observe in the context of development in ORG-A in times of rapid change.

The goal of increasing the efficiency of business processes by minimizing human intervention is one of the trends shaping development and change in organizations, as applications and relevant algorithms continue to emerge and evolve. As Kuutti (1996) emphasized, “[…] a considerable share of all technology in use has been born and still exists for automating former human operations. According to (Leont'ev, 1978), in principle all operations can be automated […]” (p. 28). From an activity-theoretical perspective, automated processes are mediated by rules which are embedded in the fabric of relations between tools in situated contexts they are part of. The logic of automation guiding development and change in practice is often linked to cost and time savings, or quality/precision enhancements, however, it is important to remember an important paradox: “the more efficient the automated system is, the more essential the human contribution that is needed to run the automation system” (Kaufman, 2010 in Hüttermann, 2012, p. 42). Recognizing related processes in the structure of activity and reflecting on their relevance in practice provide relevant elements for the developmental tendencies toward formalization discussed in this section in relation to learning and change.

Pressures towards automation were indicative of the broader tendential development of ORG-A towards a more formalized and structured mode of development in change. One of the employees described a few aspects of the LMS, pointing out some design and structural elements that influenced his daily work:

When I first started using this system. It took some time to get used to. Mostly it was intuitive, but I didn’t know how everything worked. One time I completed a module, but didn’t click on a button to confirm completion and management thought I didn’t complete it and it was mandatory. I got an email reminder so I just had to confirm that I completed it. But since then I got used to the functions and it is fine. In a way it is easier since you don’t get as many emails as before, everything is in one place. In this system you can just look at your analytics and see what you have completed and when. I guess you just have to do what you have to do and learn what you have to learn. (P58372L9)
Employee comments highlight important aspects about automation in tool-mediated activity in this context. While it may seem that that the employee in this case adapted to the new rules, it appears that the tool also changed the organizational rules related to the completion of training. The automated reminders for learning completion provide an additional element in support for the conceptualization of the tendential development of the organization towards formalization oriented by structured development in practice. CHAT/EL aspects of automation in tool-mediated change may offer some insights into these processes identified in this case. At this point, it is relevant to remember Gillespie and Zittoun’s (2010) suggestion for reflection not only on the tools/resources, but also on the mode of use and in particular between reflective and non-reflective use of tools and signs. Noticeable in the participant comment is the description of change as a shift towards a practice which is easier, “in a way, easier”, while the oppositional perspective is missing or largely implied. The same participant continues:

There is so much information you need to know, and now there is a testing function in the education modules, you have to pass a test so that the system records that you have fully completed the requirements. [...] Everything has time limits, if you have to go to write a test, a certification for example, you need to complete it within a specific timeframe. It reminds me of regular education, but I know this may seem surprising for a startup. Our organization interacts with large organizations, so we have to make sure that we comply and align. (P2079G35)

In this excerpt we can notice how the employee became aware of the more structured nature of learning in their organization in relation to automated reminders, while at the same time finding justifications for the alignment between the situated context and the broader systemic requirements. This form of localized control appears to culturally shape the dynamics of the organization as an extension of other formalized learning environments. In this example we can see the positioning of the tool mediating learning in this organization through automated email notifications based on the completion status learning tasks. It may seem increasingly clear that the introduction of the LMS increased the level of formality in the startup organization, changing rules and shaping cultural dynamics overall. In this context, the logic of learning management appears to be driven by an alignment between startup work activity and the broader macro dynamics of development startups have to navigate. These influences are integrated into individual experiences, which lead to the reproduction of relations found in formalized settings and infused into the small organizational context examined.
To conclude, this section illustrated a key component of the orientation of startups towards continual improvement and growth in relation to the situated context of ORG-A as shaped by mediated automation of knowledge creation oriented toward automation in times of rapid change. This form of mediation embedded in automation practices related to the LMS may be reflected in more concrete ways, as indicated by individuals not completing the tasks; while others may be more subtle and deeply embedded in the fabric of organizational practices, invisible, yet cumulative in elevating tension/contradictions in the systems, aspects which are relevant in the discussion of the translation of contradictions to different degrees in altered forms. We begin to understand how automation mediates the startup learning capacity by shaping the dynamic of knowledge creation, while creating uneven tool dependencies. In other words, the process of change in the context of development depended on the automated form of mediation of email reminder illustrated in the specific activity-developmental specimen discussed. Given the constantly shifting relations in activity dynamics, embedded contradictions contribute to the tendential development described along emerging trajectories guided towards object/goals through constant negotiation in practice over time and oriented by the tendencies of formalization, as we will discover in examples illustrated in the next sections.

5.4 Administrative/Managerial and Stabilization Knowledge Creation of Activity-in-Development

Work practices in ORG-A were predominantly formalized through digitization, quantification and automation, as the organization sought ways to improve processes, which involved specific task-oriented steps in working with client cases. Overlapping separate, but linked, activities in this case were mediated by software which had been already adopted at the time of the research, yet which was being customized through the addition of new modules accompanied by the creation of new processes. Interviews with employees from this organization and their managers revealed an orientation towards more formalized practices which had to be acquired and perfected through repetition, quantified and analyzed.

To further illustrate the distinct character of tendential development in relation to knowledge creation and learning in this organization, it is relevant to further describe the structural relations embedded in the knowledge emergent in the formalized change practices shaping these everyday processes. One of the employees pointed out that his daily work involved primarily serving clients, one case at a time, documenting his interactions in detail in the software
(the Client Relationship Management tool). He acknowledged that he did not interact much with his colleagues since he spent most of his time serving clients. He valued the ability to work from home and pointed out that this type of work offered increased flexibility for him and his family, as he could spend more time with his children and less time commuting to and from work. Most interactions between the employee and his team/manager took place through video-chat or phone. Interactions with his manager were limited, yet the employee was satisfied that he could serve clients well, while consistently meeting metrics assigned. The employee described his typical work life as orderly and structured. He had created specific routines which helped him to develop a high level of expertise in his specific role. This employee had to be online and available daily from 8 a.m. to 4 p.m. to serve clients by processing the cases assigned. Despite the fact that he was working from home, he had prepared a home office where he could focus on work. He developed solid organizational skills in previous jobs, which provided a relatively smooth transition to his current role. His attitude and quest for professionalism and excellence in work enabled the him to become one of the most senior employees, as reflected in recognitions for his service and high level of customer care. Weekly, he sent feedback to his manager containing observations about cases processed overall and suggestions for new policies for operational improvement. This feedback was a job requirement, and the employee ensured to diligently provide it by the due date each week. As he stated, “You have to provide at least one suggestion for improvement, it is a requirement.” (P58372L9). We observe in this employee’s account a reflection of his contribution to the more formalized cultural dynamic of his organization and to what his manager described as “high standards of operational efficiency for ourselves and in serving our clients”. Other participants in this organization shared this employee’s experiences characterized by routine, attention to process and quantified improvements, elements which, collectively can describe a more structured work environment, in which aspects of stability in activity shaped the distinct cultural dynamic in this organization. These standards, we will see, were embraced through a series of strategies which orient/guide practices on a type-s developmental trajectory over time.

This section contributes toward the broader claim of the chapter by focusing on a fragmented and formalized construction of knowledge as reflected in participants’ narratives of work practices and change. In this analytic chapter, I substantiated the evidence in relation to a more formalized activity-theoretical conceptualization of knowledge construction in development. The aspects introduced above contribute to understandings of the structured nature
of knowledge creation in more formalized practices of startup work in times of rapid development.

The case of ORG-A clearly illustrates a distinctive approach to development for startup organizations from an activity-theoretical perspective. Work practices were noticeably more formalized in nature, which represented a distinctive characteristic of this organization compared to the other two startups examined. The nature of the type of work in ORG-A shaped the socio-cultural conditions in the organization, spaces and individual modes of participation in activities. While employees and their managers recognized that formalized practices structured work activities, there appeared to be limited opportunities for making the forms of contradictions in the mediated fabric of interrelated activities visible in practice. Practices presented above illustrated the emergence primarily of what is referred to, in the activity-theoretical tradition, as *stabilization knowledge* (Engeström, 2007; Sannino & Engeström, 2017). The formal feedback was the primary means of providing suggestions and ideas for improvement and change. In this context, a primary focus of mediational strategies was on the *accumulation* of knowledge created through structured and recursive processes, which provided an additional element to the conceptualization of the role of the distinct type of tendential development observed.

I continue this discussion with an elaboration of conceptual elements which are relevant in the overall discussion of the distinct type-s trajectory of knowledge creation, with roots in the work of Engeström, deepening and elaborating on the concept of expansive learning. This process is framed more broadly in order to facilitate an appreciation of the expansive processes on the trajectories presented in fast changing environments, elements which, I argue, are helpful in providing robust foundational interpretations of relational dynamics within and across activities in motion. This foundation requires an attention to aspects related to the adaptive processes which result in the construction of change, building on the complexities of knowledge production as a distinctive mediated process embedded in the MBCC dynamic of startup organizations.

### 5.5 A type-s trajectory in Tendential Development

In ORG-A, the overall orientation towards structured approaches in knowledge creation practices provided a sense of relative structure/stability in tendencies of developmental orientations. The aspirations and visions of startup leaders manifested in the distinct strategies for development and knowledge creation structured everyday practices as the organization was
progressing on its overall type-s trajectory. This comparative stability of ORG-A was culturally prescribed by the leadership team through tools, policies and job role differentiation, strategies which were intended to support patterns of *continuity* in developmental progression. Strategies utilized in supporting this form of development were carefully orchestrated despite limited resources and the distributed nature of the work, shaping the growth and comparatively more formalized socio-cultural dynamic of ORG-A over time.

A closer analysis of the forms of mediation shaping individual preferences for stability and change among participating employees contributed to the complexity in conceptualizing the multiple constraints and affordances of the startup developmental trajectory analyzed in this chapter. In particular, the diversity of individual aspirations and experiences were pronounced, more formally mediated, with limited opportunities for boundary crossing and accumulating contradictions deeply embedded in the complex fabric of work in times of rapid change. Employees rarely responded to established strategies by means of deviations from the official script as they completed their daily practices. Work practices and procedures were reinforced through the learning modules included in the LMS, allowing for limited critical engagement with policies and protocols.

On this type-s trajectory, we can observe limited possibilities for *translation* of contradictions potentially in part due to limited collaborative internal practices. Instead, stability was enhanced through processes solidifying routine practices of case management and weekly feedback. These relatively stable and stabilizing practices helped to construct a solid foundation for the type-s trajectory described in this chapter, which supported continuity under conditions of rapid change. During conversations with participants from ORG-A, it was increasingly clear that both employees and their leaders were making active efforts to align their approaches, attempting to diffuse any forms of contradiction. This approach shaped the organizational culture, contributing to the production of the particular types of what may be described as *learning-for-stability* sub-trajectories overall.

To further describe this emerging type-s trajectory and variations within this overall trajectory, in the following excerpt we can observe a moment which illustrates a dynamically developing knowledge creation process emphasizing the significant impact of tool mediation on knowledge creation. In this excerpt, the primary focus is placed on the ability of customer-facing startup employees to address client requirements with relevant types of information. This type of response was initiated as a result of a tension, triggering a sequence of events which involved a
discussion with an employee and subsequent assistive actions. Customer interactions were closely related to individual experience of skills, and the abilities of startup employees in ORG-A to assist or solve tensions/dilemmas in practice. The high dependency on the computerized systems and search abilities of workers were significant in providing/meeting required customer expectations. In such contexts, employees needed to be able to navigate through internal systems and confirm external publicly available information as they processed the cases assigned. As one of the participants pointed out “There are a variety of situations and you need to be able to serve the client with their requests quickly and efficiently. We are organizing everything online on the computer in the system, it makes it easier to communicate, lots of information, and you have to stay organized” (P2079G35). While the type of work described here may not seem typical for startup organizations in part due to the formality of the process and the administrative nature of work, it seems to illustrate a particular type of maturation process linked to a distinct organizational culture which places emphasis on cultural alignment with established organizational models. Recognizing these processes identified by participants in distinct related contexts support the significance of formalized practices in shaping the tendential development oriented by the specific organizational vision in practice.

The examination of the mediated nature of development in ORG-A provided an alternative to techno-centric conceptualizations, by instead adopting a socio-cultural approach based on the principle of mediation applied in the activity-theoretical tradition to the examination of knowledge creation practices in relation to emerging trajectories of development in times of rapid change. This chapter focused on addressing three key goals. First, by shifting the frame of analysis from a techno-centric to a socio-cultural approach in the CHAT tradition exclusively, I aimed to avoid theoretical confusion and focused instead on forms of mediation which are not typically addressed in IKM scholarship. Second, by focusing on the way artifacts/tools shape startup development in times of rapid change, I was able to provide new dimensions of analysis in conceptualizing knowledge creation in startup work activity. Finally, adopting CHAT concepts provided a new and enhanced conceptualization of the significance of metrics, completion rates, or standards of achievement in relation to learning, conceptualized in the activity-theoretical tradition.

In this analysis, aspects related to the mediated nature of knowledge creation in tendential startup development, examined from the vantage point of CHAT/EL made visible previously neglected socio-cultural dimensions of learning in startup work activity as evolving products of
structural relations of ORG-A in the context of *rapid change*. The attention to activity as the primary unit of analysis can be conceptualized within the broader context of a multitude of interactions which collectively expanded into the ecosystem for innovation startup ORG-A was part of, and beyond.

5.6 Summary

In conclusion, illustrations highlighted in this chapter suggest more formalized practices in response to strategies for development resulting in the production and reproduction of more formalized practices for *knowledge creation*, creating a particular socio-cultural dynamic leading to *fragmentation*. Illustrations in this chapter showed how developmental changes in relation to the mediational dynamics of activity in change are oriented towards more formalized practices over time through strategies including quantification, digitization and automation. While the adoption of the LMS mediated learning practices for employees, it also induced new rules which formalized the overall culture in the organization. In addition, in this more formalized *technologically mediated learning environment* (Engeström, 2016b, p. 97) of ORG-A, the dichotomy between the rhetoric of *process enhancement* and *community building* (Engeström, 2016b, p. 10) was observable. This tension/contradiction emerging from overarching pressures towards improving *operational efficiency* contributed to a formalization of individual modes of participation in activity, and more stable conditions for development, despite the rapid nature of change, comparatively conceptualized in relation to the other organizations examined. Furthermore, examples in this chapter highlight how some of the previous administrative experiences of startup leaders can translate into formal processes and practices in small, emerging organizations such as the one examined in this study, shaping their distinct trajectory of development in practice.

In this chapter, I presented interview data which illustrates how knowledge creation is accomplished in everyday startup work activities, demonstrating how learning in development is socio-culturally mediated, involving the interaction of different interrelated factors which enable or hinder daily work practices. Using interview data, I grounded the discussion of the concept of *mediation* in the context of an activity-theoretical view of startup work activity to develop and enhance conceptualizations of knowledge creation as a socially situated, culturally constructed phenomenon in practice. Drawing on the principle of *mediation* grounded in CHAT, this section examined how *startup work* activity is mediated socio-culturally, shaping individual modes of
participation of employees in startup development in times of rapid change. Based on the data collected, it was also evident that the prior experiences and knowledge of participants had an influence on the use of tools in activities.

This chapter attempted to illustrate the mediating effects of developmental startup activities in times of rapid change, highlighting the socio-cultural nature learning and its potential for expansion. This activity-theoretical approach provided a deeper and more complex interpretation of internal dynamics of change processes and tacit knowledge which, I argue, other approaches cannot address to the same degree. Making explicit the social structures surrounding the tools examined represented a solid foundation for generating claims about tendencies towards formalization in relation to the mediated nature of knowledge creation in startup work environments, shifting the focus on micro-contextualized, socio-cultural mediation in response to techno-centric, individualized approaches and demonstrating the interrelated nature of the mediated nature of learning in the broader contexts in which it takes place.

This chapter examined the mediated nature of startup work to introduce key elements constructing the type-s developmental trajectory of startup knowledge creation, resulting in fragmentation, orientation towards formalization and overall organizational maturation. We observed that the mediation of activity was more formalized in this particular startup work environment. The tool adopted (LMS) structured practices and individual modes of participation in activity, resulting in fragmentation in knowledge creation, orienting work practices towards fragmented, task-oriented and individualized forms of knowledge creation in relation to partial components of specific startup work objects in situated contexts. Contradictions made visible in this study were deeply embedded in the fabric of interrelated and situated practices, with limited attempts for initiating their translation in practice. Developmental strategies in ORG-A, however, also presented opportunities for partial forms of resolutions in efforts at translation yet provided limited opportunities for collaboration and change.

Based on observations related to the mediational dynamics explored, I identified a distinct trajectory of knowledge creation in the context of development characterized by formalization/stability and shaped by digitization, quantification and automation. In this study, it was increasingly clear that the temporal pressures of development in startup work were associated with unpredictability in everyday work practices. Navigating these mediational structures in turn can generate opportunities for emergent opportunities for interactions, change
and development as conceptualized in an *expansive view of learning* in *startup work* through the MBCC dynamic of ORG-A described in this chapter.
Chapter 6: Boundary Crossing and Co-Configurational Approaches to Knowledge Creation in Startup Work: Development on a type-c Trajectory

This chapter discusses aspects of collaboration/boundary crossing in relation to the broader mediation/boundary crossing/contradictions dynamic of knowledge creation and development, illustrating an expansive view of learning in organizations examined. By focusing on the case of ORG-B and building on the notion of boundary crossing from an activity theoretical perspective, this chapter examines activity-based interactions between different spheres of activity, shaping a distinct and potentially divergent type-c trajectory of development and change in practice. Examples discussed provide rich opportunities for new insights into social relations which transcend models prevalent in IKM scholarship. The shift in focus towards situated practices and activity-based forms of analysis of startup development, I argue, contributes to an expansive view of learning and provides insights into opportunities for change and development within and across startup organizations examined.

6.1 Introduction

In this chapter I will focus on narratives of change using illustrative examples from ORG-B to illuminate the transformative nature of collaborative forms of work practices in startup work in times of rapid change within and across organizational boundaries. In conjunction with the KAT of mediation and contradictions as a source of change, the dynamic of boundary crossing/collaboration discussed in this chapter contributes to the expansive view of learning constructed in this research study overall.

One of the primary areas of emphasis in the organizational development strategies of ORG-B can be understood as revolving around creating innovative technological products in collaboration with other institutional partners. Forms of collaborative work described later in this chapter as knotworking appeared to be a result of these strategies shaping practices which may be described as collaborative and co-configurational overall. Understood as co-configurational

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22 The theme of knotworking will be further discussed as an extension of the KAT of boundary crossing in the next section. By way of introduction only, “[k]notworking is a boundary-crossing, collective way of organizing work. Knotworking is a means for participants to create continuity in the production of the shared object […]. According to Engeström the knot symbolizes a rapidly pulsating, distributed and partially improvised collaboration between loosely connected actors and activity systems (Engeström, 2000, p. 972).” (Engeström et al., 2012, p. 389)
work, the strategies of ORG-B represented a significant mechanism in expanding the organizational networking, processes in this case characterized by discontinuity in development. Furthermore, practices in ORG-B constructed a trajectory which, unlike the other two trajectories presented in the other chapters, produced primarily possibility knowledge\textsuperscript{23} based in less formalized and more collaborative practices for knowledge creation in development. Examples analyzed from ORG-B outline significant expansive learning potentials in the context of boundary crossing, with ample opportunities for collaborative practices enabling expansive learning actions. These distinct developmental characteristics can be described in relation to a type-c trajectory reflecting the collaborative nature of strategies in response to developmental struggles in times of rapid change.

From the theoretical foundations chapter, we may extract the idea that boundary crossing is a broad and little-studied category of cognitive process (Engeström & Karkainnen, 2018). In this chapter, I discuss examples which are relevant for an activity-theoretical conceptualization of learning in different contexts which involve the crossing of boundaries within and across organizations examined. Classic studies of innovation and creative thinking emphasize the potential embedded in transporting ideas, concepts and instruments from seemingly unrelated domains into the domain of focal inquiry (e.g., Bartlett, 1958; Ogburn & Thomas, 1922; see also Margolis, 1993). Yet, such processes seem to be rare and quite demanding. As Suchman (1994) pointed out, "crossing boundaries involves encountering difference, entering onto territory in which we are unfamiliar and, to some significant extent therefore, unqualified" (p. 25). To overcome such a challenge, boundary crossing calls for the formation of new mediating concepts. In this sense, boundary crossing may be analyzed as a process of collective concept formation (Suchman, 1994) shaping the tendential development of knowledge creation and learning in practice.

In this chapter, I emphasize the need for a situated analysis in re-conceptualizing collaborative learning in everyday work practices of ORG-B by offering a complementary approach to traditional models prevalent in IKM literature. Consequently, the concept of boundary crossing, as understood in the activity-theoretical tradition, was applied in this chapter to raise fundamental questions about knowledge creation which are essential in engaging in

\textsuperscript{23} Possibility knowledge, as a concept with analytic power for the purpose of this examination will be further elaborated in a subsequent section in this chapter in relation to the theme of knotworking within the overarching KAT of boundary crossing.
meaningful collaborative activities across different spheres of activity. Conceptualized as an element of the MBCC dynamic of knowledge creation presented in the three analytic chapters overall, this chapter illustrates the significance of different aspects of boundary crossing in the context of knowledge creation and change in development. Accordingly, by using illustrative activity-developmental specimens from ORG-B primarily, this chapter aims to describe an overall type-c trajectory in practice. Examples discussed in this examination of empirical data illustrate that boundary zones facilitate opportunities for negotiated practices, which have the potential to transform activity systems as individuals engage in complex activities with expansive learning potential.

Much research has focused on professional, cultural or social aspects of developmental practices in contexts across boundaries where individuals interact to generate learning opportunities in often complementary ways. Mechanisms which relate to contradictions, as I will elaborate in the next chapter, can facilitate development and change, and need to be explored empirically to make visible aspects of learning which are often implicit in IKM literature. Across startup environments examined, professionals needed to collaborate within and across disciplinary boundaries. Given the high degree of specialization in some of the occupational roles in startups, individuals adopted different approaches which supported progress towards goals set.

Collaborating across organizational boundaries can, however, present challenges as individuals attempt to develop shared concepts and partnerships over time. Akkerman and Baker (2011a) emphasized how the presence of such practices represent important points of departure into an examination of complex dynamics at play in rapidly changing work contexts. From the vantage point of CHAT/EL, the diverse forms of boundaries represent areas where potential conflicting perspectives on concepts, tasks, activities, perspectives, traditions or values converge and are collectively navigated in practice. Because of this, there is a growing interest in the concept of boundary crossing and related mechanisms for continuity between different activities and practices in order to integrate multiple perspectives in ways which make possible more effective modalities to navigate differences, providing foundations for greater alignment between different stakeholders or functional areas within and across organizations (Akkerman & Bruining, 2016). This chapter therefore contributes to the understanding of boundary crossing and learning in relation to the MBCC dynamic constructed, using the context of startups as organizations with distinct characteristics relevant for an evolving innovation ecology in motion.
In this study, I seek to extend existing literature by proposing a novel approach which applies the concept of *boundary crossing* to illustrate the potential for expansive learning in IKM scholarship as conceptualized from the vantage point of CHAT/EL. I argue that boundaries should not be presumptively conceptualized as barriers, but rather in terms of their function in relation to learning opportunities for individuals and groups considering alternative possibilities to diverse challenges and potentially pushing knowledge into new territories. This approach therefore makes explicit socio-cultural aspects of complex dimensions of boundary crossing which, as will be increasingly clear, allow nuanced analytic descriptions of an expansive view of learning to emerge.

### 6.2 Specialized Startup Organization in a Niche Market: Collaboration, Co-configuration and the Creation of Shared Value - Struggles of Collaboration Effectiveness in Change and Development

Before proceeding with the examination of learning dynamics, it is useful to provide additional details extending the introductory details regarding the second organization in this research. ORG-B was a startup focused on the development of innovative medical devices used for surgical procedures. The specificity of this type of work appeared to require close collaborations between the startup and the medical partners, which appeared to have a *shared object*. In contrast to ORG-A, ORG-B was highly dependent upon feedback from the medical partners and as a result placed significant focus on developing trusted relations in this type of co-configuration work over an extended period of time. Overall, this approach required *boundary crossing* and the creation of new knowledge and learning for participants.

In this context, for ORG-B, an emphasis on collaboration was not only an effective overarching strategy for development, but also a necessity. By creating a teamwork environment, this organization sought to accomplish organizational goals through strategies designed to promote the sharing of knowledge, effective communication or supporting employee initiatives related to participation in broader communities relevant for professional development. The creation of knowledge necessary for innovation could be achieved only through effective forms of collaboration which required the integration of different skill sets, problem solving and a willingness to contribute to team efforts. This organization was focused on the development of an innovative technological device in the medical field, which required ongoing improvements to address the requirements of practitioners. The device required in-depth knowledge of electrical
engineering, software development and user experience design, among others, a nexus of highly specialized expertise which could be generated through effective team work. Furthermore, it was not sufficient to develop the device in a lab setting, instead, it had to be utilized by practitioners, who could provide the necessary feedback for improvements. Overall, development was dependent upon the collaboration of experts within and across organizational boundaries.

In the context of development, new partnerships were established and additional employees joined the team. As a result, this organization was undergoing transformations in three key respects in relation to development. First, the rapid growth resulted in increasing pressures for more effective forms of collaboration to ensure participation in team meetings. These meetings had to be designed to maximize the creation of knowledge required for innovation and development. Secondly, creating the collaborative environment necessary for development required attention not only to the technical and creative contributions of practitioners to the team efforts, but also individual variations in participation. Third, maintaining the collaborative nature of the work environment was challenging, in part, as a result of the rapid changes and the distinct ways individuals coped with the specific dynamic of startup work over time. Effective collaboration had been a foundational element of the development of the organization and highly effective strategy for growth. To cope with change, this organization had to evaluate and develop strategies designed to both ensure continuity and adopt new elements to support changing requirements in collaborative practices.

Notably, in comparison to the other organizations in this study, ORG-B appeared to seek and support collaborative opportunities for development, initiatives which were intended to support knowledge creation across organizational boundaries. This organization sought to sponsor events and regularly participate in conferences. By investing in these events, ORG-B was actively building a strong foundation for growth and development. Through active participation and contributions to the broader innovation ecology, this organization addressed strategies related to client acquisition, building new social relations and facilitating potential encounters as significant elements in development. In this organization, employees were also encouraged to attend events related to their object of work and propose ideas about potential grants or new ideas for development. The collaborative and community-focused strategies adopted in ORG-B represented significant aspects contributing to a distinct cultural dynamic and overall trajectory of development over time. Organizational expectations were, however, not simply to collaborate, but rather to accelerate the rate of knowledge creation in support of development towards
organizational goals. Collaborative strategies were grounded in the historical development of the organization, which had achieved growth expectations as a result of similar practices previously.

As I emphasized earlier, the concept of *historicity*, as conceptualized in the CHAT tradition, is relevant in understanding and situating the startup as an important element embedded within structural relations of historical change. These relations are both interdependent and contradictory. Contradictions provide the transformational potential by re-shaping patterns of work and learning and re-orienting practices towards new horizons of possibilities, historically evolving. Understanding this requires an attention to both the moment in which the activity is situated and the historical context simultaneously.

In addition to building new relations across organizational boundaries, ORG-B also placed significant emphasis on maintaining these relations through ongoing communication. A strategy adopted involved preparing a monthly newsletter to all of the contacts, containing product updates, or other relevant stories. Furthermore, the organization dedicated resources to maintaining social media accounts, growing social networks and enhancing their market visibility. These strategies allowed ORG-B to enhance their *social capital*, which Engeström describes as “the glue that makes communities more than the sum total of their individual members” (Engeström, 2008, p. 169). In comparison to ORG-A and ORG-C, ORG-B focused developmental practices primarily on collaborative approaches both within and across their organizational boundaries. These practices included regular *co-creation* episodes with medical partners. The relation built with the hospital partner in the development of the new product represented practices which provided the foundation for collaborative approaches to development.

While collaboration was one of the primary elements of the developmental strategy in ORG-B, struggles associated with related activities represented key areas for learning. The collaborative nature of development in this case was based on a need for problem-solving which transcended multiple domains of individual expertise including engineering, design or financial aspects of broader business requirements. In this context, the precise answers to the problems examined were not known or unclear. Furthermore, in these circumstances, it was unclear who should take a leading role as the collaborative activities progressed fluidly from addressing more technical aspects of problems to aspects related to design. Contributing to the problem-solving process through collective cognitive participation was complicated by the interdisciplinary backgrounds of participants at the intersection of technical or non-technical professional
perspectives. The expectation of sharing and combining the different perspectives resulted in tensions which had to be addressed, in different ways and to different degrees. Making decisions while considering all perspectives represented a difficult task. Overall, the outcome of collaborative activities was highly significant, however, rewarding individual contributions represented a challenging area to address. Nevertheless, despite these challenges, the development of the product of ORG-B and the growth of the organization itself was dependent upon these forms of collaboration and improving related activities over time.

6.3 Aspects of Boundary Crossing in the MBCC Dynamic of Knowledge Creation: Examining Activity-Developmental Specimens in Startup Development

Illustrating elements characteristic to the distinct trajectory type of trajectory described in this chapter must be grounded in an examination of indicative activity-developmental specimens from ORG-B which illustrate aspects of boundary crossing relevant for a deeper understanding of knowledge creation in everyday practices for development and learning in change. That is, as discussed earlier in the work, these specimens are selected on the bases of their ability to “indicate” definitive features of the system(s) of activity vis-à-vis the modes of participation they describe. Based on this consideration, aspects of boundary crossing represent central elements in understanding the socio-cultural dimensions of everyday practices in conditions of rapid change within and across organizational boundaries. Social relations we observe in these contexts shape the actions of individuals through forms of co-configuration, collaboration or partnerships in development. The recognition that “[t]here is a growing need to promote collaborative problem solving among public and private sector organizations” (Gray, 1985, p. 911) has been outlined as an important theme of studies focusing on the interorganizational domain. The effectiveness of collaboration for knowledge creation is predicated on a number of factors, among which the socio-cultural conditions of development require significant emphasis when viewed from the vantage point of CHAT/EL.

6.3.1 Boundary Crossing in the MBCC dynamic of knowledge creation and development: co-configuration and interorganizational partnerships

In the context of collaborative activities of startup employees, there emerged evidence of an interplay between more and less formalized collaborative practices, which became an important driving force for engaging in diverse activities across organizational boundaries. The semi-
structured interviews conducted in the course of this research were overwhelmingly illustrative of learning practices which took place in the broader innovation ecology and beyond as individuals sought to develop innovative models for growth and development across a range of channels in practice.

A key strategy for development in ORG-B was based on the ongoing inter-organizational partnership between the startup and the hospital partner, oriented towards building coordinated approaches to the development of a specialized medical device. The nature of this relation was collaborative in nature and required effective communication and coordination over time to support a cohesive approach to solving the complex issues related to product development, which neither organization could solve independently. Supporting this model of inter-organizational collaboration required, in other words, the creation of knowledge in the form of shared interpretations of information and processes, structures and constraints in conditions which may be characterized as dynamic and evolving over time.

As explained in the previous sections and the indicative review of literature, IKM studies have focused extensively on the mechanisms for knowledge creation within organizations, placing emphasis on strategies which promote the conversion of tacit knowledge to explicit forms which can be stored, used and reused, however, inter-organizational forms of collaboration for knowledge creation have not been extensively explored in this tradition from an activity-theoretical perspective. In addition to intra-organizational collaborative practices, a significant form of boundary-crossing in the interview data was a description of inter-organizational collaboration for innovation.

To better understand the type of interorganizational partnership in ORG-B from a CHAT/EL perspective, it is necessary to remember that “[c]o-configuration is a very demanding mode of work and production. It offers radical strategic advantages when the objects of work demand it” (Gray, 1985, p. 911). Furthermore, it is important note that interorganizational partnerships should not be viewed as a uniform phenomenon, and place emphasis on the situated nature of collaboration, shaped by the specific circumstances and relational dynamic they take place in. Engeström (2004) highlighted two major challenges of co-configuration work:

Co-configuration presents a twofold learning challenge to work organizations. First, co-configuration work itself needs to be learned (learning for co-configuration). In divided multi-activity terrains, expansive learning takes shape as renegotiation and reorganization of collaborative relations and practices, and as
creation and implementation of corresponding concepts, tools, rules, and entire infrastructures.

Second, within co-configuration work, the organization and its members need to learn constantly from interactions between the user, the product/service, and the producers (learning in co-configuration). Even after the infrastructure is in place, the very nature of ongoing co-configuration work is expansive; the product/service is never finished. These two aspects – learning for and learning in – merge in practice.

(p. 16)

Addressing these challenges in startup contexts, I argue, presents unique challenges and opportunities. As I will elaborate in the next sections, we may meaningfully describe this aspect of boundary crossing as startup co-configuration in development and change.

The interview excerpt below describes how interorganizational collaboration provided a common platform which enabled the crossing of boundaries between the two different types of organizations in the process of co-configuration for new knowledge creation in development. The example provided by the manager/owner also emphasizes startup learning as an element strengthening connections which extend deep into communities these startups serve.

We are affiliated with a hospital. This proved to be an important part of our organization and contributed to our current well-being because we gathered information from the nurses and doctors and we can invite them to our office and get feedback on our product. That’s I guess a type of collaboration. And it is good for new hires as well. Because of our connection with the hospital we give them an opportunity to observe the doctor where our system is actually being used in the hospital. And it really helps especially the engineers who understand that part of the business, and how it is used. They see how it is applied in the Operating Room, or you can see the not so obvious interaction with the many nurses, surgeons, fellow residents, people with different roles, how they interact with our device and that can be very powerful. (P84U2937)

In this case, we observe how collaborative forms of practice are centered around the surgical device (the product) as a boundary object. Reflecting on this form of collaboration brings into awareness aspects which are often neglected. In this case, it is the essential nature of the collaboration with the hospital partner which should be emphasized. While the notion of “collaboration” reflects the nature of activity in this specimen in general, it is essential to remember that “[t]he range of phenomena that may be characterized as collaboration is
In analyzing the co-configurational element above we may observe an interdependency between the startup and the medical partner in the form of a strategic alliance in which both partners maintain a strong relation over a long period of time. While the partners represent different domains of expertise, they accomplish a form of co-configurational development which is essential to the achievement of the shared object/goal. In this context, engineers are able to “to observe the doctor where our system is actually being used in the hospital”, the possibility to interact with “nurses, surgeons, fellow residents, people with different roles” allows a direct and meaningful connection with the product of their work. We can observe how employees from ORG-B cross the boundaries into the distinct sphere of activity of the hospital partner, learning new rules, and becoming part of the hospital community.

Several other participants described similar examples of boundary crossing highlighting the relations which ORG-B aimed to build with end-users or clients over time through co-configurational work. In these examples, the tensions between the different cultural dynamics became increasingly clear, as participants described other work environments they interacted with to address gaps in operational efficiency and process. This example contributes to the analytic points presented in this chapter illustrating how boundary crossing activities create or are shaped by the conditions and dynamics of development in which they take place, leading to different trajectories in practice.

In addition to the crossing of the organizational boundaries into the hospital sphere of activity, ORG-B provided another relevant example which illustrates the importance of shared spaces for collaborative practices. In this context, spatial considerations in relation to the co-configurational nature of startup work were reflected in the creation of a new space between the startup and the partner hospital as a “co-working space”. One of the employees explained:

> Sometimes we meet in co-working spaces with our partners to discuss options and next steps, especially when our office space is not available because of an event or if it is more convenient for our partner-client. So, the way it works is, you just book an office space or a conference room and you know it is available when you need it. I think there is an app for that too. It is convenient and we can meet in different locations if we want and they have nice modern spaces too. (P3083R65)

The excerpt above illustrates a relevant concept in activity theory: the creation of “third spaces” (Gutiérrez, Baquedano-López, & Tejeda, 1999), which Engeström (1987, 2018) conceptualized
as shared zones of proximal development in the boundary zones between different spheres of activity drawing on the original Vygotskian formulation. The use of shared co-working spaces represents a significant element in the evolution of co-configurational work. Collaborating in these spaces represents an opportunity for both partners to share the experience of a new environment for collaboration, potentially facilitating learning interactions between the partners as they design the functions and features of the product in collaboration. In particular, this form of collaboration both offers and requires flexibility in coordinating development and knowledge creation distributed over long periods of time.

In sum we can say that this section highlighted an orientation of ORG-B towards collaborative forms of development and growth, which I described as co-configurational in nature. This form of development involves collaborative practices which may take place in co-working spaces or the individual spheres of activity partners are part of. Based on the activity-developmental specimens examined, we begin to understand how co-configurational approaches in the context of boundary crossing shape the dynamic of knowledge creation, supporting “collaborative concept formation” (Engeström, Pasanen, Toiviainen, & Haavisto, 2006), providing support for startup employees as “collaborative thinkers” (Engeström, 2005c). We observed how the co-working space provided a spatial bridge between the organizations, which represented an important element in the establishment of the distinct trajectory of development of ORG-B in times of rapid change.

6.3.2 Boundary Crossing in the MBCC dynamic of knowledge creation and development: community/family participation and distributed cognition
Extending the examination of elements constructing the distinct trajectory of development of ORG-B initiated in the previous section is a discussion of boundary crossing into community spheres of activity in this section, which deepens the examination of knowledge creation initiated previously. The attention to socio-cultural aspects of collaboration/boundary crossing from the vantage point of CHAT/EL complements existing IKM literature by illustrating relations in the dynamic of development which were previously neglected. An attention to factors associated with knowledge creation beyond organizational boundaries shifts the emphasis to collaborative practices which enable an appreciation of learning in the broader ecology with significant implications to startup learning and development.
Startup organizations are positioned in a geographic ecology for innovation in which they interact with a broad range of service providers, universities, large companies or funding organizations to share ideas, seek funding or interact in the context of events and networks. Essential to these ecologies is the ability and willingness to share resources, and an active participation in events and initiatives supporting their dynamic nature while building support systems. Aligning with this macro structural dynamic, ORG-B recognized a necessity to expand through community involvement by participating in events and contributing to the ecology for innovation. Part of broader ecologies are ecologies-within-ecologies for innovation, including accelerators and incubators which provide a range of services or space for support and mentorship. Remembering the embedded nature of the multiple dynamics of change at different levels of magnification has significant implications for the tendential development and change in learning described in this research.

Conceptualizing aspects of boundary crossing in ecologies for innovation from the vantage point of CHAT/EL requires an adoption and conceptual development of theoretical tools to explain the complexity of startup development and learning across organizational boundaries. I adopt the concept of “distributed cognition” (Engeström, 2014c) to examine these phenomena as reflected in the activity-developmental specimen discussed below as an indicative illustration of the broader dynamic of activity in development, in ORG-B, in times of rapid change.

A particular instance of boundary crossing was described by an employee through the vivid metaphor of a “family”, framing the idea through the following statement:

When I help organize these events and bring people together, like one big family, but it is difficult to bring people together. Despite the fact that everyone comes from different companies or with different expertise, there is so much we can learn from each other not only in terms of coding or technology. What I mean is – we have limited resources as startups, but I think we are more flexible and we actually need to collaborate and create all these opportunities because no one will do these things for us. (P7937B59)

The metaphor of a family illustrates an orientation towards collaborative practices in the broader ecology the startup is part of. This form of cognitive artifact construction can be conceptualized as a reflection of a commitment to “bring people together” (P7937B59), which is, however, hindered by a lack of resources, as will become increasingly clear in this section. Understood from the vantage point of CHAT/EL, we may begin to observe in this example evidence of distributed cognition in the innovation ecology the startup is part of. An attention to the social
distribution of cognition emphasizes the distributiveness of cognitive processes and the social dimensions of learning and change in the context of startup development (Cole and Engeström 1993).

Using this excerpt as a point of departure into a grounded examination of the complex nature of *boundary crossing* in startup work, I continue by considering some of the examples illustrative of themes which are central in appreciating situated learning contexts across overlapping activity systems or startup work/learning. From the empirical data it was evident that different forms of startup learning take places across organizational boundaries. In the examples analyzed, participants indicated that they participated both in structured and unstructured learning activities. While IKM literature focuses primarily on collaborative intra-organizational and generalized models of knowledge creation in which learning appears to be embedded and often implied, in this chapter I illustrate the importance of conceptualizing situated activities under the broader theme of boundary crossing in both intra- and inter-organizational contexts to gain an appreciation of learning which takes place in overlapping systems of activity, as conceptualized from an activity-theoretical perspective. While some of the participants reported a variety of learning taking place in local universities, colleges or online/MOOC style courses, some less formalized practices appeared to stand out in relation to different manifestations of contradictions in participant narratives in relation to boundary crossing. These manifestations allowed access to internal dynamics of change in the activity systems they were part of and other overlapping activity systems they interacted with, both of which highlighting the importance of specific forms of situated practices with expansive learning potential. These interactions were considerably interrelated to the boundaries inherent in the broader socio-cultural contexts in which they took place.

Advancing this analysis of boundary-crossing in relation to startup learning leads us to an examination of other examples of inter-organizational practices which are indicative of group-oriented practices oriented towards developmental goals. In previous illustrations of collaborative dynamics in these contexts, there were indications of shared directionalities on trajectories of development suggesting complementarity in collaborative approaches. These relations appeared to mutualistically and sometimes symbiotically emerge in practice, oriented by an aim towards a collective purpose. One of the employees suggested that the informal support offered by communities they are part of was invaluable in navigating the complexities of changing
innovation ecology dynamics, further highlighting the importance of a collective approach to knowledge creation. The employee pointed out:

There is so much you can learn from others, especially from presentations in the ecosystem. No other way to hear about these things, they are not recorded so you can't just watch them online. The latest examples and ideas I get from attending events and making notes in my notebook. Sometimes you hear about mistakes people make and what they learned so that's really useful. When you bring these ideas back to the office, that helps our teams to focus on or at least explore some new avenues while being aware of some of the potential challenges we might have to face along the way. (P3083R65)

In this context, the supportive function of communities illustrates how collaborative practices emerge in the process of boundary crossing linked to transforming environments shaping individual modes of participation in activity. Challenges shared in the communities by the participants provide elements which could be analyzed in relation to organizational practices of change shaping the tendential development of the organization in practice. These elements appear to reinforce participation in these communities, strengthening the fabric of knowledge in the ecologies for innovation. The practice of sharing challenges in the community provides a vivid image of the focus on collaboration as a core feature of the innovation ecosystem as described by other participants as well. This example echoes Engeström’s illustration of a “terrain [which] opens up to all directions for exploration” (Cole & Engeström, 1993). Relations observed in this context are characterized by patterns of interactions leading to collective conceptualizations of change and forms of learning which transcend organizational boundaries.

Examples provided by participants highlighted examples of opportunities for not only individual, but also a potential for collective and social transformation. In the boundary crossing examples examined, there were noticeable aspects of learning showing both similarities and differences among participants, allowing collaborative practices to emerge. On one hand, shared interests in technology and innovation appeared to be some of the common denominators allowing individuals to develop shared conceptualizations of change, their positions within the innovation ecology and potential visions for future developments. On the other hand, differences were evident in the diversity of job roles, professional backgrounds and levels of experience of individuals. Attending these events regularly enabled the emergence of what Kerosuo and Engeström (2003) refer to as collective routines accompanied by the creation of new instrumentality and forms of possibility knowledge, but also more tangible artifacts as tools which
are adopted by individuals in their organizations to navigate complexity in times of rapid change. The diversity of individuals participating in these events provided a fertile ground for the emergence of complementary perspectives on change and development which shaped both the dynamics of the innovation ecology and individual modes of participation in activity over time. These aspects related to community participation further shape the tendential development of the organization in practice and orient it towards collaborative forms of knowledge creation over time.

Navigating these diverse perspectives collaboratively in the context of boundary crossing enabled potentially expansive forms of learning to emerge despite and/or possibly as a result of the complex nature of changing instrumentality across overlapping spheres of activity. While the relations forming in the process of boundary crossing were primarily socio-cultural in nature, they resulted in material outcomes for participants and their startup organizations. As one of the managers/owners pointed out: “There is always a possibility to meet a prospective client or business partner in social settings - like events or even when you least expect it. You just have to be ready to introduce yourself and your company well” (P84U2937). The manager/owner in this case illustrated the importance of bottom-up forms of collaboration in the process of boundary crossing which may not always be planned, yet which brought into awareness the serendipitous nature of relations emerging in boundary-crossing activities in search of shared individual and collective goals in developmental practices.

In contrast to Engeström’s (1993; 1995; 2018a) work on workplace learning and expertise in medical settings which involve primarily structured and mostly institutionally bound activities, we can observe forms of highly unstructured work activities in startup organizations which can be characterized as highly dynamic and rapidly changing. This seemingly unstructured character of startup work appears to shape expectations and overall time horizons of individuals-in-activity, posing a new set of challenges for an activity-theoretical re-conceptualization of work in times of rapid change.

In continuation of points raised earlier in relation to foundational aspects of the theoretical overview of the research as a whole and some of the considerations illustrating the complex nature of collaborative practices in processes of knotworking, I highlight emerging processes through which new instrumentality is developed in potentially shared objects. This grounded foundation will further provide relevant elements in the discussion of learning expansion elaborated in the next chapter. Focusing on the contradictions in changing practices allows
relevant insights into aspects of startup learning extending broadly beyond organizational boundaries. The less formalized learning settings participants engage with in the innovation ecosystem provide opportunities for the emergence of collaborative capital24 (Engeström, 2005b, 2008b) characterized by a high degree of fluidity shaping individual modes of participation in activity. At the same time, these examples of what Engeström describes as partially improvised collaboration represent important elements in the emergence and development of knotworking as a potential key element of learning strategy in collaborative environments across organizational boundaries in times of rapid change orienting the specific tendencies of development in practice. These forms of group-based approaches appear to provide both challenges and opportunities for meaningful engagement as individuals navigate social relations and differences to develop and sustain a culture of collaboration under a shared purpose for innovation and change relevant in shaping individual modes of participation in creating collaborative capital and new forms of practice.

In the excerpt below, it is relevant to note that individuals aim to learn what is not yet there (Engeström, 2016c), while looking for opportunities to engage in activities, often experiencing challenges in finding entry points into social networks. It is important to point out that social relations may not emerge naturally, and often individuals appear to struggle in finding specific opportunities for engagement. One of the employees framed the activity as follows:

When I go to events and presentations it is often hard to connect with people. Unless you go with someone who is regularly going there and who can introduce you to others. Or someone who is naturally outgoing. The great thing about these events is that it’s always different and you don’t really know what to expect, so it’s always surprising. Sometimes you’re surprised about the quality of the events and other times disappointed. But it is all about discovering new things and in the end also learning about yourself, meeting others who are successful in this business and trying to understand what they do well or different and so on. I always have my business cards with me so that I can connect with people. But more often people I meet prefer to connect through [professional social network] on our mobile devices. And then you can see: “Oh, we have this person in common”. So yes,

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24 The notion of collaborative intentionality capital reflects an attempt at hybridization between three distinct domains: “(a) theories and studies of collective intentionality and distributed agency, (b) theories and studies of social capital in organizations, and (c) cultural–historical activity theory” (Engeström, 2005b, p. 308)
going to events and making the most out of it is really a skill you need to learn, otherwise you just sit in a corner and that wouldn’t help much, I guess. (P3083R65)

Examining in greater detail the participant’s experience in seeking meaningful opportunities for engagement in events has a broader relevance to discussions concerning the formation of collaborative opportunities in the innovation ecology more broadly conceived. In these contexts, uncertainty appears to be prevalent and represents a tension/contradiction in the process of a bottom-up emergence in collaborative activities across intersecting spheres of activity. In this environment, a form of “intentionality capital” (Engeström, 2005b) appears to emerge in complex configurations. These observations support Engeström’s (2008) conclusions in another study of intentionality capital: “[a]lthough often inefficiently, partially and belatedly, the different actors do seek interconnections and they do reciprocate” (p. 216). This conceptualization and empirical material point to the usefulness of the concept of object-oriented interagency in the pursuit to “connect and reciprocate” (p. 225) in ecologies for innovation.

The links between aspirational goals at the individual levels and the possibilities for engagement in creating collaborative capital shape individual modes of participation across situated contexts examined. Within these dynamic, unstructured contexts of overlapping spheres of activity we can observe tensions/contradictions which can result in new instrumentality shaping interactions. In the example above, we could observe individuals exploring mediating artifacts shaping connectivity, either through a mobile platform or through a physical card. This observation supports the claim that the emergence of collaborative capital is built on a pursuit for common object across intersecting spheres of activity in situated contexts towards types of interagency across boundaries. This form of grassroots formation of collaborative networks is particularly important for the horizontal dimension of learning expansion and the creation of cognitive trails in the process of horizontally constructing the dynamic cultural fabric of the innovation ecology in motion (Engeström, 2003, 2018d). In contrast to formalized collaborative practices across organizational boundaries, we can observe here a socio-cultural form of learning based on individual engagement and ability for negotiated practices which provide opportunities for the formation of links between both individuals and their organizations, some of which may stabilize over time. Over time, these patterns of participation may provide cumulative opportunities for horizontal learning expansion driving new instrumentality and changing modes of participation in activity with implications not only for the situated contexts in which they take place, but also for hybridization opportunities across what Engeström (2008b) describes as fluid
organizational fields. Other examples in this chapter which illustrate community-based interrelations between different spheres of activity provide additional insights into the dynamics of boundary crossing in relation to object-orientation and instrumentality in change. In these instances, we begin to visualize patterns of knowledge creation which are rooted in collaborative practices of communities in a constant process of transformation. Consequently, these tendencies illustrate aspects related to the complementarity of different modes of participation across intersecting practices shaping individual and collective experiences and relations in times of rapid change. Engeström (2005b) summarizes the importance of these concepts as emerging forms of organizational assets as follows:

Formations such as the agentic collaboration between actors […] are valuable assets for the organizations involved. They perform a dual job in that they solve very complex problems and also contribute to the reshaping of the entire way of working in their given fields. They are very cost efficient in that they do not require establishing new positions or new organizational centers. Indeed, these formations tend to reject such attempts. Rejection and deviation from standard procedures and scripted norms are foundational to the success of such amoeba-like formations. Their efficacy and value lie in their distributed agency, their collective intentionality. In this sense, I suggest the notion of collaborative intentionality capital as an emerging form of organizational assets. (p. 333)

In the vast majority of interviews conducted during this research study, participants addressed aspects of learning linked to practices which took place outside the workplace. Perhaps not surprisingly given the small size of the organizations examined, this study found relatively few examples of learning approaches involving specific courses prepared within startups examined. Learning practices can be described as largely informal, with an emphasis on problem-solving. In general, efforts were focused on community building and collaboration in which learning outcomes were embedded. Some of the learning reported by participants took place in online media, MOOCs, specialized workshops or university/colleges, and were often linked to professional accreditation requirements (Project Management Professional - PMP, Professional Engineer – P.Eng. and others). However, in this case, the tendencies shaping development and orienting knowledge creation and learning in change were predominantly collaborative in nature.

In these contexts, participants had to cross institutional boundaries and engage in learning opportunities at different institutions in the community and the broader innovation ecology. The analysis in this chapter illuminates how everyday work activities which involve the crossing of
different boundaries, as understood in the activity-theoretical tradition, mediate learning outcomes for individuals. These less formalized work practices allow us to understand emergent themes with relevance to an expansive view of learning, and more specifically aspects of the collaborative nature of knowledge creation which are empirically grounded in participant narratives. The embedded nature of learning in activity at the intersection of overlapping activity systems enabled insights into the situated nature of startup practices in conditions characterized by discontinuity and change. Consequently, the concept of boundary crossing provides a substantial foundation for the empirical analysis of interrelated activities in startup organizations with expansive learning potential. By outlining these aspects of boundary crossing, I argue in this chapter that an expansive view of learning in startup organizations is predicated upon an integrative view of intersecting activity systems between startups and the broader ecosystem. However, as it will became increasingly clear in the emergent themes presented in the remainder of this chapter, boundary crossing represents a dimension of activity which cannot be understood in separation from the other KATs adopted in this research. Learning appears to be structured in the contexts examined through the interaction of these KATs under certain situated conditions over time. Before I explicitly link these themes to an expansive view of learning in the integrative chapter, I focus in the following sections on additional important aspects which relate to the horizontal dimension of learning (Engeström, 2005b) as understood through a CHAT lens.

Developing a deeper understanding of boundary crossing as a collaborative practice requires an examination of mechanisms which mediate activities resulting in the integration of resources from different communities to collectively address a challenge or goal. Participants in this study described the formation of “bridges” which allow relations to emerge as different groups collaborate at the intersection of different spheres of activity. From an activity-theoretical perspective, learning is embedded in social relations between different activity systems which organize interactions amongst their constituents (Engeström & Nummijoki, 2005; Yamagata-Lynch, 2010a). In this study, the overlaps between activity systems created were fragile, which may be indicative of rapid shifts in practice characteristic to dynamic startup environments. A more careful examination of these overlapping systems suggests contextual collaborations which provide opportunities for co-creation and complementary approaches to problem solving with expansive potential in learning outcomes for participants in practice.

Participant preferences for less formalized learning practices appear to be a characteristic of startup organizations, yet these practices are in constant negotiation, resulting in
tensions/contradictions over time. For example, ORG-A represented a relevant context where oppositional perspectives of formally and informally structured learning were actively navigated in the process of tool implementation. This initiative had relative impacts on different subgroups within the organization with different objects and goals. In this context, the LMS was a boundary object which created a bridge and common platform for the distributed workforce. As one of the employees framed the genesis of the idea as follows:

We needed to have a common place where we could share resources like tip sheets, e-manuals and so on. We tried a free tool, but it didn’t have all the features we were looking for. We had to find something more professional, reliable. Then someone proposed a learning management system, they had it in a company they used to work for previously, and we said: let’s give it a try, or at least explore it. (P3S43234)

As highlighted in the introductory remarks, the less formalized everyday learning practices in startup organizations elevate the importance of boundary crossing for engaging in other opportunities with learning potential. Resulting social relations based on these boundary crossing activities were often aligned to a range of interests and object/goals, allowing individuals to explore aspects of learning which they perceived as meaningful and relevant.

Another aspect described by an employee in relation to boundary crossing relates to the process of social participation as a form of discovery, which the employee framed as follows:

These things you cannot learn from books. you need to talk to people, share ideas, participate in events and so on. I find out about workshops or new trends. When you talk to people, you get an idea from here and often make some friends too. When I go to these events, I always wonder- who am I going to meet, what do we have in common? It is a small world, I think and often when you get to know the person you find out that you have a common friend and really, it is like an adventure going to events because you never know how the next idea could actually change your life. (P69C3620)

Between these lines there seems to be powerful evidence of commitment and a consolidated form of participation in activity, which pulls the participant towards participation, as reflected in the enthusiasm evident in the discourse. This enthusiasm is rooted in the overarching “culture of innovation” which is a prevalent theme in the startup domain. While forms of boundary crossing may not be as prevalent in other more traditional organizational settings, ORG-B in particular appeared to promote an exploratory approach which extended deeply into the innovation ecosystem. The following excerpt further illustrates some of the approaches adopted:
Most of our colleagues here participate in different events in our field, either, you know, by volunteering or organizing, being judges on competitions and so on. In a way that keeps us motivated and it is in our DNA, to try to do things better to reimagine things and see ideas turn into products. (P3083R65)

The example highlighted above illustrates a multiplicity of opportunities for horizontal learning expansion in environments characterized by discontinuity/change. Being part of the startup domain offered a sense of belonging for the employee in this example, as he described an overall feeling of enthusiasm for innovation, problem-solving and change.

Theory on boundary crossing (Engeström, 2001a, 2003; Engeström et al., 1995) suggests that while artifacts are significant independently, they acquire importance in boundary crossing activities supporting development in situated contexts which can mediate practices at professional boundaries in different settings. Artifacts are therefore located at the intersection of different groups, practices or communities, and may have different meanings when examined from different perspectives. Existing literature has discussed a range of artifacts in boundary zones, including physical objects, processes or practices (e.g. Gedera, 2014; Miettinen & Virkkunen, 2005; Mwanza & Engeström, 2005). In addition, artifacts may enable individuals to learn about different ways of conceptualizing ideas in order to understand different perspectives, and meanings as they emerge in practice. Artifacts can also offer opportunities to create shared meanings as they are negotiated, contested or examined. The opportunity to create a new vision at the intersection of different groups is therefore a significant aspect of artifacts in the process of boundary crossing. Viewed from an activity-theoretical perspective, the ambiguity embodied by artifacts in different contexts can be clarified in relation to objects in activity. In this study, boundary objects included an LMS, a shared experience or the object of startup work practice itself. At the same time, artifacts also create contradictions which need to be negotiated in the process of achieving objects. Understanding these aspects of boundary crossing helps us to explain how learning emerges in situated practices in activity across startup organizations examined especially in relation to the tendencies observed towards different forms of knowledge creation over time.

Examples of boundary crossing examined in this study were not limited to institutional or personal dimensions. Take for example the case of one of the managers/owners who described a temporal/spatial form of boundary crossing, highlighting the distributed nature of the workforce in their startup and framing it as follows:
That is right, it made it easier. And since our workforce is *across the globe and in different time zones*, by having this portal in place, the education can be accessed anytime. And also all our employees are mobile and being a mobile employee you have the option of watching some education videos before you go to bed. At lunch or after dinner, or after you put your kids to bed. It gives you the *flexibility* we try to provide to our employees, so that it is easier for them to access the information we want them to see. (P2343F35)

In this example, we can observe how the tool the manager/owner is referring to was intended to facilitate boundary crossing while extending socio-spatially and temporally into personal spheres of activity. Other examples highlighted in the next sections further illustrate primary contradictions embedded in geographical crossing facilitated through technological means, resulting in object changes over time.

It is important to point out that the social networks participants create or participate in facilitate relations which involve interactions perceived as relevant by participants in accomplishing personal object/goals. In these contexts, learning appears to be inextricably linked with the contexts they take place in. The emerging collaborative social networks in this sense represent a source of resources and support, which cannot be provided by startup organizations alone. In the data examined, there are several examples which illustrate how individuals even create their own communities through collaborative activities held together by an object/goal to address an intersectional need or area of interest. Take for example the case of one the employees, who felt that there were no groups for educators who wish to learn how to code, and in response created an online group on a popular digital platform which facilitated these forms of community relations. While not directly related to the job, this initiative provided an opportunity for the employee to create a specific kind of learning environment, combining their own professional background and the startup experience.

I am not sure why I started the group. I wanted to meet others like myself but didn’t find any similar groups, and it was so easy to just build one myself, and within days others joined. I guess I wasn’t the only one who was looking for an opportunity like this one. I learned that you just have to start something, build something, and others will join. If I do things, try, get out of my comfort zone and help others, not only it feels rewarding but it helps others as well. (P7937B59)

It is relevant to point out that the groups created facilitate learning for individuals across institutional boundaries as they nurture shared interests and rely on individual participation to
create the distributed value to individuals navigating the dynamics of boundary crossing through different modes of participation in activity. Consequently, these groups helped to balance the limited resources available intra-organizationally in startups while creating collaborative value for individuals who participate, share, and build the innovation ecology, broadly conceived.

Essential to conceptualizing the boundary crossing mechanisms embedded in startup work is a recognition of the relationships between learning and the development of subjective experiences, which orient people towards goals expressed in different forms. As one of the employees explained:

First I was afraid to participate in these events and I asked a friend to come with me so that I am not alone. When you are all by yourself and there is no one to introduce you to others, unless, you are really outgoing it is hard to just go and see presentations. But going to events actually helped me to get out of my comfort zone and talk to people, exchange ideas. I made new friends and they introduced me to others and so on. I think I am more outgoing and feel more like I am part of the broader startup community.

(P69C3620)

In this excerpt, we see again a tension/contradiction in the process of boundary crossing, highlighting the social nature of engagement between different spheres of activity. The tension/contradiction in this case resulted in new forms of engagement as illustrated by a transcendence of a personal comfort zone towards the creation of new social relations, which supported an increasing level of engagement for this particular participant. Individual and social transformation, viewed from this perspective, are interrelated and shape the nature of knowledge creation orienting the tendencies of startup development in practice. In the next sections, these ideas are further illustrated and expanded in relation to the horizontal dimension of learning in development.

To better understand the dynamics of boundary crossing across intersecting activities, we can consider the insights provided by one of the employees. The employee in this case was aware of the importance of formal learning, but at the same time emphasized how startup experiences, had shaped his ability to gain a broader set of skills faster compared to other more formalized work environments. Like others in his organization, he had always been interested in technology and innovation, and soon after graduating from University, joined the startup. The transition from formal studies to startup work was perceived by the employee as an abrupt one, since the startup had limited opportunities for learning (e.g. courses). Throughout his University studies, he heard
conflicting perspectives about the value of credentials from multiple perspectives including family, colleagues or friends. In the interview process for the startup position, the participant remembered limited emphasis on the degree itself. Instead, he perceived that the degree was used as an indicator for the startup organization, or milestone. The mixed feelings the employee experienced were linked to contradictions as they aggravated over time in the process of discovering the new work environment or expectations, leading to a shift in practice. In the participant discussion of the startup environment there appeared to be both excitement for the increased flexibility, and concern for the need to pursue independent learning in order to obtain the Project Management Professional (PMP) designation.

In this example, we can observe the transition towards new learning possibilities creating emerging tensions in relation to individual modes of participation in activity. The employee first attempted to learn independently using a self-directed approach, which resulted in feelings of isolation since none of his colleagues were pursuing the same object/goal. Consequently, the employee crossed organizational boundaries in search of new learning opportunities and enrolled in courses offered in the evenings at a local postsecondary institution. Following his enrollment, the employee was able to draw on professional experiences acquired in the workplace to complement academic work, which represented a learning experience characterized by non-linearity in his approach offering insights into the dynamic nature of startup learning as a function of intersecting goal-directed activities within and across fast changing work environments.

Other examples of boundary crossing could be identified in the empirical data collected. In these examples, we can distinguish different processes which enable learning opportunities across boundaries in times or rapid change. In one of the examples, a startup employee worked long hours to support an extended family located on different continents. He explained by framing his perspective as follows:

In this field there is no 9 to 5. You have to really enjoy what you are doing and your family must be supportive too. Especially when you have to work long hours to get work done for a project. People rely on you, and you just can’t miss the deadlines because other people’s work depend on you and so on. It is both rewarding and sometimes a huge challenge, and you have to be willing to do it. (P3083R65)
In this example, we see again an illustration of forms of tension/contradiction embedded in temporal and socio-spatial dimensions of object expansion, particularly in the long hours individuals spend to complete startup work, but also interrelations of family, time and space.

Despite the dynamic nature of startup work, some participants reported regular participation in volunteer activities. In one of the cases, an employee outlined the interrelated nature of work and home learning, underlining that the significant amount of time invested into volunteering for different local events related to innovation facilitated social interactions and promoted sustained engagement. From this perspective, startup learning extended both in spatial terms into the innovation ecology and in temporal terms beyond regular work hours. The employee pointed out at the same time that the support of family members had been crucial in helping to sustain continued engagement in learning activities.

More characteristics of the boundary-crossing mechanisms appear to emerge from the narrative provided by participants as they describe the dynamic nature of social relations which guide the development of collaborative practices over time. From a cultural-historical perspective, we see cultural patterns emerging which emphasize the benefits of collaboration as a supporting mechanism for community building in the startup domain. Between the interconnected activity systems which constitute the broader ecosystem we see individuals who take leading roles to promote collaboration and engagement. The employee in the example highlighted in this section remembered the initial fears, which had prevented participation in community based events, describing how difficult he perceived interacting with others in social settings, including the different innovation focused events organized in the community. This fear may have been in part due to the lack of knowledge of any informal rules which mediate the interactions in such contexts. As a result, the employee chose an alternate form of participation, engaging initially in digital media and contributing to online forums centered around topics of professional interest for the innovation-focused community. The participant described the experience as “empowering”, and after gaining confidence in interacting with others who were already taking part in events, he changed his mode of participation and started attending the in-person events regularly. This decision resulted both in new opportunities and a shift in practices which created new social relations which solidified over time. As described by the employee, the changes achieved socially translated into material outcomes, which included new professional opportunities and opportunities to support others, outcomes which mutually reinforced each other.
Similar examples of boundary-crossing were common in the interview data, highlighting additional overlaps between different spheres of activity. These examples provide insights into multiple opportunities for learning extending into home/family or community life. Viewed from this perspective, it is noticeable how some startup employees extended the work spheres of activity towards personal spheres, influencing individual perspectives and themselves being influenced in this process. One of the employees framed the challenge as follows:

I often spend long hours working home in the evenings while my children do their homework, so, we sit at the same table, and work on our projects. They see me working and I see them working and we’re all at the same table. Sometimes I feel like I am doing my homework too for the next day, and they see me working too, and that keeps us all focused. Whatever they ask me about related to their school projects, I think: innovation, doing things better, faster. That is what I do all day so that’s what comes to my mind. (P7937B59)

Social interactions in this example are shaped by the conditions in which activity takes place and the choice to complete different work/school related tasks as a group. This form of spatial mediation is relevant in highlighting the interrelated nature of work/family spheres of activity, illustrating the mediational dynamics of everyday work extending deeply into the fabric of life and leading to changing forms of participation in activity over time. This example is illustrative of the polycontextuality and boundary crossing (Engeström & Karkainen, 2018) in horizontal dimensions of learning expansion in the process of boundary-crossing. While this overlap between different spheres of activity does not take place in professional settings, we can conceptualize these interactions at an activity system level as a form of simultaneous participation in multiple communities. In this example, social relations in the family are shaped by participation in seemingly unrelated domains. As Engeström (2005a) points out, “boundary crossing calls for the formation of new mediating concepts” (p. 220). Indeed, we can observe a process of collective concept formation in the family about innovation extending work practices into family dynamics in both temporal and spatial dimensions. In this example, the desk represents a boundary object mediating specific objects and leading to what Engeström describes as cognitive retooling in relation to perceptions, perspectives or attitudes towards innovation and learning.

To conclude, this section provided additional elements to the conceptualization of a distinct trajectory of development of ORG-B characterized by tendencies towards collaboration.
and community building. These collaborative practices extended beyond organizational boundaries and even involved active participation/support by family members. The development of “distributed cognition” as the vision/projection for development mediated the participation of individuals in collaborative practices beyond organizational boundaries. The illustrations of collaborative forms of knowledge shaping change in the context of boundary crossing in this section help to better conceptualize the innovation ecology as a sociocultural system in development. This conceptualization contributes to the understanding of the distinct type of knowledge creation shaping the trajectory of ORG-B in relation to the MBCC dynamic constructed previously. The next section provides further illustrations of collaborative practices in the context of intra-organizational development and change in ORG-B, as viewed from the vantage point of the CHAT/EL approach elaborated in this chapter.

6.3.3 Boundary Crossing in the MBCC dynamic of knowledge creation and development: intra-organizational collaboration and the development of collaborative intentionality capital

The elements of the distinct tendential developmental trajectory discussed in this section in relation to the distinct trajectory of ORG-B concerns intra-organizational collaboration practices and their implications for knowledge creation in times of rapid change. This discussion extends the empirical insights gained in the previous sections and deepens the analysis of the theme of boundary crossing in relation to the MBCC dynamic developed in this chapter.

In this context, ORG-B placed significant emphasis on supporting collaboration in the workplace to enable more effective knowledge sharing and problem solving. Communicating, sharing and cooperating were key aspects of the organizational strategy for development, which could enhance productivity and increase engagement in practice. This strategy was at the core of the distinct workplace culture of ORG-B and encouraged collective engagement, building trust and effective communication. Intra-organizational practices were built on principles of complementarity: each participant had to contribute their distinct skills and abilities to support growth and development. In this context, we can observe the emergence of collaborative intentionality capital (Engeström et al., 1995), which supports the tendential development of ORG-B towards participation to the achievement of the shared object. Achieving the level of effective collaboration required for the complex work object of ORG-B was, however, difficult to achieve and required a shift in distributed cognition resulting in shaping the tendential development of ORG-B towards knowledge creation aligned to collaborative intentionality
capital in practice. This goal was achieved by means of co-innovation and co-operation, as illustrated in empirical insights developed from the activity-developmental specimen discussed below.

The first strategy for the development of collaborative intentionality capital shaping the distinct orientation of the trajectory in the development of ORG-B included reinforcing rewards for idea sharing in the context of collaborative initiatives. In this section, I outline examples of boundary crossing between startups and client organizations with a focus on co-innovation. These forms of collaboration lead to inter-organizational learning and are based on mechanisms which include coordination, cooperation and communication (Engeström, Brown, Christopher, & Gregory, 1997). As outlined in previous chapters, an activity-based perspective on learning provides a robust conceptualization of the social relational mechanisms through which learning is constructed in situated contexts. Within activity as the primary unit of analysis, learning is embedded in an intricate interplay of conscious and unconscious processes which are interrelated and inseparable from their situated contexts (Sannino et al., 2009; Yamagata-Lynch, 2010c). An examination of socio-cultural dimensions of startup learning assumes an active production of social relations mediated by concepts, language or other artifacts which produce complex mechanisms for change and innovation, aspects which are relevant for the conceptualizations of elements contributing to the distinctly collaborative forms of knowledge created, and the tendencies in development outlined in this context.

As discussed previously and illustrated through empirical data, the complex nature of startup environments is characterized by overlapping spheres of activity which blend and mutually complement each other. While individuals in the innovation ecology startups were part of engaged in shared activities by crossing organizational boundaries, they were often guided by similar motives/goals and patterns of engagement in activity framed in distinct ways. Their different personal interests and aspirations were cohesively blended with common interests under an overarching aspiration to support innovation. This common aspiration, however, cannot be fully understood in isolation from the specific socio-cultural context participating startup organizations are part of, placing significant emphasis on innovation as a form of achievement in the situated societal context of the ecology examined. As one of the participants pointed out, engaging in learning/collaboration and networking communities facilitated learning by enabling the creation of social relations creating the fabric of social relations in this innovation ecology. Consequently, it is this form of participation which allows the employee in this case to explore
new opportunities for development in collaboration with other professionals who share similar objects/goals.

I feel that *we all want the same thing*, to connect, to explore, to grow, and often it is difficult, you come from the suburbs, you drive, and really, you have to be committed to participate when you could just watch online content or take a course. When you go to events, I think there is a *social aspect* to it, and also an opportunity to meet former colleagues and friends, and they introduce you to other people and so on. It is like a meeting place, and you get to learn a lot of things. (P69C3620)

The employee’s description of community-based collaborative groups highlights the importance of boundary crossing in goal-directed learning as a means to engage in the innovation ecology while building social relations with learning potential. This point is further illustrated in other examples, which highlight the emergence of what Engeström describes as *intentionality capital* (Engeström, 2004a; Engeström, 2005b) across organizational boundaries.

Startup professionals who participated in this research underlined how boundary objects such as online tools mediating digital and the physical dimensions of practice enable the overlapping of different activity spheres shaping different forms of participation for startup professionals in ecology-based learning opportunities. It was noticeable in the empirical data how participation in activities with learning potential often depends on contextual aspects which may include personal or logistical factors. Another employee pointed out:

The problem with participating in communities is, you don’t really know when events take place. I subscribed to several websites which send me updates, but often I find that it is better if you just find out from a colleague or friend who is also interested in something and then you can coordinate to attend. You share some ideas about what is said during the presentations and how to adopt what we hear in our company. (P3083R65)

This participant perspective supports claim that learning is socially structured through less formalized forms of participation in the process of boundary crossing. In contrast to planned, institutionalized approaches to learning, we can see in this example forms of learning which transcend organizational boundaries in a process of social participation in shared activities which are goal-directed. The process of boundary crossing facilitates the learning experience by providing conditions for changing forms of participation.

A significant insight which was distinguishable in the data suggests the emergence of cohesive social processes which structure learning processes in startup organizations. These
cohesive mechanisms in less formalized everyday work practices of startups provide new opportunities for learning in the context of boundary crossing between the different spheres of activity. Consequently, shared interests represent conceptual artifacts in boundary zones, which shape learning processes over time. These cohesive mechanisms are predicated on mutualistic relationships, which involve certain degrees of support, guidance or mentorship structuring social relationships within and across these collaborative groups, reflecting polycontextuality (Engeström et al., 1995; Engeström & Karkinainen, 2018) in boundary crossing in relation to everyday work practices. As individuals who work for startups create opportunities for collaborative activities, they benefit from shared resources and ideas, which have an impact on their organizations indirectly while shaping individual development.

By leading, organizing or otherwise engaging in diverse initiatives in the innovation ecology, individuals support a culture of innovation where learning is embedded in shared objects in overlapping spheres of activity. Another example of boundary crossing provides insights into situated, polycontextual forms of boundary crossing in academic partnerships supporting a horizontal expansion of object in startup work. The boundary that the manager/owner describes in the following example provides a sense of the collaborative nature of startup work in the process of innovating:

We did this in partnership with a university. One of the requirements for this project was for academia to perform the analysis. And that is what they did, and they came up with recommendations of products. And also ranking of products and the ranking was done based on usability, price, like market acceptance and so on. So, they provided the findings to our organization and then together we selected a product that best fit and then we started developing based on this platform/product that was recommended. (P54T6545)

Though essentially the process of boundary crossing was actively managed, aspects of shared value and cooperation could be brought into discussion to describe organizational relations which developed in achieving the outcome. The manager/owner described the nature of the partnership which shaped the selection of the LMS in the broader context of the strategy to improve organizational performance as follows:

What the academic partner did was they looked at market acceptance. So, market acceptance is based on how many countries are accepting this specific product to be the standard. The product that was recommended was also the standard product that Canadian Universities use, for education purposes. So, we know for a fact that, you know,
market acceptance is quite high and based on that we were sure that it will fit our needs because, from a size perspective we are not even close to what Canadian universities are using and resources, and students, and so on. (P54T6545)

Among the most notable aspects of this partnership was the collaboration between different traditions and domains of expertise in a co-configurational approach which integrated different domains of expertise in developing new forms of learning for both the startup and the academic partner. This type of integration resulted in the development of an LMS as a tool which was intended to adapt to changing needs of users and generate what may be described as *dialogical* form of *configurational knowledge* (Engeström & Toiviainen, 2011; Fox-Wolfgramm, 1997). This form of learning in co-configurational work required an ongoing relationship between the startup and the academic partner. As Victor and Boynton (1998) point out, “co-configuration work never results in a “finished” product. Instead, a living, growing network develops between customer, product, and company” (p. 15 in Edwards, Daniels, Gallagher, Leadbetter, & Warmington, 2009). In this case, an ongoing relation was formed between the startup and the academic partner, facilitating mutual learning between the parties over an extended period of time.

An additional strategy which emerged in relation to the development of “collaborative intentionality capital” was related to co-operation designed to facilitate idea sharing and personal engagement towards the achievement of organizational growth goals on the distinct developmental trajectory of ORG-B. In this case, the instruments developed included an online storage space where presentation materials were stored for re-use and reference by both new and more experienced employees. This organization supported this space through an index of contents in the form of a document containing links to individual files, resulting in an instrumentality which could be used jointly by employees and extended leadership teams. This index was descriptive in nature and search functions were limited. Furthermore, its construction and maintenance were primarily delegated to a single employee, who was responsible for curating the information, placing the documents in the right sub-folders and adding the file names to the index. A manager/owner explained:

We have weekly presentations, weekly meetings to share and learn. We have set topics then assign people to give a talk on that topic. Some of them can be conceptual, technical and so on. We will require the presenter to learn and present it to the group but actually most of the time is the knowledge that an individual has because of *previous work*
experience and that is good to educate the younger team members. And then once someone is making the presentation, is it incorporated into [the storage tool]. We present using PowerPoint and the ppt is shared in [the storage tool]. After a while it may become difficult to organize, I think, but thankfully our size is still manageable. And we have different folders in [the storage tool] So, there is the software team, there is regulatory, there is test, it is partitioned well enough, so that it is still manageable. (P84U2937)

The excerpt above helps to illustrate the new instrumentality constructed by the startups in response to the challenge of fragmented knowledge embedded in presentations accumulated over time. This example illustrates a crucial challenge which is found in the discourse: the tool will eventually become limited or limiting as the organization grows. A possible way to identify further tensions may involve expanding the time perspective to facilitate an analysis or mapping of possibilities in better managing the collaborative learning process. Using this approach may allow ORG-B to dialogically negotiate the construction of the innovation trajectory while identifying potential gaps in anticipation of the time when the current practice will no longer be “manageable”. Such critical realizations are significant and positioned in antithesis to ignoring problems of change in learning. The temporally expansive realization that the information may “become difficult to organize” in the future brings to the forefront potential future outcomes/problems which may become critical and no longer possible to ignore. New instruments need to be developed to address the expansion of the object. From an activity-theoretical perspective, this new instrumentality can be constructed collaboratively, incorporating multiple points of view as startup employees and their managers navigate the dynamics of change over time through joint interpretations and revisions of object towards new and reconfigured forms of practice. This critically reflexive process of planning and development can facilitate the evolution of solutions from incipient, basic forms, to elaborate, negotiated instrumentations which align to organizational dynamics and its specific culture, filling important gaps on an expansive pathway towards innovation/growth.

This section developed additional elements of development as relevant aspects of boundary crossing relevant for the MBCC dynamic of development in ORG-B I developed in this chapter. Collaborative practices with tendencies towards the development of collaborative intentionality capital support the distinctiveness of the trajectory of development in ORG-B in times of rapid change. Boundaries between different functions or roles appear to be organized around boundary objects, such as the presentation, enabling or constraining interactions across these boundaries.
The aim to strengthen cross-boundary collaboration, in this context, represents a valuable tool for startups to support organizational IKM practices. Furthermore, intra-organizational collaboration strategies in co-operation, co-innovation and rewarding idea sharing represent foundational elements of the collaborative tendencies of the cultural dynamic prevalent in this organization, viewed from the vantage point of the CHAT/EL approach adopted in this research project. These aspects of boundary crossing developed in this section complement those elaborated in previous sections to illustrate the distinctiveness of knowledge created in ORG-B on its trajectory of development in times of rapid change. The next chapter provides an analysis of the third and final element in the MBCC dynamic, contradictions as a source of change in learning.

6.4 Socialization/Negotiation and Possibility Knowledge Creation of Activity-in-Development

A deeper analysis into the knowledge creation dynamics of ORG-B in the context of boundary crossing allows us to identify and understand social relations shaping the organizational culture in this organization in relation to the distinct type of knowledge created in the context of development. Complex relations highlighted in previous sections based on insights from ORG-B provide views into the collaborative forms of knowledge and the strategies adopted by the organization to support development over time.

We may observe in this organization more flexible and less formalized mechanisms for adaptation to new requirements in product development. A notable aspect of this type of knowledge creation in development was the proactive attitude of participants in embracing the complex nature of their work while proposing and developing their own projects in small groups within and across organizational boundaries. These distinct individual modes of participation in activity, broadly conceived, paint a different picture of startup work, distinguishing ORG-B from the other organizations examined. Consequently, this organization appeared to navigate the two rhetorics of transformation - *process efficiency* and *community building* (Engeström, 2016b) by emphasizing collaborative forms of knowledge creation in which socialization/negotiation and the creation of new visions/possibilities were dominant. As Engeström (1998) pointed out, “[p]ossibility knowledge emerges in active change efforts” (p. 247). The emphasis ORG-B placed on such efforts in the process of boundary crossing shaped its distinct cultural and social dynamic and oriented the development of the organization towards on a distinct type-e trajectory as it navigated *divided terrains* (Engeström, 2003) in practice.
6.5 Development on a type-c trajectory in practice

The type-c trajectory described in this chapter was illustrative of collaborative practices shaping orientations towards co-configuration work as predominant strategies for development. Individuals embraced this community building approach as they learned to generate new knowledge in the process of boundary crossing. This trajectory was established through the collaborative navigation of struggles within and across organizational boundaries. In this specific developmental trajectory of development, team building activities provided evidence for the orientation towards collective forms of knowledge creation supporting the co-creation of the innovative products.

Looking at the structure of activity through situated work practices, we can see in this context how this emerging trajectory consolidates individual contributions to produce an object which appears to be greater than the sum of its parts, despite the complex and dynamic divided terrains ORG-B must navigate through. The analysis of startup work presented in this chapter highlights that individuals perceive their positions in the innovation ecology in dynamic terms as they navigate between fluid organizational fields (Engeström, 2018b), allowing transformative forms of development to emerge. In understanding these transformations, it is crucial to consider situated experiences in boundary crossing trajectories of expansion. In order to fully appreciate the claims presented, excerpts from ORG-B were evaluated in relation to their significance for a re-conceptualization of knowledge creation from the vantage point of CHAT/EL, shaping a distinct and potentially divergent type-c trajectory in development.

Building on earlier studies, we saw that startup work often involves a process of collaboration involving both the leadership teams and individual workers in relation to advancing organizational agendas, often structuring advancements through the resolution of divergent perspectives in transformation. In the examples discussed, we saw forms of co-operation as a collaborative activity with overarching implications on individual modes of participation and continuity in activity. Clearly, this conceptualization of change involves assessing the dynamically shifting conditions linked to contradictions within knowledge creation processes actively undergoing transformations. It should be pointed out, however, that the process of co-operation involved certain considerations of problem-solving dynamics related to the collaborative nature of participation in activity.

The dynamic and rapidly changing nature of startup work presented ongoing challenges in everyday practices. In examples highlighted in this chapter, we saw that circumstantial conditions
were rapidly changing, creating difficulties for employees in supporting both internal and client-facing activities. According to participants, different forms of collaboration were not only necessary, but crucial in addressing the challenges of creating reliable models which could be replicated to reduce some of the challenges associated with rapidly changing conditions. We observed the formation of new instrumentality\textsuperscript{25} in processes of boundary-crossing as a difficult process, similar to the findings of the study by Kerosuo & Engeström (2003), in need of enrichment in order to facilitate transformative processes of change in learning. These processes involved the creation of new ideas and potential miniature cycles of expansive learning. Such complex learning environments involved significant *co-configuration* in the form of alliances integrating distributed stakeholders strategically over time in activity systems which were loosely interconnected (Engeström, 2004). Deeply embedded in this complex collaborative dynamic were daily practices which were goal-oriented and inextricably linked to their situated contexts in development.

The excerpts in this chapter provide relevant insights in illustrating dynamic interplays between different dimensions of collaborative practices, emphasizing mechanisms for re-shaping object-related forms of evolving practice and the capacity of individuals to create forms of knowledge which help to overcome tensions in object-oriented work activities. In this process of struggle and negotiation, we see new object/goals emerge, providing alternatives to previous practices, especially in *co-configuration* contexts in times of rapid change (Engeström, 2004; Engeström & Toiviainen, 2010). Clearly these forms of boundary crossing shape modes of participation in practice as different forms of collaboration become increasingly required to overcome fast changing requirements.

While trajectory uncertainties in startup activities remained relatively high, different forms of interactions shaped the development the organizational culture in ORG-B over time. Inherent in the navigation processes, I argue, there is a realization of expansion which is in part created through recurring patterns of change which translate everyday practices into creative strategies for change and development in learning. The dynamic nature of learning related to this collaborative dimension of analysis can be used to better understand some of the explanations for distinct modes of participation in activity. Becoming aware of the importance of collaborative

\textsuperscript{25} While there might be similar related themes in in other bodies of literature, the notion of *instrumentality* should be interpreted in the CHAT tradition for the purposes of this study to avoid theoretical confusion (see earlier discussion in this work).
practices leads to the question of the level of engagement and some of the intrinsic motivations in activity linked to broader socio-cultural dimensions of transformation. An employee described a collaborative form of learning, pointing out the reliance of startup employees on each other’s expertise, as follows:

The way we work involves a lot of improvising, not only because we can, but mainly because we have to. After a while you get used to change, it becomes routine. We need to work together and rely on each other’s expertise. When we come up with ideas, we debate, and brainstorm together to find the right solutions, and then talk again, continue the conversations online. Someone takes a picture of the whiteboard and we build on that. It took a while to understand how to better produce good ideas and we’re still working on that regardless if it’s in person or online. (P7937B59)

In this excerpt, we can observe that knowledge creation in development is a significant element of the collaborative nature of development. As I noted before, the dedication expressed by participants seems to be linked to an object-orientation aligned with organizational goals with implications on innovative practices shaped by subtle processes of change/navigation intensified by contradictions in development. Clearly this dynamic of change illustrates the relations between individual and group transitions shaped actively by the process of transformation and knowledge construction orienting individual experiences and transcending relevant dimensions related to different modes of participation in activity. Individual experiences are therefore actively shaped in the division of labor and the cultural mediation of community dynamics in times of rapid change.

Understood from a broader perspective, the collaborative approaches highlighted in this chapter involving boundary crossing appear to explain aspects related to dynamic object changes in rapidly evolving contexts. Reviewing these examples, we can now better see how collaborative practices in the contexts examined facilitate the transmission of knowledge in relation to the ongoing dynamics which gives rise to the distinct trajectory of knowledge creation, which I describe in this case as type-c. In this analysis we find some of the challenges individuals experience in practices revolving around development on the type-c trajectory. Viewed from this perspective, the struggles embedded in distinct practices co-evolving dynamically as collaborative processes become increasingly relevant for an expansive conceptualization of learning in change and the MBCC dynamic they are part of. In contrast to learning processes reviewed in the previous chapter, those on the type-c trajectory are characterized by collective
meaning making which shape the development of advanced knowledge/skills and individual modes of participation in activity within and across organizational boundaries, and even in relation to personal/familial spheres of activity. While we can observe some similarities with previous studies in relation to the conditions of rapid change in developmental trajectories, the analysis presented in this chapter illustrates some of the distinct processes emerging from the empirical data presented from an activity-theoretical perspective, encompassing situated and dialectical aspects of learning over time in relation to knowledge creation on a distinct type-c trajectory of development and change.

6.6 Summary

In Learning by Expanding: An Activity-Theoretical Approach to Developmental Research (2014) Engeström points out several observations that relate to the process of boundary crossing in relation to the possibility of learning expansion.

On the horizon of third-generation activity theory, there are big issues that will increasingly challenge and stimulate the development of the theory and practice of expansive learning. The first of these is the emergence of large “runaway objects” (Engeström, 2009a) or “hyperobjects” (Morton, 2013), objects so massively distributed in time and space as to transcend localization, such as climate change or pandemics. Runaway objects have the potential to escalate and expand up to a global scale of influence. They are objects that are poorly controlled and have far-reaching, unexpected effects. (p. xxxvi)

These insights point towards challenges to the study of complex learning systems in rapidly changing environments in which activity-theoretical approaches to analysis provide promising new directions in the re-conceptualization of learning and development through a CHAT lens. Few theoretical traditions can provide meaningful approaches to describe the interrelated nature of practices, especially in relation to elements relevant to the KAT of boundary crossing, which embrace socio-cultural aspects of the dialectical nature of activity on developmental trajectories of development in situated contexts over time.

In conclusion, I suggest that several aspects related to the KAT of boundary crossing are relevant for the conceptualization of the MBCC dynamic at the basis of the expansive view of learning presented in this research study and its distinct type-c trajectory for knowledge creation in development. Notably, ORG-B adopted forms of knotworking to horizontally expand into the
rapidly evolving ecologies of innovation it was part of. This collaborative form of development places an increased emphasis on new relations and co-configuration in the context of boundary crossing within and across different spheres of activity. The illustrations in this chapter highlight how ORG-B approached development through co-configuration (Engeström & Nummijoki, 2013) strategies to create advanced products, resulting in the emergence of possibility knowledge (Engeström, 2007; 2007) in the context of knowledge creation and change in development.

As highlighted, the tension/contradiction in the rhetoric of process efficiency vs. community building was navigated collaboratively, resulting in the creation of possibility knowledge. In the illustrations examined, the pronounced attention to processes of community building in ORG-B provided opportunities for collaborative knowledge creation on a type-c developmental trajectory. Strategies identified in this chapter were indicative of the changing nature of work as co-configurational. In this chapter we observed a balance of relatively stable routines within the startup and the partner organization, and improvisations and negotiations in the context of co-configuration/knotworking. These observations echo Engeström’s (2008b) findings: “The relatively stable standard procedures of cooperative continuous improvement are not sufficient. Rapid negotiation and improvisation with constantly changing configurations of partners gain central importance” (p. 196). These considerations contribute to both confirming and supporting the robustness of the CHAT/EL framework employed.

The aspects related to the analytic theme of boundary crossing contribute to the development of an expansive view of learning in startup organizations, as conceptualized in an activity-theoretical tradition from the vantage point of CHAT/EL. This perspective reveals that the development of ORG-B through co-configuration/knotworking represented a complex process in which perceptions, feelings and attitudes of participants were influenced by socio-cultural factors in practice. Overall, the data analysis adopting a socio-cultural perspective showed that reflexivity in boundary crossing was a major factor in the personal achievement of knowledge creation goals in development. This small-scale analysis of boundary crossing in startups complemented dominant approaches to the conceptualizations of learning in IKM literature highlighting divergent experiences of individuals in times of rapid change. These less formal practices could be, I argue, more effectively conceptualized through a CHAT lens which can make visible socio-cultural aspects largely obscured by generalized models prevalent in studies from other theoretical traditions, including IKM.
As I proceed with the analysis in the following chapters, I will continue to add detail to the conceptualization of *boundary crossing* dynamics in relation to the other KATs examined, as they emerge from participant perceptions of knowledge creation and change in development grounded in their experiences in practice. This analysis of *boundary crossing* is intended to serve as a foundational approach in analyzing fast-developing environments within and across organizational boundaries through a cultural-historical lens. Overall, this discussion contributes to the re-conceptualization of development in relation to an MBCC dynamic of knowledge creation, which represents a significant area of interest in the context of exploring new ways for bridging different domains of practice, supporting the rapid development of evolving innovation ecologies in which multi-stakeholder approaches to collaboration are necessary to make significant and tangible contributions to new conceptualizations of learning and change. The concept of *boundary crossing* was therefore applied in this chapter to transcend standard notions of workplace learning, providing a more nuanced view of aspects related to the development of new forms of expertise in relation to evolving forms of knowledge creation in dynamic, rapidly changing work environments.

Concurrently, in the context of prevalent uncertainty in changing work environments, transformational models of learning and development such as the one adopted in this study can complement existing literature through a multi-dimensional analysis of creative forms of practice requiring different forms of participation. Engeström et al. (1995) point out several ideas which relate to this closing discussion:

In their work, experts operate in and move between multiple parallel activity contexts. These multiple contexts demand and afford different, complementary but also conflicting cognitive tools, rules, and patterns of social interaction. Criteria of expert knowledge and skill are different in the various contexts. Experts face the challenge of negotiating and combining ingredients from different contexts to achieve hybrid solutions. (p. 319)

In conclusion, this chapter illuminated patterns of knowledge creation in development produced in the course of boundary crossing, not only in relation to forms of co-configuration work, but also in the process of navigating inter-professional activities in the context of innovation-related events part of the broader ecosystem ORG-B was part of. In collaborative *boundary crossing* contexts, diverse perspectives and experiences were perceived as valuable additions to the cultural fabric of the innovation ecology. This process was reinforced when individuals contributed to the development of new instrumentalities or cognitive artifacts, as expertise was
constantly negotiated, constructed and reconstructed in practice, requiring sustained participation over time. Empirical data outlined the complexity of knowledge creation in relation to development in times of rapid change, highlighting the significance of emergent forms of possibility knowledge in collaborative activities involving multiple stakeholders across different spheres of activity. Consequently, findings illustrate and reinforce the emergence of networks/communities in response to individual needs for learning as startup professionals negotiate expertise, navigating uncertainty and change within and across their organizational boundaries over time.
Chapter 7: Contradictions as a Source of Change in Learning and Knowledge Creation in Startup Work: Development on a type-e Trajectory

This chapter applies the concept of contradiction as understood from the vantage point of CHAT/EL in relation to the broader mediation/boundary crossing/contradictions (MBCC) dynamic to gain insights into knowledge creation and developmental change in startup organizations examined. Empirical data from semi-structured interviews in ORG-C as an illustrative context for this particular analytic aspect examined revealed the importance of contradictions as a source of change in learning shaping a distinct and potentially divergent type-e trajectory of development. These contradictions are explained in relation to the MBCC dynamic illustrating an expansive view of learning and incorporating the other analytic themes of mediation and boundary crossing discussed in previous chapters in complementary ways, while offering insights into the specific conditions of rapid and often turbulent change, in startup organizations examined.

7.1 Introduction

Previous chapters presented accounts which emphasized the mediated nature of learning and aspects of boundary crossing in relation to startup work as illustrated by participants. In this chapter, the concept of contradictions is discussed as an important element in understanding the dialectic nature of knowledge creation in startup development as conceived from an activity-theoretical perspective, with an emphasis on indicators which direct attention to activities with expansive learning (EL) potential. Each analytic section of activity-developmental specimens begins with a discussion of contradictions in relation to CHAT/EL, followed by an examination of specific examples in the empirical data.

The activity-theoretical principle of contradictions adopted in this study to develop a deeper understanding of learning dynamics in startup organizations represents a central tenet which illuminates transformative aspects of change potentials in work practices largely neglected in IKM scholarship. I argue that contradictions can be effectively examined within and across constituents of activity systems – tools rules, division of labor, either individually or in the process of boundary crossing, providing opportunities for change and learning in diverse contexts.
examined. This chapter complements existing literature by contributing to an understanding of contradictions supporting an MBCC dynamic of knowledge creation with an attention to distinct modes of engagement in activity shaping a particular form of knowledge created in startup work on a distinct type-e trajectory in development.

The role of contradictions as a source of change in learning is an area that has been largely obscured in IKM scholarship by other focus areas primarily process- or tool-centric in nature. The indicative review of literature presented in a previous chapter identified few examples of studies focusing on contradictions, and even fewer related to the role of contradictions as a source of change in learning. In this chapter, I focus on three areas where an activity-theoretical approach to the examination of contradictions can complement and expand IKM scholarship while contributing to the expansive view of learning proposed in this thesis.

First, I re-frame the concept of contradictions from generalized/broad conceptualizations prevalent in IKM literature to situated/micro-conceptualized dimensions characteristic to CHAT analyses and show how this shift provides more nuanced descriptions of factors, which are important for learning conceptualizations specifically. Second, I make explicit the examination of learning in relation to aspects of contradictions, which represents a departure from previous implicit conceptualizations of learning in relation to contradictions, prevalent in IKM studies. Third, I substitute amalgamated or generalized conceptualizations of contradictions by adopting an activity-theoretical approach grounded in CHAT, which distinguishes between multiple forms of contradictions and their manifestations in practice in order to provide a fine-grained analysis of the distinct roles of contradictions as a source of change in learning. These shifts provide the basis for the examination of a contradiction/resolution/synthesis (CRS) dynamic which I construct in order to evaluate the Potential for Expansive Learning (PfEL) in startup knowledge creation and development.

In order to reconceptualize startup development as collective transformation, it is necessary to begin with an elaboration of several theoretical elements which extend the KAT of

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26 Sannino and Engeström (2018) underlined the importance of making visible the contradictions embedded in the structure of work practices through their manifestations. They pointed out: “As contradictions are historically emergent and systemic phenomena, in empirical studies we have no direct access to them. Contradictions must therefore be approached through their manifestations. We may also treat manifestations as constructions or articulations of contradictions. In other words, contradictions do not speak for themselves, they become recognized when practitioners articulate and construct them in words and actions. However, contradictions cannot be constructed arbitrarily. Their material and historical power is not reducible to situational articulations and subjective experiences (Engeström & Sannino, 2011b)” (p. 49).
contradictions introduced in the second chapter. Specifically, I focus on the manifestations of contradictions in the form of dilemmas, conflicts, critical conflicts and double-binds to provide the foundations for a deeper understanding of the potential for collective transformation shaping the orientation of tendential development analyzed in this chapter. Engeström and Sannino (2011a) explain the concept of resolution of inner contradictions and the generation of “thirdness” as follows:

Focusing on inner contradiction requires that we analyze the concrete historical system within which the contradiction takes shape; dealing only with external contradictions means escaping this crucial theoretical challenge. For analysis of inner contradictions at the level of organizations, we need a theoretical model of the systemic “anatomy” of organization. [...] Inner contradictions need to be creatively and often painfully resolved by working out a qualitatively new “thirdness”, something qualitatively different from a mere combination or compromise between two competing forces. The notion of “thirdness” stems from Hegel and was coined by Peirce (1998) in his critical discussion of Hegel's logic (Prenkert, 2010). In the present context, the idea of “thirdness” refers to the generation of novel mediating models, concepts and patterns of activity that go beyond and transcend the available opposing forces or options, pushing the system into a new phase of development. (p. 371)

In order to establish the foundations for the contradiction/resolution/synthesis (CRS) dynamic I will use in the next chapter, I first develop the concept of translation of contradictions building upon the concepts of “resolution” and “internal contradictions” from the CHAT/EL tradition gradually in the analytic sections which follow these introductory sections. In the next chapter, the concept of translation will be applied to examine the potential for expansive learning in startup work with attention to implications for learning and distinct modes of participation of individuals-in-activity.

From an activity-theoretical perspective, this process of transformation through the translation of contradictions can be facilitated by formative interventions, in which stabilization processes consolidate new practices. To analyze the complex nature of social and cultural interactions in relation to concepts of contradictions it is therefore necessary to adopt a reflexive and analytical approach. As Kuutti (2011a) highlights:

Because activities are not isolated units but are more like nodes in crossing hierarchies and networks, they are influenced by other activities and other changes in their
environment. External influences change some elements of activities, causing imbalances between them. Activity theory uses the term contradiction to indicate a misfit within elements, between them, between different activities, or between different developmental phases of a single activity. Contradictions manifest themselves as problems, ruptures, breakdowns, and clashes. Activity theory sees contradiction as sources of development; activities are virtually always in the process of working through contradictions. (p. 34 in (1996)

As Kuutti (1996) points out, these ruptures or breakdowns present and represent opportunities for change, which I argue may include innovative approaches in restructuring organizational practices and developing new and improved objects over time. In this context, an analysis of the translation of contradictions can provide a deeper understanding of evolving processes at the core of system transformations emerging in patterns of “expansive cycles” which are navigated in practice to advance the development of activity (Sannino & Engeström, 2017). This is facilitated by continuous reflections by participants in shaping trajectories of development dynamically rather than in rigid or static ways. In these contexts, expansions take place within or across activities through innovative and recursive practices. It should again be highlighted therefore that contradictions, from an activity-theoretical perspective, do not represent failures, but rather opportunities to overcome obstacles in the process of growth and development. At the same time, contradictions can represent turning points which can enable movement from static to dynamically changing practices based on recursive expansions in zones of proximal development, connecting historicity with strategic foresight in times of rapid organizational change.

7.2 Micro-Enterprise in Search of a Breakthrough: Struggles to Cope with Uncertainty and Pronounced Discontinuity in Change

The case of ORG-C depicts a distinct form of development and a more complex trajectory defined by struggles surrounding growth in a micro-organization with limited resources and a comparatively more challenging context for development. In this chapter, we can observe several illustrations which appear to relate to distinctly challenging forms of development and knowledge creation, which tend to shape the cultural dynamic of ORG-C on its trajectory or development.

Like many small startup organizations, ORG-C was actively looking for tangible solutions for growth and development. It may therefore not be surprising to learn that for a small company
like ORG-C, development was often difficult. In particular, finding customers, or even finding what to focus on in times of rapid change represented major challenges. The limited amount of resources available therefore resulted in pressures on decisions related to prioritization and resource allocation. In addition, the company was relatively new and still had to develop brand awareness in the market in order to grow more effectively by partnering with individual medical offices or larger medical groups. As one of the participants from ORG-C pointed out, the company had to face difficult situations and learn from repeated rejections, constantly calibrating their approach for development. However, finding customers was not the only challenge for the organization in the context of development. The growth in the number of customers lead to new problems in the area of customization and delivery, as the company needed to develop new strategies to balance competing priorities including product development, marketing, and others. Given these multiple priorities, learning appeared to be linked to tangible outcomes, and focused on short-term goals.

For ORG-C, experimentation represented both a necessity and overarching strategy for development at a nexus of contradictory dynamics of change in development. Three key areas of interest illustrate the distinctive nature of the type of development and knowledge creation observed in this organization. First, in the context of limited resources, the organization supported activities in which problem-solving and reflection were central, oscillating between different approaches in search of solutions for growth. Second, in this distinct organizational environment, coping with unforeseen circumstances and events was a mechanism for navigating developmental growth as employees and their managers learned to adapt while developing and shifting daily priorities in response to changing requirements through everyday innovations. Learning to cope effectively with these challenging circumstances was particularly important in managing everyday work, while balancing the anxieties of uncertainty with the hopes and confidence for success. Third, development, in this context, required the creation of knowledge necessary to overcome daily challenges in different ways, through active experimentation, yet the accumulation of knowledge itself generated distinct and complex new forms of obstacles which had to be confronted. The search for any ideal approaches to development in this context appeared to remain elusive, yet embracing the need for coping with challenges provided a robust source for hope and direction for change in practice.

The forms of pendulation between fragmented and the consolidated approaches to development appeared to provide a driving force for development in what could be distinguished
to be a comparatively more discontinuous and unpredictable trajectory of development. It is important to note that the small size of the organization provided considerably distinct opportunities for expansion and at the same time more significant fragility in development. The pathways forward on this trajectory were rich in contradictions, providing opportunities for change with every step forward. Conclusions in relation to the findings in this chapter are more tentative as the organization examined was actively searching to discover or construct its own cultural dynamic at the time of the research, under conditions of rapid development.

In comparison to ORG-A and ORG-B, ORG-C displayed notable manifestations of struggles expressed in the descriptions of experiences of transformation under conditions of rapid development. Engeström (2018) explained the importance of contradictions in relation to development as follows:

Contradictions are the prime source of change and development in activity systems.
Contradictions are not the same as problems or conflicts. Contradictions are historically accumulating structural tensions within and between activity systems. An activity system is constantly working through tensions and contradictions within and among its elements. Contradictions show themselves in disturbances, often taking the shape of discursive manifestations such as dilemmas, conflicts, and double binds (p. 16).

“In this sense”, claims Engestöm (2018) elsewhere, ”an activity system is a virtual disturbance-producing machine” (p. 16), aspect which was visible in the context of highly uncertain conditions and future prospects of this small organization which oriented practices toward re-active approaches to change, pendulating between consolidated and more fragmented initiatives. Furthermore, this constant struggle for business survival shaped situated actions as the organization was actively navigating the challenging ecology it was part of. The following sections highlight some of the strategies adopted for development illustrating the MBCC dynamic at the basis of an emerging type-e trajectory of knowledge creation in practice.

7.3 Manifestations of Contradictions and the MBCC Dynamic of Knowledge Creation: Examining Activity-Developmental Specimens in Startup Development

The attention to contradictions as a source of change in learning is based on a growing interest in dialectical approaches to development and a need to better understand relations in the fabric of startup work in the situated contexts of the innovation ecologies they are part of. In
contrast to Cartesian/reductionist approaches which frame complex phenomena as mostly static and decontextualized, dialectical approaches focus on the multifaceted nature of change and the interrelations which serve as the basis for a deeper analysis of developmental change and learning. Furthermore, everyday startup practices in this context can be described as full of inconsistencies, tensions, and uncertainty, leading to the need for rapid decisions in attempts to solve and resolve challenges. Understanding dialectical phenomena in the CHAT/EL tradition with a focus on manifestations of contradictions provides complementary insights in areas of IKM literature where other methods have largely been unsuccessful. To describe this back and forth movement between opposing choices, practices and propositions, I apply the term “dialectical development” based on Engeström’s theme of contradictions as a source of change in development, with emphasis on both individual and organizational transformation in practice (2018b). I argue that contradictions represent a valuable topic of interest in the context of an emergence of “new forms of work” in the ecologies for innovation and broader socio-cultural macro structural dynamics startups are part of (Miettinen, 2001; Reijo, 2009).

7.3.1 Manifestations of Contradictions and the MBCC dynamic of knowledge creation: contradictions in production and development as dialectical-reflective practice

Strategies for development in ORG-C were based on an awareness of the need to overcome challenges in the process of development within the structural and material conditions which were limiting growth. Shaping these contradictory conditions of challenges/opportunities for development were factors including limited resources or the lack of knowledge of specific strategies for development. ORG-C therefore had to use the tensions embedded in the process of rapid development in navigating potential options for actions and strategies in practice. Emerging conflicts, dilemmas or double binds invoked learning processes by means of zig-zag change oscillations of object-oriented actions in the process of development. This highly dynamic and discontinuous type of development was particularly pronounced in ORG-C as it struggled to cope with rapid change, resulting in a distinct trajectory shaping orientations towards getting-by practices for knowledge creation and change in learning.

In order to understand the complexity of development of ORG-C, it is relevant to consider the dialectical aspect of startup work I describe in this section as “reflective practice”. We may describe this strategy as dialectical-reflective practice building on the CHAT/EL approach grounded in Engeström’s view of contradictions as a source of change in development
(Miettinen, 2001; Reijo, 2009). Viewed from this perspective, this strategy allows us to more easily visualize a shift in the object of ORG-C as viewed from the vantage point of CHAT/EL towards more effective approximations of alignment to customer needs. In other words, the organization had to reflexively examine customer feedback in order to shape future directions in development, under conditions of rapid change, uncertainty and time pressures.

To more effectively grasp the role of contradictions in the development of ORG-C as dialectical-reflective practice, I will consider an activity-developmental specimen illustrative of the nature of the distinct trajectory of ORG-C. In this context, we can observe temporal limitations reflected in the urgency to acquire new clients for the medical media product. Despite intense recent activities for development in the organization, there was limited progress towards goals. As a result, the organization decided to focus on client feedback as a source of insights for new strategies and practices for development. An important glimpse at this change was provided by the following excerpt illustrating a projection of growth in the form of a chart. This anticipatory projection represented a cognitive artifact which initially emerged as an abstract conceptualization, constructed over time and enriched through metrics. Tracing the historical formation of the chart mentioned by the participant, we can see that its emergence was the result of the initial vision of the manager/founder. This cognitive object had to be re-evaluated, as described by the owner/manager in the excerpt below:

It is like we are always on the edge, and we need to keep going. We had to take a moment and ask ourselves how to proceed, we had to get together and understand what our customers were thinking, how we can help them. So, we actually had to do something about it, prepare a feedback form and collect some data. It’s not easy to understand clients, when you hear something it is usually something that is really good or if something doesn’t work and we have to fix it. So, we did that and then we printed all the feedback and had a meeting, looked at the charts and feedback and realized clients wanted more self-serve functions. In that meeting we had this moment when we realized there was a better way to do things, and that changed everything. (P42K9472)

Changing directionality in development appears to be a key aspect shaping the dynamic of work. By looking closer at the above quotation, we can observe a dialectical conceptualization of the need for change as perceived by the participant in the evaluation of the availability of potential feedback described as a sharp dichotomy of good and bad. This is a significant idea which was brought into awareness in relation to the potential for mediating this contradiction in practice. By
focusing on the social context of the contradiction, the organization considered multiple approaches which mediated the *dialectical-reflective practice* in attempts to solve the dilemma and facilitate more effective *production*. In other words, ORG-C mediated a *contradiction of production* through a *dialectical-reflective practice of knowledge creation* in development.

To elaborate on this contradiction of production and its implications for knowledge creation in development, we can see that the change in the mode of communication with emphasis on feedback resulted in a particular kind of customer-related knowledge which resulted in a shift in the object/goals of ORG-C towards the adoption of more “self-serve” functions. In this instance, we can see a form of “feedback learning” or “double-loop learning” which requires specific actions, some of which are potentially expansive. The particular adoption of client feedback to mediate the complex production-related mechanisms of startup development by means of a dialectical-reflective practice resulted in a shift in practice characteristic to the type of trajectory of ORG-C.

The activity-developmental specimen discussed in this section illustrates that development is not always a natural process, but one which requires ORG-C to continuously mediate contradictions over time. Instead of suppressing, obscuring or ignoring different forms of contradictions in production, it is possible to transcend dichotomies through dialectical-reflective practices which have the potential for learning and expansion. In essence, this example contributes to the conceptualization of mechanisms for facilitating learning by emphasizing the significance of contradictions in generating development in everyday startup work practices.

7.3.2 Contradictions and the MBCC dynamic of knowledge creation and development: Contradiction of exchange and the development of interactive expertise

The mechanism of startup growth and development is based on exchanging the object of work for financial capital which can be used for new initiatives and expansion. In other words, ORG-C, like most startups which develop under the historical conditions they are positioned in, was part of the macro structural mediations of systems of production, exchange, distribution and consumption (Engeström, 2014a; Holt & Morris, 2015). The product of startup work can be viewed as a commodity which had to be exchanged in the market. To achieve this goal, ORG-C had to actively find new customers, articulate the value of the product and successfully exchange the product in exchange for capital. In other words, ORG-C had to find new clients and sell the product by generating the necessary knowledge about client needs and requirements and translate
that knowledge into value statements which could mediate the client acquisition process. The significant challenges faced by ORG-C in this context can be described as a contradiction of exchange, which required solutions for development. This section attempts to theorize this process to gain insights into this dialectical developmental process and its implications for the emergence of a distinct trajectory and type of knowledge in ORG-C.

In order to acquire new clients, ORG-C attempted different exchange related strategies for development. One of the strategies was to create a territory map to identify prospective customers in the local area. Proximity was a significant factor in order to allow in-person visits to the offices of prospective clients. Another strategy was to create a list of prospective clients who had to be called individually. While there were many potential strategies which could be adopted, it was relatively clear that these strategies would involve an element of a “trial and error” approach. Indeed, the acquisition of new clients involved rejections, from which insights were derived and refined. Based on these practices which may be described in terms of struggles in experimental development, a particular form of knowledge was created. The challenge of development in the activity-developmental specimen I discuss below can be conceptualized as a contradiction of exchange, where no rules appear to be evident. It is important to point out that the client acquisition process was not approached carelessly, but rather systematically, generating different metrics and operationalizing success. By adopting this recursive approach, ORG-C was able to develop what works and what could be improved. This approach to development can be described as prevalent in everyday startup work activities of ORG-C, which appeared to rely heavily on a trial-and-error approach. Notably, this approach was a form of active knowledge creation and learning, highly engaging yet which required individuals to cope with the rapid change and uncertainty in development.

Understanding these phenomena from the vantage point of CHAT/EL requires a number of important concepts to describe the contradiction of exchange embedded in the structure of activity and its internal relations. In particular, the notion of object/goal-orientation will become increasingly significant in the analysis of the activity-developmental specimen in this section. We will observe how goal-oriented actions in search of solutions to the exchange problem lead to the realization that multiple solutions exist instead of a single solution as the object/goal. The complexity of the exchange contradiction cannot be solved by an individual alone - it is rather “an interactive accomplishment, constructed in encounters and exchanges between people and their artifacts” (Engeström, 1992, p. 7) and can be described in Engeström’s words as “interactive
expertise”. The process of trial-and-error presented in the activity-developmental specimen in this section illustrates the creative approaches and experimentation at the basis of development in ORG-C. Overall, we therefore begin to observe how “interactive expertise” (Engeström, 1992) is developed through “employee driven innovations” (Haapasaari et al., 2018) as attempts to resolve the contradiction of exchange presented in this section.

The innovations in everyday startup work practices can be conceptualized as procedures, ideas or other practices which lead to the achievement of the goal (Haapasaari et al., 2018). An employee explained:

We had no idea how the clients would respond, or how many meetings would be required to acquire a new client. I quickly realized that it was much better to go personally and visit client offices instead of calling. We actually brought a consultant to help us find an effective strategy. I recorded my observations based on client interactions and then we talked about how to approach new accounts, articulate the value better and so on based on the accounts in the territory map. We did this together, and my colleagues helped a lot to create the vision, adapt to customer expectations or customize our message. (P4937J24)

In this excerpt, we can distinguish an example illustrating the development of interactive expertise in startup work activity as an interactive accomplishment reflected in the struggles of development shaping the creation of a distinct type of knowledge in the context of the change dynamic outlined. In this case, we learn that “colleagues helped a lot”, suggesting the dynamic nature of exchanges between startup employees and the artifacts they interacted with in daily practices to transcend the exchange contradiction described previously. I argue that this contradiction provides the foundation for the initiation of employee driven innovations in different forms as they explore multiple paths to discover elements which can contribute to solving or resolving the challenge of client acquisition. In this context, experimentation practices are reflected in the different strategies adopted by ORG-C, including consulting, collaborative meetings or client visits. As the employee pointed out “Surprising how we find solutions when we are not even expecting” (P4937J24), suggesting that ideas emerge from the process of experimentation.

In summary, this section highlights how a contradiction of exchange can be a source of change in development and addressed through employee driven innovations to generate interactive expertise. By adopting experimental strategies and systematically solving the tensions/challenges associated with this contradiction, ORG-C was able to develop on a distinct
trajectory which involved a specific type of knowledge. This section provides useful elements for the conceptualization of innovative approaches in problem-solving, aspects which are particularly relevant for startups like ORG-C in times of rapid change.

7.3.3 Contradictions and the MBCC dynamic of knowledge creation and development: contradiction of consumption/distribution and the potential for expansive learning

In the process of contradiction-driven development discussed so far, a distinct type of knowledge was created, shaped by the structural conditions in the organization, and itself shaping the distinct trajectory of the organization in change. Understanding how this knowledge will be used and distributed within the organization represents a key question this section seeks to analyze. In the previous sections, we observed how a production contradiction was the source of change in a dialectical-reflective practice, and how an exchange contradiction was the source of change in employee-driven innovations. In this section, I argue that a consumption/distribution contradiction can be seen as the source of change in development in this activity-developmental specimen, shaping a distinct type of knowledge created in practice.

Developmental practices in ORG-C were oriented towards the accumulation of knowledge gained through experience and experimentation. This accumulation of knowledge capital was intended to enhance performance mechanisms recursively. In other words, the accumulated and accumulating knowledge was consumed and distributed within the internal mechanisms of knowledge construction. This process had to be managed and translated into what Dutreneit (2000) describes as “strategic capabilities”. In the activity-developmental specimen discussed in this section, we can observe patterns of knowledge accumulation supporting development and change, leading to a contradiction of consumption/distribution: the new knowledge produced became itself a tool mediating a process enhancement/community building contradiction in practice.

The small size and limited capital of the startup appeared to be limiting factors for growth, structuring the engagement of ORC-C in the innovation ecology it was part of and shaping its orientation towards strategies for coping with change. In contrast to the stabilization and possibility knowledge created in the other startups, development in ORG-C could be described as one characterized by coping/getting-by/zig-zag patterns of change. In particular, this organization employed strategies which were mediated by limited resources and opportunities for partnerships in development, orienting practices towards experimentation in both collaborative
and more fragmented developmental activities in search of best practices. Unlike the other organizations in this study which developed relatively incremental patterns of knowledge creation shaping their developmental trajectories through either more personalized or collaborative approaches, ORG-C projected an uncertain, but potentially expansive future which was dependent upon transformative opportunities for change.

In the face of rapid development, ORG-C experienced disruptions and shifts in strategy orientations, as it navigated complex problems resulting in a need to manage knowledge resources. In response to these challenges, the organization employed a consultant to help analyze and systematize an approach to a transformative approach to knowledge creation. In this context, the consultant played an important role in developing and coordinating approaches in shaping strategies for creating a developmental path aligned with the transformative vision of the organization. The consultant participated in planning sessions and acted as a subject matter expert in designing the knowledge strategy for the organization, articulating areas of focus. In my conversation with a participant from ORG-C, it became clear that the management of knowledge is itself a form of knowledge creation which is situated in practice and which requires co-development in specific organizational contexts in change.

To briefly review, Engeström (2016b) described this dichotomy as follows: There is a deep gap and mutual hostility between two important rhetorics of transformation in organizations and activity systems. The first one we call process efficiency rhetoric; the second one we call community building rhetoric. Process efficiency rhetoric is usually used by upper management and engineering consultants, reflecting external expectations directed to the organization, mainly concerned with the output and cost-effectiveness of the activities concerned. Community building rhetoric is often used by human relations consultants and human resource developers, aimed at reflecting internal experiences, need for participation and work-related wellbeing of the organization’s practitioners. (p. 6)

As knowledge accumulated in the process of development, it was transformed into other forms within the organization. These new forms of knowledge shaped what Fischer (2010) described as “cultures of participation” and which can support learning and expansive forms of development. Furthermore, by overcoming this contradiction it is possible to avoid the risk of an “encapsulation of learning” (2010) and shift focus on more expansive forms of development in practice.
Referring to the challenge of accumulating information, a manager/owner described an experience of this form of contradiction-driven change as follows:

It is challenging to know what you need to know at the right time and most of the time I couldn't get started, it was just too much, and data kept accumulating in our systems. I guess our philosophy was, the more the better, and that is good in a way, but then it became too much to manage. That is when the consultant we hired helped us re-imagine our strategy and how we can make better use of what we have. Part of it was, ok, here you start a new process, here you use existing data. We knew we had to start somewhere, and the consultant pointed out some areas we knew we had some challenges with, in a very effective way, and helped us articulate the specific areas exactly where we had these challenges. Now we have a lot more data, but it is much easier to manage and work with. (P42K9472)

In this excerpt, the participant described a process of navigating a tension/contradiction associated with growing amounts of unstructured information. In other words, knowledge accumulation represented itself a contradiction of consumption/distribution, which had to be mediated or resolved. On one hand, more information was correlated with greater chances of developing valuable customer-related insights, while on the other hand, this large amount of information/knowledge became “too much to manage” for the organization. This contradiction represented a source of change in development, as the consultant encouraged the re-organization of knowledge practices which connected current practices with the potential for meeting the requirements of significantly higher volumes of data as projected in the future of ORG-C.

As noted earlier, structuring approaches to managing knowledge was necessary, leading to pressures as contradictions which were translated in practice. This process viewed in relation to the broader strategic context of development involved the development of an ability to specify the specific areas where the contradictions were located to facilitate subsequent analysis and implementing the model. The participant articulated the complexity of interrelated processes shaping the organizational conditions which have facilitated the initiative for change, resulting in identifying the precise loci for intervention, enabling the change processes to take place. In other words, accumulating knowledge was not sufficient in the process of development, reinforcing the need for developing solutions in addressing the growing amounts of information. This specimen provides additional support which solidifies the characteristics of the distinct type-e trajectory
that can be distinguished in ORG-C. This specimen is reflective of broader patterns of activity shaping the development of the startup, and the distinct type of knowledge created over time.

In summary, the strategy discussed in this section oriented ORG-C towards a distinct type of knowledge and trajectory of development. We can observe a specific consumption/distribution contradiction in the activity-developmental specimen examined, indicative of the broader dynamic of activities of ORG-C in the process of development. The accumulation of knowledge in the form of information aggravated the contradiction, which was temporarily resolved through consulting. While the partial resolution of the consumption/distribution contradiction resulted in process enhancement as ORG-C continued to struggle on its trajectory of development and growth, as in the absence of a community building strategy in addressing the consumption/distribution contradiction highlighted in this chapter, learning appeared to remain “encapsulated”. On the other hand, the adoption of a community building strategy in transcending the consumption/distribution contradiction would likely transform encapsulation into expansion.

7.4 Practical/Re-active and Experimental Knowledge Creation of Activity-in-Development

Conditions of rapid change observed in this organization structured its orientation towards mixed forms of knowledge creation. At the time of the research, the organization was balancing possibility and stabilization knowledge creation while evaluating process efficiency strategies in response to the increasing demands of complex activities in constant change. Knowledge creation under the specific conditions of development in ORG-C depended on tool creation within the organization from the most basic applications (spreadsheets, text processors).

According to one of the participants from ORG-C, the work was informally divided among individuals. However, employees and their managers in this organization viewed the ongoing struggles as opportunities for leadership, creating a sense of purpose. Finding potential solutions to emerging tensions or challenges, in this regard appeared to be perceived as adding significance to their work. Individuals also placed creative problem-solving in a central position in the context of their developmental trajectory. Creating knowledge for problem-solving under these conditions required an attention to transformation and the emerging instrumentality opening up new possibilities for advancement in development. Significant knowledge in this case was created through problem-solving in response to tensions, or dilemmas, facilitating the
visualization of contradictions to create new possibilities for change and development, however, development was challenging, and uncertainty was prevalent in daily practices.

The case of ORG-C demonstrates a distinctive approach to development as this organization constructed experimental pathways on the developmental trajectory it was on, actively producing its distinct culture in change. On this developmental trajectory, navigating contradictions played a significant role in relation to the MBCC dynamic presented, initiating actions with expansive potential. Daily practices presented significant opportunities for questioning, analyzing or pointing out the contradictions within or across organizational boundaries, which could initiate developmental processes in situated contexts.

In this section, we learned how ORG-C developed knowledge in response to challenging conditions and limited resources by navigating contradictions of production, exchange and consumption/distribution. In the next section, we will examine the implications of this approach for learning of individuals-in-activity shaping their orientation towards mobility in the innovation ecology.

7.5 Conceptualizations of a type-e Trajectory in Tendential Development

The development of ORG-C cannot be simply conceptualized as a series of linear steps, but rather as discontinuous, yet potentially accelerating transitions over time under conditions of rapid change. This case illustrates how situated activities in the specific the socio-cultural context of this organization structured its development leading to a distinct trajectory compared to ORG-A and ORG-B. In this section, I therefore bring into focus empirical materials from the activity-developmental specimens examined to support the analytic claims related to this emerging trajectory of development and change.

ORG-C illustrated the high aspirations of small, emerging startups in the innovation ecology this organization was part of. Opportunities for development were navigated as everyday struggles shaped by the specific conditions in ORG-C. Furthermore, envisioning and comparing outcomes to those of other successful organizations seemed to provide a driving force for the distinct type of knowledge creation in practice. The case of ORG-C demonstrates the relativity in developmental choices and possibilities in comparison to the other organizations examined, structuring everyday actions and strategies over time. In this context, despite its limited resources
and comparatively smaller size, ORG-C remained dedicated to experimentally shaping its own pathways on a trajectory aiming towards exponential growth.

In order to support this form of development, this organization had to develop its own model for growth and expansion. Yet despite the restrictive conditions shaping its development, this organization appeared to navigate contradictions despite discontinuities, shifting orientations repeatedly between fragmented and collaborative practices in change. These shifts created conditions for a trajectory characterized by informality and experimentation in approaches to development, which, despite its development was fragile at the time of the research. This trajectory demonstrates the complexity in development at or around the time of its genesis in times of uncertainty and rapid change. The case of ORG-C thus demonstrates a visionary/reactive approach to struggles in development guided by a vision of exponentiality in growth constructed in part beyond organizational boundaries and to which other organizations similar to ORG-C aspire to. This vision or specific goal could not be vividly described by participants, aside from comparisons to other organizations which had achieved such goals.

The transformation of contradictions from one form to another was prevalent in work practices of ORG-C. One of the interviewees from this organization stated visions of global reach and expansion, demonstrating aspirations which were shaped by narratives of other organizations that had experienced similar types of growth. These aspirations for exponential development constructed an orientation towards embracing any opportunities for partnerships and variations in the object of work. In particular, ORG-C deviated from the initial product offering and started to co-create solutions with clients. This strategy increased operational costs, leading the company to re-evaluate practices by balancing scalability and the ability to customize the product to fit the needs of the client. The organization learned to include more options than necessary for most clients and charge according to the features enabled. Providing the service online allowed the possibility for global expansion. As one of the interviewees pointed out: “Anyone will be able to use the product and just turn on the features they need, and turn off the ones they don’t. It is pay-as-you-go”. At the time of the research, the organization was continuing to explore ways in balancing the two aspects of development.

Constructing new and more expansive forms of knowledge in development requires mechanisms which can enable the navigation of a wide range of contradictions in development. In this context, knowledge construction was interrelated with implementing the new practice, reflecting on its significance/implications and consolidating it. The ideas discussed here are
representative of a type-e trajectory of knowledge production and involve a conceptualization of struggles for meaning making in order to cope with new and challenging natures of organizational growth. It is therefore relevant to obtain a sense of the transforming nature of knowledge which is experienced by employees and differentiated approaches to navigating the struggles embedded in the complexity of specific changes in the processes of completing journeys in development. A careful analysis of empirical examples from ORG-C suggests a range of developmental stages in activity on a type-e trajectory which I presented above in order to illustrate relevant aspects of the transformation process in times of rapid change.

7.6 Summary

This chapter began with a discussion of the concept of contradictions as understood through a CHAT lens in relation to the EL framework. I then proceeded to situate the concept of contradictions in the context of CHAT. This analysis culminated in examining specific activity-developmental specimens conceptualized in situated startup contexts by integrating socio-cultural perspectives applied to an examination of contradictions as a source of change in learning. Different aspects related to contradictions as a source of change in learning were illustrated by making visible elements which were deeply embedded in dominant dimensions of the macrostructural dynamic of development ORG-C navigated through. These aspects were found to be actively produced/re-produced in work activities as individuals navigated the rapid nature of change in work practices, giving rise to experiences which were relevant in the context of the overarching context of the innovation ecologies ORG-C was part of.

The observations in this chapter highlight the importance of contradictions as a source of change in learning and provide empirical support for an enhanced understanding of change processes unfolding in startup work. These examples also provide a deeper understanding of learning dynamics and specific aspects of struggles in experimental practices of contradiction-driven change often understudied or neglected in IKM research. The conceptualization of development on a type-e trajectory provides rich opportunities for an examination of strategies, intuitions and feelings individuals use to balance multiple dimensions of work simultaneously. Understanding these dynamics in activity, I argue, provides a solid foundation in appreciating the complexity of work/learning in startup environments examined in times of rapid change.

To conclude, this chapter provided a discussion of contradictions as a source of change in the development of the startup organization examined. Building on this transformative potential,
the next and final chapter examines the degree of translation in relation to a contradiction/resolution/synthesis (CRS) dynamic which can be conceptualized as an examination of the potential for expansive learning (PfEL) in the context of knowledge creation and development in times of rapid change. A key argument made was that different forms of contradictions are grounded in broader socio-cultural dimensions of rapid organizational change which shape the structural dynamics of social relations at the basis of an expansive view of learning. Empirical data were used to elaborate the arguments made through detailed examinations of aspects which expanded an understanding of learning in these contexts, as viewed through an activity-theoretical lens. Throughout the chapter, it became increasingly clear how different forms/levels of contradictions were navigated through contradiction-driven mechanisms sometimes perpetuating practices and other times hindering development in oppositional ways. Building on these CHAT foundational concepts, we saw how startup professionals in ORG-C struggled to navigate these contradictions in the context of rapid developments in their organization. The next chapter will apply these insights in conjunction with ideas from the MBCC dynamic described to examine the potential for expansive learning in relation to distinct directions of development of individuals-in-activity.
Chapter 8: Integrative Discussion and Conclusions
This chapter highlights the contributions and implications of the study’s findings for practice, proposes new directions for future research and outlines areas where the activity-theoretical approach adopted in this study can enhance current IKM frameworks in different contexts or settings. The chapter concludes with a discussion of an overarching aim to expand knowledge on learning dynamics in the field of IKM overall. By deepening the examination of the macro-structural and contradiction/resolution/synthesis (CRS) dynamics illustrating the expansive view of learning constructed, this chapter more closely examines the transformative potential of contradictions as a source of change in learning. More specifically, the potential for expansive learning (PfEL) is examined using a contradiction/resolution/synthesis (CRS) dynamic across startup organizations examined, which initiates a dialectic reconceptualization of learning deeply embedded in the structure of startup work practices related to knowledge creation in times of rapid change. Furthermore, this discussion enables the possibility to infer directions of development of individuals-in-activity towards projections of professional/”knowledge work” futures in relation to distinct modes of participation of individuals-in-activity and variations in learning on the distinct and divergent trajectories of change constructed in this research study.

8.1 Introduction
The previous analytic chapters outlined three distinct and potentially divergent trajectories of knowledge creation in relation to distinct strategies employed by participating organizations in coping with rapid change in their development. These trajectories were empirically informed and aligned to the KATs adopted from CHAT to examine the nature of this dynamic of change. In this chapter, I will demonstrate difficulties with resolution/synthesis in translation efforts that tend to reproduce contradictions in only slightly altered forms. A careful analysis of the contradiction/resolution/synthesis (CRS) dynamic demonstrates how this translation unfolds as a learning-in-activity dynamic by adopting an analytical-empirical approach grounded in participant narratives in organizations examined. Based on these insights, I suggest tendencies about the nature of the dynamic which gives grounds for predictions of the directions of development of individuals-in-activity as projections of startup/knowledge work futures related to
individual modes of participation in activity in response to developmental strategies in times of rapid change.

This research focused primarily on social relations shaping a set of very specific learning practices that individuals undertake in startup organizations, adopting an activity-theoretical perspective. In this study, an emphasis was placed on understanding learning dynamics individuals engage in as they navigate the complex nature of startup work, which I argued, was at times facilitated or hindered by mediating factors in different contexts. It should be emphasized, however, that this study does not offer a comprehensive examination of learning of individuals in the organizations examined, rather, it focuses on key learning dynamics that are used to help indicate the character of knowledge created and trajectories of organizations in times of rapid change. This represents a subtle, yet important difference. The use of an activity-theoretical framework provided valuable concepts including mediation, boundary crossing and contradictions as a source of change in learning. These key analytic concepts represented theoretical tools which enabled a complex discussion of different aspects of learning integrating the micro levels of analysis with broader, macro level conceptualizations of socially constructed phenomena of learning dynamics in startup work practices. This multi-dimensionality of analysis enabled a solid examination of relations embedded in structural dynamics of startup organizations in times of rapid change.

To review, Engeström (2014b) described expansive learning (EL) as “a historically new type of learning, which emerges as practitioners struggle through developmental transformations in their activity systems, moving across collective zones of proximal development” (p. xvi). This study makes visible a range of socio-cultural relations which shape learning practices in startup organizations by examining empirical data based on participants’ perspectives and experiences of situated, concrete practices from an activity-theoretical perspective. In the previous chapters, I sought to illustrate an expansive view of learning predicated upon the interrelation of the concepts of mediation, boundary crossing and contradictions as a source of change in learning. I described this view in relation to a mediation/boundary crossing/contradiction (MBCC) dynamic. Throughout this research project, I sought to understand the complex nature of learning dynamics in small, but highly innovative startup work environments, an area which, as shown in the indicative literature presented earlier, has not been addressed extensively in IKM literature to date. Adopting this activity-theoretical perspective aligned to the EL model in relation to Engeström’s work specifically, I developed a central argument that learning is deeply embedded
in the socio-cultural dynamics of innovation in practice shaping variations in individual *modes of participation* of individuals-in-activity over time. In this chapter, I further examine the potential for expansive learning (PfEL) as a contradiction/resolution/synthesis (CRS) dynamic in relation to the degree of translation of contradictions in practice (*realized, un-realized and under-realized*).

Attempting to understand the complexity of everyday *knowledge creation* practices in startup environments required a re-evaluation of learning dynamics as a function of situated and interconnected relations *mediating* practices in times or *rapid change*. In this context, Engeström’s conceptualization of expansive learning provided a valuable starting point into an activity-theoretical analysis of learning as a socio-culturally mediated phenomenon in practice. This type of analysis draws on concepts emerging from the CHAT tradition to make visible cultural and historical relations which highlight how expansive forms of learning can emerge in social practices. A consideration of learning as socially situated and culturally mediated was therefore enabled by a conceptualization of activity in startup work as the primary unit of analysis.

Using activity as the starting point in understanding the interconnected nature of startup work practices provided a robust foundation in examining the unique nature of startup communities as positioned within broader structures mediated by relations which are historically constructed and constantly evolving through mechanisms including the MBCC dynamic described in the previous chapters or the CRS dynamic discussed in the following sections. The concepts of *mediation, boundary crossing* and *contradictions* as a source of change in learning provided useful analytic themes in examining how individuals perceive learning in the interconnected work practices described in this study and how these practices in turn produce the cultural dynamics of learning in the organizations studied. At times, learning appeared to be hindered by contextual conditions which shaped the use of tools as individuals navigated complex and fast changing work requirements. Highlighting these complex activity-focused relations in the context of evolving work practices provides insights into broader conceptualizations of the nature of the ecology for innovation which extends in multiple dimensions of the *macro-structural dynamic* introduced in the first chapter. The fine-grained analysis of interactions in the empirical data suggests subjectively constructed forms of learning which are integrated into situated practices at the basis of negotiated mechanisms of work transformation. Startup environments characterized by a high degree of uncertainty provide
contexts where social interactions are highly dynamic and enable abundant opportunities for negotiation and change.

The research question addresses the lived experiences of change and development of startup employees and manager/owners through a theoretically informed dialogue between the KATs and the empirical context of the startups revolving around IKM. The struggles inherent in startup work and development produced forms of practice which are necessarily related to the object-oriented-ness of development. The complex forms of knowledge/learning developed on the distinct and potentially divergent trajectories in activity were actively and agentively constructed, shaping individual modes of participation, as individuals not only adopted distinct directions for development, but also actively struggled to generate meaning in relation to the significant and often elusive horizons of innovation. As they navigated these turbulent conditions of complex and changing work, they created rich opportunities to generate knowledge, defining and re-defining activities unfolding in divergent ways. Experiences and perceptions of significance, meaning and object-oriented-ness shaped the distinct character of startup work at the time of the research study.

Claims emerging from this study are meant to speak to the different themes outlined in Engeström’s EL framework, with a particular emphasis on activities relevant to the key areas of IKM highlighted in the indicative literature review in Chapter 3. Collectively, these interrelated claims provide a robust argument that learning is socio-culturally constructed and mediated in situated work practices of startup organizations over time. Navigating contradictions in the process of rapid change had a significant effect on learning, shaping the perspectives and approaches of individuals in everyday work practices as reflected in the directions for development of individuals-in-activity outlined. In the following sections, I integrate the insights developed to evaluate the potential for expansive learning as a contradiction/resolution/synthesis dynamic of change in learning across the organizations examined, examining different forms of contradictions within and across these organizations over time.

8.2 Translation of Contradictions and Variations/Changing Modes of Participation in Activity on Distinct and Potentially Divergent Trajectories of Development

In the course of the research study, it became increasingly clear that the contradictions embedded in the relational processes of development were transforming and actively converting
in practice towards a form of synthesis, process I describe as translation. In other words, contradictions were often actively solved in development, but rarely resolved. As they approached synthesis, they transformed into only slightly altered forms. While all startups examined produced contradictions in daily practices, they converted them, more or less actively, and to different degrees. As a result, the nature of expansive learning may be described as realized, under-realized and unrealized, depending on the degree of conversion of contradictions in practice.

The organizations examined were engaged in similar struggles for growth and development yet adopted different strategies as mechanisms for the translation of contradictions in practice. These struggles for rapid and significant growth, however, relatively rarely lead to synthesis in translation in the specific conditions of the innovation ecology they were part of. Despite the high rates of failure among startups in general, these startups considered that they had a viable chance to achieve the goals they envisioned. By attempting to grow and develop despite challenging conditions, they were reproducing macro structural narratives of innovation in relation to aspirations for success. The extent to which these startups produced and translated contradictions in practice was related to distinct degrees of expansive learning shaping individual directions of startup knowledge work futures in practice.

Building on the analyses of distinct trajectories of knowledge creation introduced in the previous chapter, it is important to point out the characteristics of these emerging orientations shaping variations in individual modes of participation in activity over time. The aim of this chapter is to consolidate the characteristics of the three typologies of learning as a function of the KATs adopted across organizations examined to illustrate variance within these trajectories in relation to different degrees of translation of contradictions in efforts at synthesis. By presenting individual variations within trajectories as a function of individual modes of participation in activity in relation to the translation of contradictions, it is possible to observe how contradictions are reproduced/converted in altered forms, but also accumulated if ignored or obscured, leading to aggravation over time.

The diversity of modes of participation in activity in response to strategies for development was evident in the three organizations examined. ORG-A illustrated tendencies towards formalization in relation to the socio-culturally mediated nature of participation and learning in startup work activities in times of rapid change by making visible the interrelations in activity between its different constituents. ORG-B provided vivid examples of collaborative
strategies in the context of rapid development, while ORG-C employed strategies oriented towards practical/phronetic knowledge creation in development.

In this section, I therefore direct my attention to these distinct modes of participation of individuals-in-activity, and hence, learning. Before examining this aspect more closely, it is useful to review the MBCC dynamic at the basis of the expansive view of learning constructed in previous chapters, which will enable an examination of the potential for expansive learning (PfEL) as a contradiction/resolution/synthesis (CRS) dynamic in startup organizations in the following sections of this chapter. To review, illustrative examples in ORG-A reflected strategies in development creating stabilization knowledge in the form of repeatable, process-oriented practices, supporting incremental changes aligned to the business plans of the organization and set goals. In this context, the organizational strategies aimed to improve the efficiency of processes by quantifying and measuring progress towards set goals using different mediational means including metrics or the process-orientation. Strategies in ORG-B were focused on collaboration, orienting practices towards possibility knowledge in the form of new models or prototypes. This form of knowledge was extracted from collaborative practices through mechanisms including co-operation and rewarding contributions. In this context, collaborative and boundary crossing practices were used to support knowledge creation as a valuable resource, augmented by the genesis of shared value in the construction of new products and services. In contrast to strategies in ORG-A, ORG-B supported developmental strategies which allowed employees to explore and develop new forms of collaboration with clients in distinct environments as zones of proximal development by means of innovation-focused meetings in co-working spaces, co-configuring their approaches to development and creating knots as a strategic knowledge creation mechanism. The third organization, ORG-C developed strategies relevant to practical action, orienting employees towards experimentation and coping with rapid changes, resulting in forms of getting-by knowledge. Strategies for development were more informal compared to the other two organizations examined, and this organization was often reproducing macro structural narratives of innovation. As one of the manager/owners from ORG-C underlined, “To innovate, you have to believe, work hard and learn from others who have been successful. You have to have the right mindset.” (P42K9472). A participant from this organization believed that formal education was necessary, but not the most important factor in achieving the level of success required in the startup ecology. As detailed in the previous chapter,
this organization projected an exponential trajectory for development, however, the pathways to this projection appeared to be characterized by instability and discontinuity over time.

Examining variations in changing *modes of participation* in activity in the context of development contributes to a deeper understanding of distinct dynamics in each of the organizations examined, shaping strategies and in turn being shaped by the strategies adopted. It is therefore important to conceptualize the unique responses of individuals-in-activity through their *modes of participation* in relation to the distinct typologies of knowledge created.

Consequently, the distinct modes of participation in activity of individuals are the result of their unique experiences and backgrounds, progressing on their developmental trajectories, yet through subtle variations in their approaches to change and knowledge creation. The argument supported in this chapter contributes to a broader claim that trajectories of knowledge creation / startup knowledge trajectories should be analyzed in their situated contexts within the broader socio-cultural conditions shaping their development. The different degrees of translation of contradictions in the context of *mediation* and possibilities for *boundary crossing* available to organizations examined in this study were closely related to their abilities to translate contradictions in the process of development, shaping individual directions and distinct *modes of participation* in activity over time.

While strategies of startup organizations examined were influenced by the specific conditions they operated under and the founder’s background/vision, their future orientations shaping individual trajectories for development were influenced by strategies and artifacts employed to *translate* contradictions shaping their transformation, as well as individual perceptions of change in learning. Findings of this study, while exploratory in nature, help to develop a deeper understanding of the elements of these strategies/mechanisms for development which can be distinguished from the narratives of organizations as they navigated tensions/contradictions between continuity and change in development. Analyzing the unique experiences shaping the distinct modes of participation and directions of development of individuals-in-activity allows an appreciation of a range of challenges and opportunities for change within the specific conditions under which the participating organizations operated at the time of the research. To illustrate the emergence of learning as changing modes of participation in activity in the context of startup work/development it is necessary to consider the distinct socio-cultural dynamics in each of the organizations.
8.2.1 Assiduous startup work activity, Accumulation-in-translation and administrative learning

The distinct type of activity which could be distinguished primarily in ORG-A represents the sum of everyday practices which could be clustered and described primarily as assiduous. In Chapter 5, strategies for development in ORG-A were presented to highlight elements which constituted relations of accumulating contradictions in startup work. This type of work activity can be characterized by an emphasis on stabilization/administrative knowledge shaping a trajectory facilitating the emergence of structured knowledge, managed through specific processes. Dominant strategies for development employed by ORG-A were oriented towards accumulating and systematizing knowledge, elevating the tension/contradiction inherent in the growing volume of information over time. We may consider this tension as a quantity/quality contradiction. Strategies for the translation of contradictions were related to process-orientation directed towards systematizing information and extracting insights through structured mechanisms which included the LMS mediating learning practices. Individuals in this organization rarely challenged or questioned IKM practices, but rather contributed to their enhancement over time, creating a distinct culture compared to the other organizations examined. Despite accumulating tensions related to growing amounts of information, responsibilities for finding solutions were implicitly delegated to the leadership team, resulting in a focus on the fragment of the object instead of attempts at transformation. This mode of participation in activity was common among participants in ORG-A.

The cluster of practices which shared these characteristics reflected a relative orientation towards structured, stable forms of knowledge producing continuity and routines while reproducing the particular forms of knowledge and the tensions/contradictions embedded in them. Practices in this organization were aligned to individual aspirations toward stable employment and predictability, with an implicit assumption that these strategies enhanced the probability for a more stable future. Illustrative activities in ORG-A suggest an increasingly stable future in this organization. While this particular mode of participation in activity was predominant in this organization, similar forms of this mode of participation were also observable on the other trajectories in ORG-B and C in times of rapid development, yet not as pronounced.

In the specific context of ORG-A, the increasing volumes of information determined changing practices in alignment with the organization's culture and supporting strategies for
development. Specifically, a central aim of the leadership team in this organization was to increase the efficiency of knowledge creation, as elaborated in Chapter 5. The leadership team in this organization valued proven, systematic approaches to development, considering incremental improvements as a relatively more stable approach to knowledge creation. This focus on knowledge creation in relation to systematic, process-driven practices represented a reflection of previous experiences of the leadership team in more mature, established organizations.

Activities related to this typology, some which were presented in relation to the MBCC dynamic in the analytic Chapters 5 to 7 can be characterized by structured approaches manifested in an attention to process, structure and detail. They usually display specific patterns, repeated and perfected over time. The language used by employees in this organization to describe activities for development/knowledge creation included terminology such as “process efficiency” or “processing time” or “data analytics” which was distinct from the more informal terms used in the other organizations examined. This linguistic form of mediation in knowledge creation and references to standardized business processes/models shaped the modes of participation of individuals in activity. One of the employees noted the importance of being specific in the use of language to describe specific business processes “Our group works well together and one of the reasons for that I think is the fact that we all have some business background so there is less confusion about what someone means when they say: let’s measure this, or use analytics to identify the bottlenecks in information flow or data quality issues.” (P3S43234). This attention to clarity and common understanding relates to the ability to operate efficiently without the need to create alternative meanings, aspect required in the specific fragmented conditions of the distributed workforce. For this organization, structure appeared to be a necessary prerequisite for increasingly efficient processes.

In this context, an employee from ORG-A described the distinctive nature/culture of the organization by pointing out the role of processes in supporting the culture of professionalism as a distinguishing characteristic for knowledge creation in the specific context examined: “We are a small organization, but we invest a lot in developing best practices, something you know works and you can improve.” (P2079G35). This approach seems to reproduce the formalized practices in larger, more established organizations, providing continuity and the promise of increasing stability in development. At the same time the change in modes of participation of individuals-in-activity remained limited.
In summary, the particular cultural dynamic of change and development produced in ORG-A reproduced broader social relations prevalent in larger organizations, including specialization, process-orientation and competition. Struggles embedded in these relations were addressed through structured approaches in the management of knowledge, shaping the individual modes of participation in activity through process-oriented, administrative strategies. The limited change in modes of participation in activity in relation to the translation of contradictions in practice shaped a distinct type of startup/knowledge-work in practice. Strategies employed generated mostly stabilization knowledge, ensuring a higher degree of predictability in development despite rapidly changing organizational conditions.

8.2.1.1 Translation: Accumulating contradictions and the non-realization of EL
Based on empirical data of activity-theoretical exemplars of assiduous work activity primarily identified in ORG-A, there were limited expansive actions with potential for initiating transformative processes for development. Processes of translation of forms of contradictions in the structure of startup work in these cases were rarely visible, even when magnified through the CHAT lens. The link between learning and development in these circumstances, viewed from the vantage point of CHAT/EL, requires conceptualizations through an analysis of strategies oriented towards the translation of contradictions in efforts at synthesis. However, in these particular contexts, the initiation of expansive processes was limited by fragmentation in approaches to knowledge creation and change. In other words, initial/initiating epistemic expansive actions were rarely present. Overall, strategies in translating these contradictions were highly mediated by technological tools and processes aimed to sustain continuity in development. Furthermore, an essential element in this particular form of process of translation was a rewards system promoting attention to detail and contributions to process efficiency in managing cases, most of which were mediated by metrics and KPIs. This helps to explain how the practices of individuals in processes of knowledge creation could be traced to the overall strategies for development, leading to the limited degree of initiating expansive actions.

An examination of developmental practices of ORG-A provided insights into a particular type of startup organization in which process-orientation and standardized routine are an integral part of the tendencies in the developmental strategy. In fact, the characteristics of this organization resembled those of more mature organizations: specific processes, scalable infrastructure and learning/development plans for employees. These mediating factors were
significant as the organization was projecting additional rapid growth. However, the tendencies towards more formalized practices were not coincidental, but rather structured by its past experiences of growth, and the professional experiences of the startup leaders, some of whom had built startups previously, or had worked in larger organizations. For them, learning to navigate rapid change in the startup environment represented a new challenge, to which they responded through familiar mediating artifacts/tools, including the LMS and associated processes. In other words, they responded to rapid change through mediational strategies which were consistent with familiar tools/artifacts.

The attention to learning in ORG-A was linked primarily to the delivery of specific knowledge about processes and practices which were presented in the form of educational modules. At the end of each module, there was a quiz to ensure both completion and content mastery. This attention to metrics and quantification of knowledge delivered, produced or converted may seem surprising considering the small size of the startup, however, this practice seemed to have been embraced by employees, becoming part of the cultural dynamic of the organization. Startup leaders had created a vision of the company and were actively building a scalable infrastructure. While the organization was growing, there appeared to be limited opportunities for expansive forms of learning. Employee participation in developmental changes was relatively limited to the regular formal feedback and the occasional group meetings, yet overall, most of the learning was completed at an individual level. Limited opportunities in collaborative engagement with contradictions in efforts at translation appeared to result in few expansive actions, as individuals developed personal strategies for learning in order to enhance their skills. These included professional certifications (PMP, P. Eng.) or advanced degrees (MEng, MBA), some of which were intended to support professional aspirations of employees beyond their current roles.

In this organization, the learning of disciplined approaches in navigating the complexity of startup work in times of rapid change was aligned to management expectations structuring the cultural dynamic in the context of development. Hard work, attention to detail and perseverance were rewarded by means of different forms of recognitions (e.g. awards). For some participating employees from this organization, such forms of recognition were effective ways of structuring their modes of participation in activity. As one of the employees pointed out “You’re being rewarded for good work, it’s noticed.” (P58372L9). The distinct modes of participation of individuals-in-activity we observe in ORG-A originate from the more formally mediated
structure of practices shaped by a particular set of relations between tools, rules and the division of labor, and the other constituents of activity unfolding as the organization navigated contradictions in times of rapid change.

8.2.1.2 Projections of formalization in and startup knowledge work directions of development of individuals-in-activity

This section focuses on directions of development of individuals-in-activity, including the development of skill in relation to the distinct form of knowledge created on the type-s trajectory they are progressing on. Analysis of modes of participation in activity on the type-s trajectory help to explain the distinct skills developed over time by individuals, conditioned by the specific mediational structures in the organization. The learning/skill of individuals for their professional directions of development was in part shaped by the distinct type of knowledge created in the organization, which was itself shaped by the tendencies towards formalized, process-oriented strategies for development. In the case of ORG-A, these aspects were particularly evident, as reflected in the preference of individuals for stability in development relative to the other organizations examined, shaping directions for a more formalized professional development for skill/learning.

Individuals completing this form of startup work varied in their opinions related to their skill development in relation to developmental strategies of knowledge creation. As mentioned previously, acquiring the skills/knowledge necessary for their projections of professional futures requires personal engagement with the knowledge creation processes. Employees such as the ones interviewed, highlighted that over time, the structured approaches to development had become part of the cultural fabric of the organization, resulting in an expectation for a high level of professionalism and business process improvement. While the professional futures of startup employees may be uncertain, their practices and aspirations were oriented towards potential future careers characterized by a higher degree of stability, and structure. One of the employees pointed out that: “Skills I learn here are transferable, I learn to organize my time effectively and achieve the tasks I need to complete.” (P2079G35). Clearly, the aspirations of employees are complex and include a range of possibilities, which are reflected in the different variations in modes of participation in activity orienting the directions of development of individuals-in-activity over time.

Despite uncertainties in their directions of development, employees aspired to meaningful work in professional environments. These views were in part constructed on the basis of current
practices and their perceptions of stability in work as a reflection of structured approaches to development and learning. The limited levels of flexibility in everyday practices were balanced by a perceived higher job security, shaping their individual modes of participation in knowledge creation practices in relation to the broader strategies for development.

8.2.2 Collaborative startup work activity, resolution/synthesis-in-translation and cooperative learning

In this cluster of collaborative startup work practices, modes of participation were highly participatory in nature, as detailed in examples outlined in the previous chapters. Examples of collaborative activities within and across organizational boundaries were illustrated in activity-developmental specimens primarily emerging from ORG-B. These specimens provide the possibility for examining collaborative strategies in the context of boundary crossing with attention to the translation of contradictions in times of rapid change in development. Unlike ORG-A and C, activities in this cluster were mostly dependent upon knowledge creation within collaborative settings. Consequently, ORG-B relied on the co-creation of knowledge with the medical partner over time. In pursuit of innovative product development, this organization drew on collaborative strategies in creating new knowledge, enabling the potential for the visualization of contradictions with possibilities for translation. The resulting form of shared knowledge translated partially into value for both partners, highlighting the potential for significant development between organizational boundaries. Collective forms of translation strategies for contradictions resulted in collaborative tendencies in change processes, expanding knowledge in product development. It is important to mention that ORG-B experienced a progression towards collaborative forms of development, from initial product concept to forms of co-configuration in optimizing features and applications, as the organization relied on the partnership which provided some degree of stability, despite the relatively pronounced uncertainty of change in development. In this cluster of collaborative startup work practices, modes of participation were therefore highly participatory in nature.

In the case of activities in this cluster, a major source for development therefore stemmed from collaborative activities in the process of boundary crossing. Also illustrated in part by the case of ORG-C, contradictions were translated partially/near resolution, as the tensions embedded in developmental strategies and practices were made visible in collaborative practices for co-configuration, resulting in expansive actions supporting growth. In the case of ORG-B,
collaborative forms of knowledge were embedded in the everyday practices of the organization, manifested in the form of open discussions and active efforts to develop solutions. Among the most relevant manifestations of the elements of collaborative forms of knowledge was the collaborative development of prototypes emerging from co-configuration in the context of boundary crossing. ORG-B provided illustrative accounts of knotworking as a historically emerging type of work in which practitioners have to collaboratively navigate developmental processes, while taking joint responsibility for progress (Engeström, 2014c). In these illustrations, we could observe that this organization responded to the complexity of development not by emulating existing practices, but by collaboratively navigating struggles along their developmental trajectories. This new way of work and learning required strategies for problems which lacked readily available models, and which could not typically be addressed by individuals in isolation.

8.2.2.1 Translation: resolution/synthesis and the potential realization of EL
The translation strategies of ORG-B at the boundaries were partial and included co-creation activities, group brainstorming or participation in broader community events for development. These collaborative activities were approached strategically in relation to the goals of growth and expansion, orienting individual modes of participation in activity towards reaching consensus and navigating obstacles collaboratively as they emerged in practice. Consequently, they strengthened the possibilities for expansive actions in the context of co-configuration, determining distinct modes of participation for individuals, focused around social approaches enabling group discussions, listening to concerns and engaging in conversations for learning and transformation.

Extending this grounded introduction to the dynamically evolving nature of learning in the context of boundary-crossing as a central area of focus in this section, it is relevant to consider situated experiences in activity which provide important insights into some of the translation mechanisms shaping individual modes of participation in activity emerging from the evolving knotworking relations in times of rapid change. One of the employees provided a description of aspirations for advancement in relation to a tension of hope for growth and expansion on one hand, and a concern for the future of the startup on the other. In response to this tension/contradiction, the participant used the opportunities for boundary crossing to attempt and achieve a partial/near resolution of contradictory feelings in times of high uncertainty and rapid change:
Of course, you have to be realistic. When I attend these events and meet others like myself, it is clear, you see. That I’m not alone. This type of work is not for everyone, it is really rewarding and intense at the same time, you never know what is just around the corner, but you have to stay focused on the goal. I don’t know how others do this, but I know it takes a lot of sacrifice sometime. But then you speak to others and they are really positive and then you get this boost of energy to keep going. That's part of the reason why I enjoy meeting others at events, they are a very supportive group and it feels like we are all in this together. (P69C3620)

The employee in this excerpt provides us with a description of some of the struggles embedded in the dynamically changing network of what Hasu & Engeström (2000) described as “loosely connected actors”, negotiating and navigating participatory processes which are less formalized and in sharp contrast to experiences we observed in ORG-A. The practices described by the employee illustrate a process of partial/near resolution of the contradiction as reflected in the conscious evaluations of potential future options in vivid descriptions, suggesting a concern for potential directions of development in practice. The concept of sacrifice evoked illustrates an important element in relation to this struggle kept in balance by the supportive structures of community-based practices providing the necessary energy for continuity. In other words, these processes can be meaningfully compared with epistemic learning actions of modelling solutions and examining new models, as conceptualized on an expansive cycle, suggesting partial/near resolution in practice. Notable in these comments is the employee’s description of the innovation community in relation to collaborative practices which indicates an active involvement in pursuing opportunities for learning and development. The employee in this case describes collaborative practices which serve the dual purpose of personal and professional development on one side, and an alleviation of aggravating tensions/contradictions in times of uncertainty, on the other. Evolving relations in these situated contexts provide a key mechanism through which the employee created meaningful experiences in relation to collaborative practices in times of rapid change. I argue that this type of learning embedded in collaborative/boundary-crossing experiences of participants cannot be separated from the broader social and cultural dynamics of interrelated work/life practices in times of rapid change.
8.2.2.2 Projections of socialization and startup knowledge work directions of individuals-in-activity

One of the key features of projections of professional futures of individuals based on their variations in changing modes of participation in activity related to collaboration/boundary crossing was an ability to navigate collaborative dynamics of change in development. Practices associated with this type of development were central in supporting productive collaboration across boundaries in times of rapid change. In contrast to individuals on other trajectories for development, individuals creating this type of projection favor participation in activities which are collaborative in nature, developing mechanisms for co-configuration in knotworking within and across their organizational boundaries. An example of such collaborative developmental practice is the active contribution to the organization of events in the innovation ecology the organization was part of as a dominant mode of participation in activity in the context of boundary crossing. This practice was put forward by one of the manager/owners as follows:

We want to take a leadership role by bringing people together and that adds value to everyone. It is not only about the product, it is about the process. Clearly hospitals or research institutes want to connect, to find new ways to collaborate, and clearly you can`t do that if you work in isolation. People know that and of course it may sound simplistic, but bringing people together is really something you learn, something you develop over time. It`s really dynamic and you never stop. (P84U2937)

Based on empirical insights emerging from manager/owners narratives, individuals in this organization aspired to less formalized modes of participation in activity in practices not confined to the organization, but also across boundaries into the broader ecology the organization was part of. Despite the fact that practices were generally not structured, this type of work required creativity, negotiation and integrating expertise from multiple domains. Individuals in this organization seemed to approach development through community building, considering different related approaches within and beyond their organizational boundaries. These initiatives were shaped by specific conditions including the availability of resources (budget) or alignment to larger related complex and specialized object of work in medical technology. This high level of specialization resulted in a necessity for collaborative development for the medical device, which could not be developed in isolation and which required the integration of multiple areas of expertise.
Within these collaborative forms of development, there were variations shaping the directions of development of individuals towards distinct professional futures. While the directions of some participants were oriented towards developing skills for collaborative forms of development, others complemented their experiences through formal education at graduate levels (Masters, Ph.D.) in their free time as alternative projections of professional futures to cope with uncertainties in startup work. One of the participants pointed out, referring to the graduate degree they were pursuing “I may not use it and it may not be the most important thing, but is good to have”. The divergent nature of individual modes of participation in activity shaped orientations towards distinct projections of professional futures, yet an overall preference remained towards collaborative, less formalized forms of work, which created the distinct conditions for the development of the organizational culture in this context.

8.2.3 Experiential startup work activity, partial/near-resolution-in-translation and coping/grit-learning

By developing problem-solving skills, individuals in ORG-C created and accumulated significant knowledge while becoming increasingly resilient. The knowledge created was manifested in their ability to cope with emerging problems in their everyday practices for development. The small organizational size limited their chances to work with some of the clients they hoped to work with, yet the organization was actively working towards developing the necessary infrastructure to address specific requirements which would help address potential areas for alignment. As one of the participants pointed out, their projections looked promising, however, the challenging conditions they had to navigate represented significant obstacles for their growth. Any shifts in their developmental trajectory were dependent, however, upon the number and type of future clients acquired. Despite the orientation towards forms of learning reflected in ORG-C towards expansive development, this organization was uncertain about the forms of knowledge and learning which could support development. Consequently, the experiences of individuals in this organization appeared to be oriented towards problem solving as a form of learning in development. In other words, resolving contradictions was a necessary, yet fragile form of development in learning with expansive potential. Conversion, however, could be described as highly partial and approaching resolution, but rarely synthesis.
8.2.3.1 Translation: partial/near resolution and the under-realization of EL

In comparison to the other clusters discussed in this chapter, in which the translation of contradictions was shaped by either structured or more collaborative strategies for development, in this context, individuals had to learn how to cope with rapid change while constructing and working towards the vision of a successful enterprise with more limited support. While the future of ORG-C appeared uncertain, it had significant potential for transformation: even if the business did not deliver the exponential results in a specific, arbitrarily determined timeframe, the founder may choose alternative strategies in the form of new ventures or partnerships. This form of development concurrently provided uncertain futures for individuals and opportunities for new beginnings. The illustration of this type of development provided by ORG-C in Chapter 7, highlighted progress towards a vision created in a broader context of an overarching narrative for progress in an evolving ecology for innovation.

In this third category of translation we can observe contradictions approaching, but not necessarily fully achieving positive synthesis. In fact, reaching this degree of translation results in new and alternative forms of contradictions on the change trajectory. Despite achieving a significant degree of practical/phronetic knowledge (type-e), these experiences did not produce results aligned with the exponential vision ORG-C was aiming for. In this context, the strategies of ORG-C for coping with daily challenges were pronounced and included scripts for handling rejections, self-talk or incorporating time for reflection/meditation/mindfulness into daily practices.

In contrast to the 1st and 2nd degree translations exemplified in previous sections, translations in this section illustrate the transmission/reproduction of contradictions in the complex fabric of the ecology for innovation in times of rapid change and development. Understanding this pattern of transformation aligns with visions of exponential growth and a creation of new tensions/contradictions of 3rd degree in development. In these contexts, participant narratives reveal the theme of transformative innovation and breakthrough, as well as a series of motivational quotes related to success, perseverance and grit. Rejections from prospective clients were balanced by a positive mindset and self-talk, contributing to the distinct culture created in this organization over time. This mode of participation of individuals in activity can be explained by examining the form of learning created in the process of translation. This form of learning, characterized by a significant degree of grit, is related to the type-e knowledge
developed: a practical form of knowledge developed to cope with challenges despite or in response to strategies for development in times of rapid change.

In this cluster of practices, individuals generated specific forms of knowledge supporting their development in rapidly changing conditions of development. Translation of contradictions reaching partial forms of resolution/synthesis was required in order to accelerate learning processes, generating expansive actions with transformative developmental potential. For individuals, this process implies directions for knowledge work futures characterized by uncertainty, but also possibility for the application of experiential - and grit related knowledge as transferable skills.

8.2.3.2 Projections of coping/getting-by in startup knowledge work directions of development of individuals-in-activity

There were several noticeable variations in modes of participation in activity which could be identified in participant narratives of change, remembered. Analyzing potential projections in relation to directions for development of individuals-in-activity reveals some orientations towards navigating challenges with a confidence of achieving the vision constructed: “We will keep going, I am sure that we are on the right track here”. However, another manager/owner pointed out the inevitability of potential change in their projection of development: “Working for a startup is what it is, you know the statistics. I`ll wait and see, I will enjoy the journey” (P42K9472). This symbolic construction of a distinct projection implies a necessity to navigate between uncertainty and opportunity to develop grit as learning in the context of rapid development within and across organizational boundaries.

The variations in modes of participation in activity highlighted in this analysis reveal a picture of the active construction of these projections over time mediating personal engagement and shaping the aspirations of individuals as they navigate the challenging times of rapid change in their organizations. These distinctions can be explained by the mediational effects of the distinct type of knowledge created in the process of translation in efforts at synthesis as individuals acquired grit related skills in coping with uncertainty in change. The examples of variation highlighted above seem to reflect individual circumstances shaping the distinct modes of participation in activity, providing ample opportunities for expansive actions and change, aspects which help to explain the variations highlighted in this section.

Individuals who shared these professional projections came from environments where entrepreneurial innovation represented a journey to success, broadly conceived. They brought
these ideas and mindset to their roles in the organization, expecting to change any challenging conditions by converting contradictions into opportunities for development. Noticeably, these individuals’ modes of participation in activity were shaped by their confidence in transcending any limiting conditions in translation efforts towards synthesis. This confidence was related to the expansive action of reflection which reinforced expectations of exponential growth despite, at times, limited progress and rejections from prospective customers.

Overall, despite constraints to growth and ongoing challenges, individuals who shared these projections invested energy into translating contradictions embedded in the structure of developmental activity though semiotic mediations within and across organizational boundaries in times of rapid change. The knowledge created in this context shaped their orientation towards developing grit, further reinforcing the translation of contradictions in practice. Variations between individual modes of participation in activity highlight translation processes resulting in expansive actions towards synthesis, reproducing contradictions in distinct ways over time.

Key characteristics of projections for the professional directions of individuals in this cluster include optimism and confidence in the face of uncertainty despite the challenging conditions they were navigating in their struggles to achieve the breakthrough desired, aiming to connect the past to a projection of exponentiality in development. Any low probability for success did not seem to affect their aspirations for their vision of the future, in contrast to the more moderate expectations, in general, reflected in participant narratives in the other organizations examined. Despite this instability in their employment, these individuals projected a professional direction of development in which destabilization on the trajectory of knowledge creation and change presented opportunities for expansion. Consequently, their activity was primarily future oriented despite the daily coping strategies employed to continue their progression through daily operations.

In comparison to individuals in the other clusters, whose professional futures were relatively more stable, directions of development of individuals in this cluster were channeled towards similar future startup work, which requires a specific mindset to cope with possibilities of elevated levels of transformation and high uncertainty on a daily basis. Illustrations of these unique forms of work were evident in examples from ORG-C primarily and manifested in the higher attention to motivational strategies which appeared to be a coping mechanism for uncertainty and rapid change. The possibility of attaining visions for the specific professional projections of development in this cluster was mediated by reinforcing effects of broader
narratives of innovation in relation to individual participation in events or workshops in the innovation ecology they were part of, where success stories were highlighted. Some of the individuals in this group personally knew entrepreneurs who had followed similar directions and succeeded in building robust, often multiple businesses. The example offered by a participant in this group are relevant in this regard: he described the experience of a friend who started with an idea and managed to build a software company with more than 10 employees in just two years. The mentorship offered by this entrepreneur inspired the participant to sustain personal motivation in difficult times. This motivation was translated into daily actions which helped others to also continue trying, despite obstacles in times of rapid change. Consequently, these inspirational examples provided a solid foundation for their orientation towards developing grit in facing obstacles through distinct modes of participation in practice.

8.3 Summary of the Potential for Expansive learning (PfEL) as a Contradiction/resolution/synthesis dynamic: Implications for Projections of Startup Knowledge Work and Directions of Development of Individuals-in-Activity

This chapter summarized and consolidated three developmental trajectories of startup organizations in times of rapid change, providing rich illustrations of strategies for knowledge creation shaping individual modes of participation in activity for individuals as they projected their own directions of development in learning. The first trajectory can be characterized as relatively stable, characterized by continuity and relative stability in employment. The attention to structured processes in this context provides continuity in developmental processes, yet limited translations of contradictions in practice. Directions leading to projections of professional futures include professional work, structured in nature and more often mediated by metrics. This greater form of stability in development appears, however, to be indirectly influenced by limited boundary crossing and lower levels of collaboration, which in turn resulted in the cases examined in low levels of – or initiation of - translation. The second trajectory of development was enabled by less formalized practices shaping collaborative forms of strategies, which often involved boundary crossing. Examples in this category revealed highly partial degrees of translation (2nd degree), but higher levels of expansive actions compared to practices illustrated in ORG-A. The analysis of collaborative strategies in ORG-B revealed variations which were explained through individual preferences in relation to distinct projections of collaborative knowledge work.
directions of development in relation to the MBCC dynamic of the organization. The third trajectory provided distinct conditions shaping developmental strategies, knowledge creation and consequently learning for individuals in times of rapid change. Individuals in this cluster experience significant challenges, addressed through mixed/adaptive/dynamic strategies for knowledge creation, allowing them to cope with uncertainty and change while developing grit. Analysis of activities related to this trajectory show ongoing challenges for development, but a high degree of translation of contradictions yielding adaptive forms of knowledge shaping variations in individual directions of knowledge work for individuals-in-activity. Practices in this category oriented some individuals towards future similar startup work, while determining others to look for turning points for their development. Their ability to navigate complex challenges and rapid change was related to their distinct strategies for coping-learning, generating grit and perseverance in skills, reproducing the narrative for innovation as a runaway object in the innovation ecology organizations were part of. The findings of the study further establish the significance of and variations between distinct goals and aspirations in relation to the projections for the future. These trajectories should, however, be conceptualized in their situated contexts, in relation to the broader, changing macro structural conditions of the ecologies they are part of, therefore increasing understandings of variations in mechanisms for development, knowledge creation and learning in times of rapid change.

Illustrative examples in startups examined provided a better understanding of variations in activity-focused experiences of individuals navigating complexity on distinct developmental trajectories while converting tensions/contradictions to different degrees in practice over time. These tensions/contradictions include the dialectics of stability/change, continuity/discontinuity or certainty/uncertainty shaping distinct directions of development for knowledge work and learning even within these trajectories. In other words, none of these trajectories were homogenous, but rather showed variations structuring distinct modes of participation in activity.

These chapters examined distinct and potentially divergent developmental trajectories pertaining to knowledge creation in relation to KATs of mediation, boundary crossing and contradictions as a source of change in learning, as identified in the narratives of participants concerning contradiction-driven organizational changes in the context of development. Resulting activity clusters were positioned on different developmental trajectories in order to facilitate a better understanding of knowledge creation mechanisms in relation to shifting modes of participation of individuals-in-activity within the socio-cultural, historical and structural
conditions participating startup organizations were part of. Despite their divergent nature, however, participating startup organizations shared the object-goal of contributing to the geographical innovation ecology they were part of. The object of (medical/technology) innovation, I argue, is a form of generalized hyperobject, which shares characteristics with runaway objects, as conceived in the activity-theoretical tradition (Engeström, 2008; Engeström, 2008b). The empirical data presented in the analytic chapters provides relevant elements necessary in illustrating distinctive types of knowledge created as contradictions were translated in efforts at synthesis. Diverse experiences of individuals-in-activity were illuminated while reconstructing the emergence of variations in distinct developmental directions, with attention to the degrees of conversion of contradictions in translation efforts during development. Events or situations often neglected, obscured or isolated in IKM literature acquired analytical significance magnified through a CHAT lens to make visible forms of contradictions which were deeply embedded in the structure of startup work practices under developmental pressures over time.

Through empirical data presented, we observed how work activities were mediated by learning management systems, policies or distributions of tasks, structuring individual modes of participation in activity as individuals navigated both affordances and constraints of knowledge creation in times of rapid change. Learning experiences and associated expansive actions were therefore socio-culturally shaped in situated contexts either in intra-organizational practices, as well as in collaborative, boundary-crossing or co-configurational contexts.

8.3.1 Distinctions
Cases presented in this study provide detailed illustrations of work practices in distinct startup organizational contexts, producing three distinct developmental trajectories emerging from the translation of contradictions in practice. These cases reveal that startup organizations respond to specific socio-cultural conditions through a range of strategies in different ways, creating distinct forms of knowledge as they navigate complex, contradictory and often divided terrains (Engeström, 2018d, p. 216) for change and development. These strategies orient activities towards type-s (fragmented), type-c (collaborative) and type-e (experiential/phronetic) forms of knowledge creation.

The first analytic chapter illustrated practices which were oriented towards stabilization knowledge that could be organized and used to improve operational efficiency. Developmental trajectories associated with these practices included few expansive actions, resulting in mostly
fragmented learning as *contradictions* appeared to be invisible, obscured or ignored. In comparison, the second analytic chapter described cases illustrating collaborative forms of practices in the context of collaboration/boundary crossing which were co-configurational in nature and often indicative of *knotworking*. Trajectories and variations in directions of development for individuals-in-activity associated with these practices tended to produce significant possibility knowledge as contradictions approached *partial/near resolution* in efforts at translation. The third cluster of practices were more *unstructured*, producing significant forms of learning and mixed experiential/phronetic forms of knowledge as contradictions were translated to partial forms of *resolution/synthesis*, creating new and alternative forms of new contradictions in practice. Taken together, these aspects provide insights into a continuum of realization for the PfEL in relation to the EVoL described in previous chapters.

### 8.3.2 Commonalities

Despite the differences and variations observed between and within the distinct developmental trajectories of startup organizations examined, there were also commonalities in their approaches to development as they navigated the complex nature of their innovation ecologies. First, all of the organizations examined contributed to the *cultural fabric* of their local networks through individual participation, or community engagement, to different degrees and in distinct ways. Participants highlighted the unique nature of *startup work*, historically positioned in relation to major global technological milestones (popular social media networks, e-commerce platforms and others). Most participants perceived their work not necessarily as labor, but rather as a calling towards challenging status-quo, and initiating *change* in areas where they perceived gaps, discontinuities or inefficiencies. Second, trajectories were *future-oriented* and seemed to balance the uncertainty of change with increased flexibility in work practices: a fine balance which was in constant negotiation, yet fragile. They created and worked towards concepts which often seemed abstract or unattainable at times. As Engeström (2016d) points out, “[c]oncepts are future-oriented. They are loaded with affects, hopes, fears, values and collective intentions” (p. 226). Indeed, participating startups in this study navigated a spectrum of such hopes and fears in generating shared understandings of future projections in times of rapid change, generating new knowledge and learning in the process of translating contradictions in practice. The different forms of learning resulting from *startup work* practices on developmental trajectories were
solidified by means of routines - collaborative and/or fragmented in nature - which provided distinct opportunities for expansive actions to take place.

By examining the dynamic developmental trajectories of startup organizations, this chapter enabled a better understanding of strategies and variations in relation to individual modes of participation in activity shaping distinct directions of development for individuals-in-activity. A common element evident in participant narratives was a desire for meaningful work, perceived in different ways depending on the current environment and the vision created both by the founder in relation to personal visions, or aspirations of individuals in activity. The importance of individual aspirations for meaningful developmental directions enabled some individuals to effectively navigate conditions of rapid change, making significant contributions to knowledge creation in their organizations, in distinct ways.

To conclude, this chapter presented an overview of startup learning and knowledge creation on distinct, divergent trajectories in relation to variations in directions of development of individuals-in-activity supported by the translation of contradictions in times of rapid change. Indicative examples illustrated characteristics associated with general trajectories derived empirically while supporting examples illustrated variations within these trajectories contributing to the re-conceptualization of learning in startup work from an activity-theoretical perspective. Distinctions between and divergences within these trajectories paint a picture of variations in individual modes of participation in activity shaping projections of professional futures for individuals as they navigate the complex fabric of practices constituting startup work in times of rapid change. Insights emerging from data demonstrate highly partial forms of translations in efforts at synthesis, generating distinct forms of learning with expansive potential, reflecting the diversity of approaches startup organizations employ as they navigate different forms of challenges towards their objects in motion.

8.4 A Dialectical Appreciation of EL on Developmental Trajectories

Given the distinct nature of startup work characterized by uncertainty or rapid change, a more effective understanding of learning requires a dialectical appreciation of change on developmental trajectories of development and knowledge creation. The dialectical nature of expansive learning and concept of contradictions reflect aspects of learning as emergent in historically evolving systems which shape the trajectories of activity in practice. To clarify, Engeström & Sannino (2010) point out that: “Expansive learning requires articulation and
practical engagement with inner contradictions of the learners’ activity system” (p. 5). According to Daniels (2005), Davydov’s (1988) contribution is reflected in the method of “ascending from the abstract to the concrete” from an abstract conceptualization of a “germ cell” which is developed through the resolution of internal contradictions, aspect which is adopted in Engeström’s approach to activity theoretical research (e.g. Daniels, 2005). As Engeström (2016c) underlines:

This initial abstraction is step-by-step enriched and transformed into a concrete system of multiple, constantly developing manifestations. In learning activity, the initial simple idea is transformed into a complex object, into a new form of practice. [...] Ascending from the abstract to the concrete is achieved through specific epistemic or learning actions. (p. 42)

In this research project on work teams in Canadian technology startup organizations, I identified and analyzed this innovative form of learning both within and across organizational boundaries. Analyzing discursive data enabled a detailed analysis of processes and actions of *mediation, boundary crossing* and *contradictions* present in everyday work practices used in the development of innovative solutions in startup contexts examined. This analysis employed the three KATs as theoretical tools grounded in CHAT to create a robust theoretical framework reflecting an *expansive view of learning* which, I argue, is particularly well suited for the analysis of *knowledge creation* in startup work practices in times of *rapid change*.

In this dissertation I argue that the process of EL can be conceptualized as the “construction and resolution of successively evolving tensions or contradictions in a complex system” (Engeström, 2016c) which involve *mediation, boundary crossing* and *contradictions* as a source of change in learning. Instead of using the typical-ideal expansive learning cycle, I focused on situated *knowledge creation* practices in startups. The small size of startups required an increased focus on miniature cycles of expansive learning. As a result, this dissertation examined forms of learning which were *potentially* expansive. As Engeström points out:

Miniature cycles of innovative learning should be regarded as potentially expansive. A large-scale, expansive cycle of organizational transformation always consists of small cycles of innovative learning. However, the appearance of small-scale cycles of innovative learning does not in itself guarantee that an expansive cycle is going on. Small cycles may remain isolated events, and the overall cycle of organizational development may become stagnant, regressive, or even fall apart. The occurrence of a full-fledged
expansive cycle is not common, and it typically requires concentrated effort and deliberate interventions. With these reservations in mind, the expansive learning cycle and its embedded actions may be used as a framework for analyzing small-scale, innovative learning processes. (Engeström 1999, p. 385 in Engeström, 2014a, p. xxii)

Engeström views learning as an elevating process which leads to the creation of powerful new re-conceptualizations of activities; and, indeed my methodological approach to specimen selection and, in turn, empirical analysis could be understood as illuminating a variety of “miniature cycles” in the sense Engeström speaks of above. The theory of expansive learning also places emphasis on the discursive construction of object in learning from the ground up, emphasizing the importance of contradictions in driving developmental change. Subsequently, contradictions in knowledge creation processes of questioning and re-evaluating commonly accepted practices provide new opportunities for change and learning.

Integrating participants, tools and their communities into a single unit of analysis was relevant in relating contextual issues to aspects of learning, and, in particular, expansive learning. Activity-theoretical perspectives on change in an expansive learning framework provided robust learning perspectives in startup contexts examined. In an expansive approach to learning, individual subjects question an accepted practice, resulting in an idea or artifact as a “germ cell” which is developed in a stepwise sequence outwards into a community or organization through successive learning actions which produce an expansive spiral (Engeström, 1999; Engeström, 1999b; Yamagata-Lynch, 2010a). The successive epistemic actions of questioning, analyzing, modeling, examination, reflection and consolidation follow the logic of ascending from the abstract to the concrete in relation to learning processes in work towards object changes over time (Engeström, 1999b). In this study, epistemic actions were linked to development in relation to a contradiction/resolution/synthesis dynamic and the PfEL as either realized, under-realized or un-realized.

In analyzing data from the cases examined in great detail using Engeström’s concepts, instances of epistemic actions characteristic to the expansive learning cycle emerged. Some aspects of collaborative expertise, manifestations of contradictions or co-configuration were particularly easy to distinguish in the empirical data; others were embedded more deeply in the discourses examined. Categories used in startup data analyzed in this study provided indications of analytical power when applied to innovative learning in these original contexts and settings. After closely examining the constitutive actions of expansive learning in the empirical data and
identifying areas relevant for the construction of the potential for expansive learning, I am turning my attention in the next sections to insights gained from overall findings in this study.

8.4.1 Difficulties with Resolution/Synthesis: Highly Partial Forms of Resolution
This study identified difficulties with resolution/synthesis in the contexts examined, finding highly partial forms of synthesis in the context of knowledge creation in startup work. ORG-B illustrates the importance of actively creating space and time used by participants as a way to decisively reach a resolution. Additionally, artifacts such as standards were used as “what” artifacts to illustrate fixed concepts in relation to strategic goals. These concepts may have been acquired through instruction or training. On the other hand, “why” artifacts provided alternatives between potential choices and alternatives. As a result, describing and conceptualizing these artifacts analytically yielded ideas which were difficult to interpret. Surprisingly, in all cases, solutions were fixed using proposed policy to produce “where to” artifacts, which could be conceived as largely elusive.

Despite the increasing interest in examining innovative learning in recent years, only few studies adopted an activity-theoretical approach in analyzing IKM expansive learning processes in organizations. Potential reasons for this lack of CHAT-based research in this area may be the difficulty of CHAT-related approaches to analysis. Previous research studies emphasized the importance of different perspectives in organizational brainstorming sessions, and the potential for debates in incorporating questioning as a mechanism for change in learning.

The perspectives of participants were anchored in social practices which cannot be explained through simple models, but which are representative of evolving perspectives as they emerge in practice. While it should be acknowledged that there was no uniform achievement of object through synthesis, different variations in modes of participation emerged through associations between individuals in the process of developing innovative solutions. Participants started in divergent positions and made efforts to seek beneficial outcomes to the challenging problems addressed. Engeström and Sannino (2011c) point out:

In the theory of expansive learning, criteria and yardsticks of learning are built by means of historical analysis. Such an analysis aims at identifying the contradictions that need to be resolved and charting the zone of proximal development that needs to be traversed in
order to move beyond the existing contradictions. This calls for effective ways of articulating and depicting the historically possible zone of proximal development. (p. 9)

This study both used and, to a degree, developed upon conceptual tools to interpret complex data emerging from activities in diverse startup work contexts as multi-dimensional zones of proximal development in which tensions and contradictions determine the evolution of activities as individuals struggle to shape outcomes in the context of rapid change. The models developed in these contexts provide the foundations for complex analyses across activities and contexts examined.

In this section I described aspects related to difficulties in efforts at synthesis in relation to the MBCC and CRS dynamics in development to conceptualize learning in startup organizations. The distinct modes of participation in activity were linked to the navigation of tension/contradictions in creative spaces as alternatives to managed forms of learning. In these spaces, individuals created new forms of participation using different mechanisms of change and development. Similar processes were observed in ORG-B and ORG-C, yet to different degrees. As a result, partial forms of resolution were prevalent in all organizations examined, which represented a valuable observation in the context of startup organizations during rapid development and change.

8.4.2 Mixed Types of Translations of Existing Contradictions in Efforts at Synthesis

Based on empirical findings, there were mixed types of translations of existing contradictions in efforts at resolution, as contradictions were navigated to different degrees in situated contexts of knowledge creation in development. The cases examined illustrate the importance of contradictions as a source of change in learning. In other words, the tensions originating in the process of critically questioning the commonly accepted practices represented a triggering action in the process of potentially expansive learning. As Engeström (1999) points out, the action of questioning represents an important component of an expansive process of learning, which is supported by broader related concepts including constructive controversy (Engeström & Sannino, 2011c) or the positive potential of conflicts in organizational change (Engeström & Sannino, 2010). Cases demonstrate the importance of the object expansion in the process of innovative development as individuals direct attention to problems by formulating a shared understanding of potential paths forward. Innovative solutions present themselves and appear to emerge after
complex discussions during which the portions of the object are constructed, deconstructed and reconstructed in practice. In this view, the formulation of a shared object in activity represents an important result of successive actions in which potential solutions are formulated.

Constructing solutions as a result of evolving conceptual transformations took place progressively as a sequence of events and actions, which could be conceptualized as partially aligned to the model of EL. These representations could bring to the forefront the attempts of individuals to create coherent reflections of mediated outcomes, which were acceptable to the group. This collective mechanism was in line with the theory of expansive learning, emphasizing socio-cultural aspects often overlooked in IKM literature. In addition, the mechanism of the dialectical ascent from the abstract to the concrete at the basis of expansive learning provides a robust foundation for the analysis of the interplay between continuity and change in relation to converging aspects of mediation, boundary crossing and contradictions as a source of change in learning. The key epistemic actions of questioning and analysis are key aspects of the expansive learning model, which are absent in other similar theories, such as Nonaka and Takeuchi’s knowledge spiral (Engeström, 1999c). As Engeström (1999b) points out “These actions are tacitly delegated to management” (p. 401). In contrast, an expansive view of learning results in a bottom-up approach to development through the creative process of questioning and debate. As a result, small cycles of innovative learning became relevant focal points, positioned at the intersection of problem construction and problem solving.

The dynamic nature of innovative processes in organizations often required the formation of networks which transcended individual domains as “practitioners must move across boundaries to seek and give help, to find information and tools wherever they happen to be available” (Engeström, 2005a, p. 237). In these boundary crossing spaces, individuals acquired the experiences required to improve practices, creating new forms of shared innovation at the intersection of multiple boundaries through the exchange of ideas or concepts, creating a potentially expansive object. As Lambert (1999) noticed in his study of boundary crossing in relation to expansive learning, the use of tools, or boundary objects was important in developmental transfer and boundary crossing in the process of expansion of the shared object in practice (Sannino & Engeström, 2017). In the context of expansive learning, translation in the context of boundary crossing at the intersection of different environments appears to be mixed in nature.
Thus far I have described aspects related to difficulties in efforts at synthesis in relation to the mediated nature of knowledge creation to conceptualize learning dynamics in startup organizations. The LMS mediated learning using an interface designed to measure specific dimensions of knowledge in a controlled environment. Clearly, the introduction of the LMS generated a tension/contradiction in the activity system. Individuals responded to these tension/contradictions by generating creative spaces as alternatives to managed forms of learning. In these spaces, individuals created new forms of participation using different mechanisms of organization. Similar processes were observed in ORG-B and C, yet to different degrees. As a result, partial forms of resolution were prevalent in all organizations examined, which represented a valuable observation in the context of startup organizations during rapid development and change.

8.4.3 Reproduction of Contradictions in Slightly Altered Forms
Contradictions were found to be reproduced in slightly altered forms in the progression of activities along developmental trajectories of change in learning. Overall, even when translation progressed close to synthesis, contradictions were transformed into different forms. These aspects were most pronounced in miniature cycles of development which were potentially expansive in nature. Learning cycles have been used in existing literature to provide a framework for interpretation in cases where transformative processes during long transition periods in which recursive developments over longer periods of time provide a reflection of epistemic learning actions which lead to the creation of new and transformed objects or insights. It was important to delimit the expansive learning cycle in analysis, following Engeström & Sannino’s (2010) suggestions:

It is important to articulate and argue the criteria of the starting point and end point of a cycle. The logic of the expansive cycle is such that a new cycle is assumed to begin when an existing, relatively stable pattern of activity begins to be questioned. Correspondingly, the cycle ends when a new pattern of activity has become consolidated and relatively stable. […] On the other hand, it is indeed to be expected that many transformations in activity systems are not predominantly expansive. […] Expansion necessarily involves also the possibility of disintegration and regression. (p. 11)

It should be noted that miniature cycles of expansive learning are present in many large-scale cycles. Potentially expansive learning cycles can be viewed on a continuum from macro cycles to
micro cycles. In this study, miniature cycles, mostly, in part due to the smaller organizational size and nature of development, offered insights into the reproduction of contradictions in slightly altered forms.

8.5 Study Limitations

Although the activity-theoretical approach provided versatile concepts with strong analytic power, there were several challenges encountered in the particular startup contexts examined. Several limitations related to this study provide starting points for refining approaches, methods and focus for future activity-theoretical examinations of learning in IKM. The activity-theoretical approach provided a very specific type of analysis in the CHAT tradition, which was limited in its scope to re-conceptualize learning in the IKM body of literature. This narrow focus can at the same also be seen as a strength, however, as it enabled an in-depth analysis of situated practices while avoiding theoretical confusions prevalent in other bodies of literature. Another limitation is related to the limited number of examples which could be examined and the significant variance within and between different activities of distinct startups. Despite the focus on the specific sub-group of medical technology startups, which minimized such variances, the specificity of this organizational type represents their unique characteristics as small, innovative and rapidly developing organizations. Other contexts may therefore yield different findings compared to those emerging from this study.

This study was among the very few of its kind focusing on activity-theoretical approaches to the re-conceptualization of learning in the defined body of literature. Limited empirical evidence was available in providing a basis for comparison, which represented an elevated level of difficulty in the analytic process. One strategy used to minimize this limitation was to select participants who were willing and open to share rich descriptions of feelings, attitudes and perceptions, providing new perspectives on processes and phenomena unique to startup context and viewed through an activity-theoretical perspective. Another potential limitation was related to the relatively short timeframe of the study, resulting in a limited number of cases which could be examined. Given the novelty of the study approach in startup contexts, this research project provided foundational insights which future similar studies can build on over longer temporal timeframes. Complementing the semi-structured interviews with an observational, ethnographic approach could have allowed insights to emerge during activities rather than retrospectively described. This approach could have further illustrated how learning is accomplished actively as
a socially constructed phenomenon, making visible some of the relations shaping processes as actively orchestrated in practice. Although some observation was carried out, an ethnographic approach could have illustrated aspects of learning using a sequential approach grounded in rich detail and observational data.

The sample size was relatively small. Due to resource and time constraints, only a limited number of participants could be interviewed and involved in the study. In addition, limited demographic characteristics were collected during the study. Since the interview protocol was customized for the purposes of the study, there may have been issues related to the clarity of the questions or simplicity of use. To improve respondents’ understanding of questions, the survey was pilot tested by a group of volunteers in order to obtain feedback about its effectiveness and feasibility, to assess clarity and understanding, thereby improving face validity.

A practical limitation refers to the immediate applicability of insights gained from the study into practice. As several authors suggested, issues of equity and social justice should be central to any developing theory of learning. By adopting a reflexive approach, I aimed to overcome these challenges by actively incorporating a participatory approach reflecting on the voices of individuals who may be underrepresented, therefore striving to more sensitively approach the analysis of data and increase sample representativeness. This participatory approach, as a result, provided opportunities for participants to reflect on their own learning.

One of the potential contextual limitations of the study is related to participant choice not to share critical aspects about their organizations. These insights may be embedded in the complex nature of organizational factors, which may be linked to their leadership roles in the organizations, roles and responsibilities. Using a phenomenological approach involves at times subjective conceptualizations in the process of context interpretation (Creswell, 2009). These epistemological and ontological aspects were addressed in an earlier section of this thesis. The variance in the individual construction of reality at the individual and collective levels are aligned with constructivist positions complementing ontological assumptions of relativism, in which the social realities emerge in an interpretive process of reflexive inquiry (Smith, 1987). These challenges, while noticeable, may stimulate future research addressing the complex nature of startup work and learning while facilitating new developments in this field.
8.6 Contributions to Literature: IKM

Findings from this study contribute to IKM literature in both theoretical and empirical dimensions by expanding the conceptualizations of learning as socio-culturally mediated in situated practices of startup organizations in times of rapid change. Understandings which emerge from this research enhance IKM scholarship through a development of conceptual tools both developed empirically and adopted from the CHAT tradition. Key analytic themes extracted from CHAT were applied to address areas for intervention in IKM literature in relation to learning using the context of startups as examples of fast changing work environments. Interrelated aspects of mediation, boundary crossing and contradictions were identified and discussed in relation to an expansive view of learning which I suggest comprehensively assists in the re-conceptualization of learning in IKM literature from a CHAT perspective.

Therefore, a distinctive contribution of this study is the concept of an expansive view of learning building upon the mediated nature of learning, dynamics of boundary crossing and contradictions as a source of change in learning, based upon which the potential for expansive learning can be evaluated as a contradiction/resolution/synthesis dynamic enabling conceptualizations of variations in individual modes of participation in activity shaping distinct directions of development for individuals-in-activity. Unlike some of the existing literature presuming or implying that leadership alone can cause change in activity, this may not always be the case. Instead, changing interpretations of learning dynamics, contradictions or shifting conditions for change may be more relevant factors.

Based on the indicative literature review presented in Chapter 2, this study could open new pathways in exploring additional abstract conceptualizations of learning in situated contexts of startup organizations in times of rapid change. The literature review provided a further contribution to the theoretical foundations of the study, identifying opportunities for an activity-theoretical reconceptualization of learning. This research may therefore be viewed as a contribution to the current understanding of expansive learning potentials in startup organizations at the specific historical time of the research and within the specific socio-cultural conditions of change shaping the dynamics of learning examined.
8.7 Contributions to and Implications for Praxis

This section highlights some of the practical suggestions emerging from this study by addressing implications for practice and potential directions for future research related to the key themes examined in this research project.

In Chapter 1, I discussed the importance of learning in startups as contexts for innovative and evolving forms of work. Complementary to this view is an examination of socio-cultural dimensions which enable or hinder these innovative forms of learning. This research suggests that learning is deeply embedded in everyday work practices as startup organizations rapidly evolve, constructing an expansive view of learning which provides a transformative potential for the development of new forms of work transcending individualized practices towards socially organized forms which benefit workers as learners. Startup organizations could play a leading role in re-conceptualizing workplace settings by considering individual perspectives on learning, expression or other balanced approaches in practice. Some of the practical applications I suggest can be linked to the intersection between learning and innovative practices which can serve to reorient startup work towards areas with expansive learning potential. Reflecting on the social relations in rapidly changing work environments requires therefore careful analysis of situated practices as conceptualized from a CHAT/EL perspective in order to identify transformative functions of artifacts and processes central to startup work in relation to an expansive view of learning.

Another practical application of this study could involve new approaches to educational programs more broadly conceived. In these contexts, the curricula could emphasize dialectical dimensions of innovation which re-evaluate aspects of technological studies related to innovation towards expansive change processes for human-centered applications. The activity-theoretical framework developed represents a new frame of analysis which can guide the development of entrepreneurial education towards more critical areas of practice.

While the development of correlations between expansive learning and organizational performance was beyond the scope of this dissertation, further research could explore this path. This research makes an important contribution to the understanding of learning emerging from interrelations of mediated, boundary-crossing and contradictory dimensions of IKM. Building on the findings of this research, future studies could further explore the relative influences of each of these themes on organizational performance in relation to an expansive view of learning that can support startup performance across organizational boundaries.
Another practical use of this research could be to complement existing modes of activity by bringing the importance of new forms of learning to the forefront of everyday work practices in startups. Developing skills required in a fast-changing economy requires a balance of formal and less formalized approaches to learning. The ability of individuals to question the status quo in order to enable actual- empirical historical analysis of work practices can serve as a solid foundation for an expansive potential for learning in startup organizations. Another key contribution of this study with practical implications is the new set of conceptual tools through which startup leaders may re-conceptualize learning in rapidly developing work contexts. These conceptual tools have the possibility enhance collaborative practices in fast-changing, evolving work contexts with semi-structured characteristics with an increasing emphasis on dynamic and collaborative forms of learning in practice.

Viewed from the vantage point of CHAT/EL, developing a reflexive awareness of contradictions and learning is of particular importance in conditions characterized by uncertainty and rapid change. As participants reflected on their own learning practices, they were able to conceptualize the interrelationships between individual contribution and broader knowledge creation dynamics, developing a higher sense of awareness of individual and collective experiences. It results that dominant managerial practices may need to be balanced by community-based approaches to mediation enabling the potential for the emergence of expansive learning and change. Leveraging the tensions/contradictions in practice can therefore facilitate change processes by providing buffering mechanisms in participatory forms of interactions. These approaches may in turn develop into more effective modalities for collective advancement and learning.

While this study does not aim to provide a prescriptive solution to facilitating learning in startups, the insights gained can have practical relevance to IKM practitioners and startups in general. Specifically, an attention to the themes of mediation, boundary crossing and contradictions provides a valuable approach in developing an expansive view of learning in startup environments. This view can serve multiple functions, including as a starting point for in-depth discussions about object/goals and placing learning central to certain startup activities with EL potential. This view may therefore be foundational in linking activities to broader contexts and overall organizational strategies shaping projects and initiatives across startup organizations in ecologies for innovation. In addition, the expansive view may be used to avoid hindering factors as startup organizations and develop more nuanced approaches in examining alternatives.
to routine practices adopting different modes or lenses of analysis. As highlighted in previous chapters, individuals need to explore opportunities and actively develop strategies in addressing contradictions as they emerge in practice. The process of identifying these contradictions can present opportunities for skill development and support practice improvement.

Building on the expansive view developed, this study could also serve as a foundation for the development of new programs and initiatives. Furthermore, the study could also inspire new types of collaborations that may benefit innovators and promote collaborative solutions for skill development. Aside from theoretical and empirical contributions, this study contributes to an extension of current understandings surrounding factors facilitating/hindering learning through practical insights. IKM practitioners can benefit from the results of the study by addressing hindering factors and promoting the adoption or expansion in the use of enabling factors to facilitate learning, constructing IKM activities while incorporating enabling factors which support interactions among individuals with expansive learning potential. It became increasingly clear that contradictions can be important sources of change in learning and may lead to new learning patterns in the context of development and transformation in times of rapid change, providing foundations for future practical applications.

8.8 Future Directions in the Activity-Theoretical Re-Conceptualizations of Startup Learning

This thesis provides evidence for the suitability of a CHAT/EL based methodology in examining complex, evolving and contradictory, socio-cultural interactions in startups in relation to learning. Adaptations and lessons learned in conducting this study could be implemented in future applications of this method. A closer examination of differences especially as related to social dimensions of transformation is necessary to generate a better understanding of interconnected dynamics of learning. As a developing area of study, this research contributes to a better understanding of variations related to situated aspects of learning in rapidly developing work environments through the research questions addressed. At the same time, the study generated new questions which can benefit from further examination. The activity-theoretical perspective adopted in this study represents a valuable and original contribution to the IKM body of knowledge, which can be perfected and tested in different contexts. Building on the foundational concepts developed in this study, future research could explore other dimensions which could be part of specific research agendas. The KATs adopted in this study could be
further developed to illuminate social relational perspectives of learning with transformative potential in practice. These aspects could include new ways of identifying differentiated forms of learning mediation, boundary crossing mechanisms or markers/indicators of contradictions as a source of change in learning.

By building on existing effective practices which have shown to provide valuable opportunities for individuals who work in startups, it is possible to improve individual and organizational outcomes concurrently. This study confirmed the importance of less formalized learning practices in structuring social relations that shape distinct approaches to learning and variations of individual learning trajectories. These less formalized learning practices, however, do not always provide the most efficient mechanisms in achieving professional object/goals. In contrast, some formalized learning approaches, as observed in ORG-A, and which are goal-oriented, appear to reinforce learning in startup contexts. Collaborative learning opportunities in which critical thinking is encouraged provide learners dynamic conditions which balance the unstructured nature of highly dynamic startup organizations, resulting in a buffering effect in developmental change and learning.

Startups could benefit from tools which may help employees to better respond to the dynamics of rapid technological change by co-creating solutions which are aligned to an innovation ecology approach. By organizing practices under an expansive view of learning, startups can transform decentralized dimensions of practice towards more collaborative forms of participation. Supporting the development of various groups of women, minorities or youth can have significant and long-lasting impacts on the innovation ecology and beyond.

A central notion which adds another layer of complexity to the discussion surrounding future research directions constitutes the continuum of contradictions. While some may perceive this element as a transformational component, it is the degree to which such change occurs which determines if the threshold for transformation/expansion is met. Dialogical approaches to change assume an interconnected fabric of relationships among system components at the intersection of concrete and abstract forms of expression. Viewed from the vantage point of CHAT/EL, dialectical transformation processes look at systems in their complexity beyond the obvious patterns of expression (Engeström, 1999; Yamagata-Lynch, 2010b). One of the main issues identified in this study was the significant number of contradictions as a source of change, which are expressed in practices in different forms and to different degrees. It is therefore necessary to better understand the subtle differences in the conceptualizations of contradictions, and relations
to expansive aspects of learning. In this study, I suggested several contradictions that may be more common to startup activities in particular. The mediated nature of learning and the distributed nature of small and highly agile organizational contexts provide new forms of interactions which require innovative approaches in navigating informational complexities through potentially expansive learning approaches and a rapidly shifting focus in practice. This constantly shifting focus results in differentiated approaches which create opportunities for new types of learning interactions in startup contexts, in times of rapid change.

Developing effective and inclusive methods in stimulating learning expansion represents a focus area future studies may contribute to. Change emergence due to contradictions in activity may be a function of both new and legacy practices in startups. These contradictions may emerge from different access levels to resources, generating tensions at the systemic level. ORG-B and ORG-C showed higher levels of access, indicating that disruptions within activity may be generated by interactions among individuals in activity. Addressing these issues requires the modification of existing practices or the design of new ones in order to better mediate practices among participants in the process of activity reconceptualization. There is a possibility that contradictions may remain unsolved if not accessed through stimulating actions. While beyond the scope of the study, future research might extend this line of inquiry and examine how stimulating actions can illuminate the contradictions to facilitate change situations where transformative processes may take place.

While this study focuses primarily on learning in technology startups, other contexts or work/learning environments can contribute additional insights into learning dynamics viewed from an activity-theoretical perspective. Results suggest that significant learning takes place in startup ecologies for innovation. Furthermore, the choice for startups for the context of the study provided contributions to common debates around complex learning in startups, especially in relation to contradictions. Looking at boundary-crossing mechanisms, it is possible to develop an activity-theoretical view of conditions facilitating or hindering learning, widening understandings of learning related to the three dimensions examined. Future avenues for research may include further research in startup contexts or other domains within startup ecologies enhancing current understandings of learning or critically examining learning myths in these environments as viewed from the vantage point of CHAT/EL. This research raised valuable questions which can inform other research paths in order to provide insights in other domains of the startup ecologies.
Findings from this study broaden the understanding of localized learning dynamics which may be explored in other contexts.

Another area for future research may concern the interactions among different startup activities. While aspects related to boundary crossing discussed revealed complex dynamics of the interplay between different activities, these included both IKM and non-IKM interactions. While this study focused primarily on contradictions in the specific context of medical technology startups, future research could examine the interactions between different activities in other contexts which are either symbiotic or dividing in practice. Understanding the nature of those interactions and their relationships to learning is critical in better understanding the PfEL in other situated startup contexts in relation to IKM systems and practices.

In future studies, further analytic concepts may be developed in order to analyze activity at multiple levels and derive aspects relevant to learning dynamics in practice. Specifically, in relation to activity-theoretical re-conceptualizations of learning and change, future research could place other stakeholders central to the activity-theoretical model, enabling the emergence of different discourses based on which learning is shaped in activity. A possible future approach in theoretical development may focus on other research methods such as in-depth case study of specific cases, which could provide new insights into the distributed, differentiated or evolving nature of learning and the dynamics contributing to the emergence of realized forms of the PfEL in startup work over time.

In addition, one of the next steps could include the development of programs specifically designed to enhance learning experiences of startup employees by adopting socio-cultural, activity-theoretical considerations in customizing personalized plans for learning. Specifically, the expansive view of learning could be adapted for frameworks in supporting variations of innovation-related activities in startup practices promoting learning. Building on existing research on EL, future studies could explore the influences of other artifacts/tools mediating learning in empirical investigations providing insights into the roles such tools may play in shaping learning dynamics by enabling or hindering development in practice. The foundations for the EVoL developed in this study may facilitate further in-depth investigations into the complex relationships among activity system constituents and the ways in which activity is constructed and reconstructed in other situated contexts.

To develop a deeper understanding of the dynamics of knowledge creation and learning in startup development, issues of power may provide additional insights into the reproductive
mechanisms of practices and forces acting against subordinate social groups in practice. In particular, future research may explore variations in distinct modes of participation as forms of resistance or coping in relation to such conditions in the context of everyday work. These insights can provide important observations about social practices and the mechanisms that can be understood in relation to cultural, historical and activity-based dynamics through critical discussions concerning patterns of participation in activity and individual variations in relation to unique material contexts of specific organizations undergoing transformations/change. Explicating these dispositions, preferences, relations and conflicts dialectically vis-à-vis issues of power and contradictions in activity systems may enable an understanding of diverse realities of practice which orient shifting forms of knowledge creation and the capacities of individuals/subordinate social groups to engage in developmental/learning processes.

Furthermore, issues of gender, race or class could provide additional directions in the development of the EVoL from a socio-cultural perspective using similar or different organizational contexts. These aspects could be linked to different forms of participation in a range of organizational contexts with EL potential. Returning to the initial introduction of the situated nature of learning, it is relevant to point out that this study examined aspects of learning as conceptualized in a given socio-historical context, constantly evolving and transforming over time. Given the rapidly changing nature of technology, new modes of practice may shape new forms of participation in contexts examined. Future directions should therefore consider fundamental principles of social justice which are embedded in learning in relation to everyday struggles of diverse groups.

8.9 Summary

In Studies in Expansive Learning: Learning What Is Not Yet There, Engeström (2016c), poses several ideas which relate to the future of EL as a robust framework in analyzing aspects of learning in evolving work environments:

The ultimate test of any learning theory is how it helps us to generate learning that penetrates and grasps pressing issues the humankind is facing today and tomorrow. The theory of expansive learning currently expands its analysis both up and down, outward and inward. Moving up and outward, it tackles learning in fields or networks of interconnected activity systems with their partially shared and often contested objects. Moving down and inward, it tackles issues of subjectivity, experiencing, personal sense,
emotion, embodiment, identity and moral commitment. The two directions may seem incompatible. Indeed, there is a risk that the theory is split into the study of collective activity systems, organizations and history on the one hand and subjects, actions and situations on the other hand. This is exactly the kind of split the founders of activity theory set out to overcome. To bridge and integrate the two directions, serious theoretical and empirical efforts are needed. (p.77)

These insights suggest new directions in the reconceptualization of learning in increasingly complex and fast paced contexts characterized by rapid transformations in practice. In addition, these comments point toward the challenges of these fast-changing environments in relation to learning based on dialectical relations embedded in the mediated structure of activities. In this study, I sought to explore elements which structure learning within and between micro and macro dimensions of practice. The structured approach in analyzing the situated nature of learning through an activity-theoretical lens provided a highly useful view of complex processes which was sufficiently manageable for analysis. While useful, this structured approach acknowledged that learning is embedded in overlapping activities which are reflective of complex situations, characteristic to dynamic, multi-organizational work which are difficult to conceptualize and examine.

A retrospective look at the analyses provided in this study allows themes to emerge which illuminate a vast array of practices carried out in both conscious and less conscious ways. The specific examples identified as relevant in this study made visible processes through which learning is structured in social interactions as individuals navigate diverse forms of contradictions in fast changing work practices of startup organizations in times of rapid change. These shifting practices can be understood in relation to evolving MBCC and CRS dynamics as mechanisms which are linked to broader socio-cultural dimensions in practice, and illustrated in examples reflected in rich empirical data collected. This chapter has attempted to synthesize a significant range of concepts and their relations to EL, providing a backdrop for the reconceptualization of learning in IKM. This approach provided a new level of interpretation of learning dynamics in different contexts which share both similarities and differences in relation approaches to work practices and innovation in startup contexts examined.

A more nuanced understanding of the kind of learning emerging from the collection of details which constitute the human face of startup learning and organizational life was predicated on examining the fundamental building blocks creating the relations which shape the reality of
change lived and perceived by individuals in startup organizations. Addressing the research question therefore illuminated the problems in need for theoretical and empirical examinations with focus on certain conceptual features of startup learning dynamics which were not designed to be comprehensive, but which were addressed through a combination of ideas across IKM, CHAT and the empirical material to offer an account of factors shaping the tendential development of distinct and potentially divergent trajectories of development. Methodological and interpretive aspects adopted in this study building on the CHAT/EL approach adopted, I argue, provide a foundation for contributions to startup learning dynamics and innovation, illuminating essential realities of change and uncertainty with attention to detail, while maintaining an awareness of situatedness, historicity and the transformative potentials inherent in startup work and learning within the evolving conditions of the innovation ecosystem startups were part of.

The expansive view of learning (EVoL) developed in this examination required a differentiated perspective on distinct modes of participation rooted in the cultural dynamics of innovation as situated in an evolving overarching macro structural context, producing interdependent relations which are in perpetual change. Within these dynamic contexts, individuals developed their skills by experimenting, trying new approaches or adapting. The wide range of preferences displayed by individuals often created micro-dialectic situations with expansive potential. Mediating situated differences resulted in changing modes of practice which were in a constant state of fluid transformation (Engeström, 2007; Hakkarainen, 2008). The complexity of startup learning in everyday knowledge creation for development outlined the complex social relations which shaped the potential for expansive learning in practice in relation to changing modes of participation linked to variations in directions for development of individuals-in-activity. These opportunities for transformation may often be neglected or ignored yet may at the same time represent valuable turning points with expansive learning potential.

The first organization examined was a relatively formalized learning setting, in comparison to the second and third cases where the learning settings could be best described as semi-formal and informal respectively. I argue that, despite differences among organizations examined, emerging approaches to navigating complexity in knowledge creation practices lead to distinct forms of work and learning which can be conceptualized on distinct and potentially divergent trajectories of development and change reflecting tendencies towards formalization, collaboration and experimentation. In this context, differences become relevant as the expansive
view of learning provides a powerful lens through which micro-level socio-cultural aspects can be made visible to illuminate aspects supporting empirically-grounded claims about the role of mediation, boundary crossing and contradictions as a source of change in learning.

The analysis of the mediated nature of learning in relation to the MBCC dynamic of startup work activities outlined socio-cultural dimensions in motion, demonstrating complex relations which influenced learning for participants. One of the claims which emerges from this analysis is that learning is socio-culturally and materially mediated by three interrelated mechanisms which orient the tendential development towards formalization of practice: digitization, quantification and automation. This analysis of the mediated nature of learning in relation to the MBCC dynamic described in Chapter 5 enabled a more detailed view into socially constructed factors which underlie startup work from the vantage point of CHAT/EL. Based on the analysis of the dynamics of boundary crossing in startups in relation learning, the claim emerged that learning transcends formal boundaries in startup organizations and, as it extends into broader ecology dimensions, aspects of co-configuration, distributed cognition and the development of collaborative intentionality capital acquire increased significance. This claim of socially constructed dimensions of learning is predicated upon collaborative practices which provide an empirically based complementation to technocentric conceptualizations of learning prevalent in IKM literature. This re-conceptualization of learning, re-framed as a socially constructed, situated practice provides a more human-centric alternative to other views of learning which obscure learning as emerging, socially constructed and culturally evolving.

Finally, the examination of dialectical aspects of startup work focused on contradictions as a source of change in learning. I argued that the activity-focused perspective on learning allows a new level of visibility into previously neglected interactions which become relevant when viewed through a CHAT lens. These new conceptualizations provide relevant evidence of struggles individuals face as they navigate constant change in their rapidly changing organizations. The degree to which learning was mediated or how individuals crossed different boundaries in the process of transcending limitations could be more effectively conceptualized by bridging the micro-macro divides using the CHAT-based analytic themes adopted, in activity. The examination of contradictions therefore provided insights into the core dynamics of knowledge creation in everyday startup work practices which illuminated the importance of context specificity in shaping learning outcomes on a continuum of struggles in development and change.
This study illustrated the use of select concepts from activity theory adopted to illuminate learning dynamics in changing work environments of technology startups. Despite the variations among organizations examined, CHAT provided a robust framework to ground empirical analysis of complex phenomena with expansive learning potential in relation to distinct forms of contradictions in practice. Findings from cases examined are indicative of the significant conceptual and theoretical contributions of CHAT/EL to enhancing the understanding of the human face of learning and organizational life in startup organizations. Concepts developed through an empirical examination of cases presented therefore enabled a structured analysis of learning dynamics in participating organizations.

Adapting and developing activity-theoretical concepts for the examination of strategies and practices for development enabled an analysis of learning across cases, viewed from the vantage point of CHAT/EL. By engaging in this structured approach focused on aspects of mediation, boundary crossing and contradictions as a source of change in learning, startup work activities related to knowledge creation in the process of development were examined in different contexts. Learning expansion was based on the socio-culturally mediated interactions in the distinct contexts of knowledge creation in startup organizations examined. In these contexts, the activity theoretical approach adopted moved beyond regular conceptualizations of learning phenomena examined from cognitive dimensions, or larger societal influences. The CHAT/EL approach to examining learning in relation to knowledge creation and the contradiction/resolution/synthesis dynamic highlight the situated and mediated structure of startup work emerging from everyday activities in the specific context of innovation-focused startup organizations. Placing central emphasis on change and learning in these contexts, it is possible to better understand factors which contribute to the evolving nature of startup work in times of rapid change and their tendential development in relation to everyday practices in these situated contexts. Therefore, the in-depth examination of the potential for expansive learning (PfEL) further contributes to a better understanding of learning complexities in the unique organizational contexts of startup organizations at the cultural-historical moment of the research. Lastly, these activity-theoretical conceptualizations of learning are relevant in extending the field of IKM research by contributing new understandings of factors enabling or hindering the emergence of a potential for expansive learning in practice.

To conclude, learning in startups represents a highly valuable area for research in the context of diverse innovation agendas aligned to strategic directions for economic development.
This study has the potential to both advance the current understanding of learning dynamics in these unique environments and to provide valuable new insights and approaches to both academic and practitioner communities. In this research study, I made the case for the use of an activity-theoretical perspective to understand the potential for expansive learning in startup organizations. This activity-focused approach suggests that a mediation/boundary crossing/contradictions as a source of change in learning dynamic encompasses key aspects of expansive learning in the contexts examined, conceptualized in relation to a contradiction/resolution/synthesis dynamic on trajectories of change and development shaping distinct directions of development of individuals-in-activity towards projections of professional futures within and between organizations examined. The different types of boundaries which were transcended through mediated actions fueled by contradictions constitute valuable aspects in reconceptualizing learning in IKM literature. Building on the results of this empirical study, I illustrated the insights this theoretical lens affords into startup work practices to develop a novel analytical framework that emphasizes the potential for expansive learning in work activities performed by startup employees in everyday work practices focused on knowledge creation in times of rapid change. This framework can help shed new light on this phenomenon, especially with regard to fast changing practices in these organizations by examining aspects related to the translation of contradictions as a source of change in learning and their implications for changing modes of participation in activity shaping distinct and potentially divergent projections of professional/"knowledge work" futures.

The increased interest in new forms of work and learning is the result of a historically situated context characterized by an emphasis on innovation and technology as promising pathways towards new horizons of possibilities. However, learning experiences in the context of innovative work environments are increasingly complex and therefore resist easy formulations. To develop and grow, it is necessary to act, change, evaluate, make choices or transcend challenges which at times may seem too difficult to overcome. Startups create new tools to mediate their development, seek collaborations outside organizational boundaries and navigate the contradictory and turbulent waters of the unknown – a “web of contradictions” (Turner & Turner, 2001) in perpetual motion. Developmental tendencies observed in this study show how the distinct cultural realities of startups are actively created – in their most fundamental forms – as these organizations derive the constituent elements in search of transformative expansion. An understanding of the human face of learning and organizational life in startups must necessarily
take these key aspects into account. Balancing the promising potentials of current developments with critical examinations of learning grounded in robust foundations of equity have the potential to enable new pathways for development and progress for startups and other similar organizations as leaders in local ecologies for innovation and beyond.
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the practice of knowledge management. *VINE*.


Appendices

Appendix 1 Interview Invite

Dear Ms./Mr. [Prospective Participant],

You are invited to participate in this research study, which is conducted as part of my doctoral program at the University of Toronto under the supervision of Dr. Peter Sawchuk, Professor and Associate Chair, OISE, University of Toronto. I would appreciate your willingness to contribute to this project, which aims to improve our understanding of learning dynamics in startup organizations. This research study aims to explore aspects related to expansive learning in Canadian technology startup organizations from an activity-theoretical perspective.

Your expertise and experiences are highly valuable, as they can provide important insights into potential learning opportunities in the startup contexts examined. These insights will expand the existing body of academic research, and may inform and contribute to future programs and initiatives supporting innovative community-based learning in the innovation sector in Ontario. The research project has been approved by the Ethics Research Office at the University of Toronto.

This study can only be successful with your participation. I would appreciate 45-60 minutes of your time to participate in a short interview and share your opinions and insights in relation to the study questions. In the next days, I will send an email with additional details and potential meeting places and times. If you have any questions, please contact me directly at [phone] or by email at [email].

I sincerely appreciate your participation in advance.
With kind regards,

George Chiran, M.Ed.
Doctoral Candidate
Department of Leadership, Higher and Adult Education (LHAE)
University of Toronto, OISE
252 Bloor St W, Toronto, ON M5S 1V6
Ph: --------- E: ------------

Peter Sawchuk, PhD.
Professor, Associate Chair and Research Supervisor, Department of Leadership, Higher and Adult Education (LHAE)
University of Toronto, OISE
252 Bloor St W, Toronto, ON M5S 1V6
Ph: --------- E: ------------
Appendix 2 Consent Form

CONSENT FORM

Thank you for your interest in participating in this PhD study, which seeks to identify and understand how Information and Knowledge Management (IKM) practices enable or hinder learning practices for startup employees in the context of innovation-focused activities. Your participation is truly appreciated.

Conditions for Participating: Your participation is voluntary. You have the right to withdraw from the study, or refrain from answering any question at any time without negative consequences.

Confidentiality: Your privacy and confidentiality are very important to us. Any identifying information will be removed from the questionnaires and replaced with unique study identification codes. The responses to the questionnaire will be anonymous and kept confidential. All necessary measures will be taken to ensure the security and privacy of your information. The study results will be reported as aggregated data so that no identifying information can be displayed in the data. Your name will not be identified in any reports, publications, or presentations based on this research project.

Benefits: This study aims to make valuable contributions to academic knowledge in the area of Information and Knowledge Management in relationship to adult learning. It will present the perspectives of startup participants on IKM practices in relationship to learning in their startup environments, as they relate to their own experiences and knowledge.

Risks: There are no foreseeable risks, harms or inconveniences resulting from participating in this study. No collection of sensitive data will take place. No coercion will be used.

Access: Access to research materials will be restricted to the student researcher and the members of the PhD committee. When not in use, all electronic data will be stored in a secure computer, and all non-electronic data, such as questionnaires, will be stored in a locked cabinet at the Ontario Institute for Studies in Education, where they will be kept for a maximum of one year following the first publication resulting from the study, and then destroyed.

This study has been approved by the University of Toronto Research Ethics Board. If you have any questions about your rights as a research participant in this study, please contact [email] or [phone] Ethics Review Office, University of Toronto.

Do you agree to participate in this study? ( ) Yes, I voluntarily agree to participate in this study.

Name: _____________________ Date: __________________
### Appendix 3 IKM Literature Matrix and KAT Alignment

#### Primary Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Context / Rationale</th>
<th>Setting</th>
<th>Problem Addressed</th>
<th>Approach</th>
<th>Method</th>
<th>Problematic in relationship to KAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDICATION</td>
<td>Lytras, M. D., &amp; Pouloudi. A. (2006). Towards the development of a novel taxonomy of knowledge management systems from a learning perspective: an integrated approach to learning and knowledge infrastructures. <em>Journal of knowledge management, 10</em>(6), 64-80.</td>
<td>A review of KM systems and their potential for supporting learning in diverse contexts</td>
<td>Lack of integration of KM systems from a learning perspective; better support learning in knowledge-intensive organizations</td>
<td>Theoretical review and integration, critique, framework development</td>
<td>Taxonomy of KM systems and integration; support learning</td>
<td>The way learning is mediated through artifacts; &quot;Learning object&quot; or learning asset, how such object is conceptualized. The way in which learning assets are found by learners (no references to metadata), learning mediation through search socio-cultural considerations of mediation in learning activities, just overall framework (no context specified - may play a role in learning mediation)</td>
</tr>
<tr>
<td>BOUNDARY CROSSING</td>
<td>Pauleen, D. J., &amp; Yoong, P. (2001). Relationship building and the use of ICT in boundary-crossing virtual teams: a facilitator's perspective. <em>Journal of Information Technology, 16</em>(4), 205-220.</td>
<td>Facilitators working with boundary-crossing global virtual teams; Looks at ways in which facilitators use information and communication technologies (ICTs) to build and manage relationships in virtual environments</td>
<td>Diversity of cultures of participants, time zones, distance; examine how the facilitator can enable relationships in team setting effectively</td>
<td>Explore the team effectiveness - team member relationships link This study focuses on the virtual team facilitators in leading global teams using ICTs</td>
<td>Interpretive qualitative methodology-grounded action learning</td>
<td>Enablers such as cognitive retooling / argumentation/dialogue as mediating artifact in boundary crossing. How boundary crossing objects are used - enabling or hindering barriers. Enabling - cognitive retooling argumentation/dialogue Barriers - cognitive inertia (groupthink) and compartmentalization (overconfidence) in specific domains - missing - for barriers - what is the issue? Perhaps the facilitator may sharpen differences/divergences? The process of collaboration requires new conceptual tools / like the collective formation of concept; The creation of shared mental objects in boundary crossing activity - missing</td>
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#### Secondary Studies

<table>
<thead>
<tr>
<th>Study</th>
<th>Context</th>
<th>Setting</th>
<th>Problem Addressed</th>
<th>Approach</th>
<th>Method</th>
<th>Problematic in relationship to KAT</th>
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</thead>
<tbody>
<tr>
<td>MEDICATION</td>
<td>Deployment of a LMS</td>
<td>Large organization</td>
<td>Understand learning in organizations with a focus on LMS; growing workforce, distributed Organization, training increasingly difficult; duplication of effort; employee choice Goal- accelerate learning, single interface, manage skills</td>
<td>Proposes framework in understanding learning in organizations by focusing on the role of the LMS; propose empirically tested framework - includes formal managed learning and informal unmanaged learning</td>
<td>Case study, 11 months, exploratory interviews with subject matter experts “elite interviewing” - investigate little known phenomena; interview HR manager Finding: LMS contributes to formal learning management in the organization; while KMS supports informal learning; authors argue that learning should be measured or evaluated to be “formal”</td>
<td>Learning mediation through LMS - The learning object - missing - what kind of learning is provided in this LMS? Employee behavior - do learning behaviors change when LMS-mediated learning is implemented due to Mediated learning in LMS - what are the socio-cultural aspects influencing learning in these environments?</td>
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<td>BOUNDARY CROSSING</td>
<td>Social networking in the KM-e-learning relationship</td>
<td>Organizations - unspecified</td>
<td>Social networking for collaboration - link between KM and e-learning</td>
<td>Theoretical</td>
<td>Theoretical review</td>
<td>General/macro - deeper insights into the mechanisms of boundary crossing through collaboration in social networking Tools such as wikis and blogs, no concrete incidents are examined, how a problem was resolved in generating learning/problem solving Distinguish between horizontal and vertical dimensions of expertise development</td>
</tr>
<tr>
<td>CONTRADICTIONS</td>
<td>Business process re-engineering Organizational improvement, improve operational performance; change, improvement</td>
<td>Organizations - unspecified</td>
<td>4 contradictions in BPR - The old and the new, It as enabler/disabler of improvement, the empowerment of workers and employee commitment to re-engineering efforts.</td>
<td>Theoretical</td>
<td>Theoretical thematic review/analysis</td>
<td>“Business Process Re-Engineering” is conceptualized in the context of IKM or at least IM Good ideas re: contradictions, for example looks at “IT” as enabler or hindering factor, but context/activity would enhance the understanding of specifics</td>
</tr>
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**Appendix 4 Interview Protocol**
Reminder
- Establish friendly environment for interview procedure
- Audio taping the interview and taking notes as well
- Double check audio recording equipment
- Reminder to speak clearly
- Relaxed atmosphere, make participants feel comfortable

General Introduction:
Thank you for accepting to participate in this study and for your time. It is highly appreciated. This research study is in the context of my doctoral program at the University of Toronto. The purpose of this interview is to gain deeper insights into IKM practices which influence learning processes in the context of innovation focused activities in your startup organization. This interview will be audio-taped to facilitate more effective analysis. Your reposes will be kept confidential. Any identifiable information will be removed from the transcript.

Introductory Questions:
How would you describe your workplace culture ("startup culture"), describe the routine practices in your organization and/or typical workday?
How does your organization support skill development? (subsidy for continuing education? / in-house training?)
Which skills do you believe are important to succeed in a highly dynamic, fast changing digital economy?
How much time do you spend searching for information, on average, per day? When do you spend the most time on this task?

KAT-1: Mediation / Learning Dynamics
Can you give me any examples of instruments you use in the process of innovation-focused activities in your organization? In what ways do such instruments facilitate/hinder learning processes?
Describe the workspace / physical environment (NB: do you use co-working space/ shared office space?)
Which technologies/mechanisms do you use for collaboration/ information & knowledge management system/ knowledge sharing
How does the space you work in influence your ability to engage in collective knowledge creation? Does the physical design facilitate or hinder your professional performance?

KAT-2: Collaboration / Boundary Crossing
Can you give me any example of collaborative innovation-focused activities in your startup organization? What did you learn from these experiences? What could be done differently?
How do you navigate information complexity to achieve their learning goals?
How often do you interact with your colleagues, discuss, analyze, shared experiences; experiential learning.
Do you actively seek help on your team or beyond organizational boundaries?
How do you stay focused on the task? What are the factors which distract your from your goals?
How did your educational background influence your development in the startup community?
To what degree does a group member influence the dynamics of goal achievement in your organization?
How do you navigate change in your organization?
Do you participate in any professional communities? How do you contribute to those communities?
Do you consider any knowledge sharing practices particularly effective?
What do you feel motivates group members to share knowledge and expertise?

KAT-3: Contradictions / Source of Change
Can you give me an example of a time when you experienced challenges in your innovation-focused work activities? What did you learn from these experiences? How did you navigate tensions/contradictions?
Do you feel overwhelmed with the amount of information?
How do you manage to navigate complexity?
Describe the role of tensions in the knowledge creating process. Do you feel that tensions are constructive or hinder the relationships in achieving the group goal in the context of a collaborative goal-directed activity?
What do you do when you are in doubt? What do you do when you see conflicting information?
What does information complexity mean to you? To what degree do you feel that you have to navigate a complex environment? How do you navigate complexity?

Concluding Questions
Which ways of learning do you perceive to be most effective for professional development?
How does your organization facilitate a culture of continuous learning?
Do you have any supports for professional development internally/externally?
How do you experience professional growth? How do you know that you “grow” professionally?