

Beyond individuals- A Process of Routinizing Behaviors Through Entrepreneurial Learning

Insights from Technology-Based Ventures

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Beyond individuals- A Process of Routinizing Behaviors Through Entrepreneurial Learning

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DOCTORAL DISSERTATION

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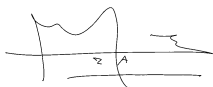
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<p>Abstract</p> <p>The primary aim of this thesis is to develop a theoretical model that enhances our understanding of entrepreneurial learning as a process by which personal streams of experience become routinized and embedded in venture-wide behaviors. I pursue this aim by exploring entrepreneurial learning as a multilevel experiential process. This process begins with learning at the individual level, which forms the basis for personal experiences that permeate into the organization, and ends with learning being transposed into the organization via routinizing behaviors.</p> <p>Routinizing behaviors is a necessary step for new ventures to perform activities in a consistent, reliable way. Without routinization, new ventures can suffer from confusion and a lack of clarity, which may undermine their ability to continuously transform ideas into new products, processes, or services. However, there is little understanding of how personal streams of experience become routinized and embedded in venture-wide behaviors. This is because the focus of entrepreneurial learning research has been predominantly centered on how entrepreneurs learn and develop knowledge, with fewer insights into how their learning is subsequently transposed into the venture. This mainly reflects the fact that entrepreneurial learning has been extensively researched using learning theories drawn from psychology. Moreover, other studies of entrepreneurial learning focus on venture-level learning, emphasizing the outcomes of learning manifested by new ventures' ability to recognize opportunities or achieve growth outcomes. As such, existing research on entrepreneurial learning offers only minimal insights into how learning at the individual level interacts and connects with learning at the venture level. Without such insights, it is difficult to explain how new ventures channel experiences in such a way that they become routinized in venture-wide behaviors. Therefore, this research advances a new conceptualization of entrepreneurial learning: one that is dynamic, experiential, and multilevel.</p> <p>The research aims are realized via a longitudinal, qualitative research design conducted in technology-based ventures. Technology-based ventures are a subset of knowledge-intensive ventures where most work is premised on investment in projects that assemble and deploy members with specialized knowledge and expertise. These types of ventures are challenged by the dynamic environment in which they operate, which requires them to continuously learn and perform activities at high levels of reliability and consistency. Given the vital role that technology-based ventures play in boosting employment and driving economic growth, understanding how they learn and develop is critically important.</p>		
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About the cover

The cover is designed by Jude Zawaideh, a young Jordanian artist. Jude is pursuing her bachelor's degree in Business of Arts and Design at Ringling College. Jude believes that art is like "matter," it cannot be created, nor it can be destroyed. That is, each and every person is capable of art in their own way, and art does not necessarily need to be aesthetically beautiful to be considered art. Jude aims to deliver art that triggers the viewers' thoughts and senses, which demands a deeper look into what is being portrayed and the different layers and interactions brought about.

The designed cover highlights the interconnected nature between the individual and the venture. It also depicts that the development of a venture is based on the decisions that the individual makes. These decisions can be internal or external to the business. The chaos of the compact composition between the individual and the venture evokes a feeling of tension, yet it also formulates a feeling of understanding how these two entities interact and come together. The contrast between the curved lines that make up the individual and the sharp-edged lines that build the concept of a venture emphasizes how these two aspects that are often treated as separate entities are intact and interconnected. The visual illuminates that the connection between the individual and the venture evolves over time into routines. Routines are portrayed in the visual by the repetitive circular lines topping the venture.

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To Nadeen, Nai & Noor

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Paper II: From individuals to the organization: A transactive memory system perspective on multilevel entrepreneurial learning. *Accepted/In Press* at *The Learning Organization*.

Paper III: Dysfunctional diversity: How entrepreneurial learning unfolds in functionally heterogeneous teams, *Academy of Management Proceedings*, Vol. 2018, No. 1 (awarded ‘Best Paper’ by the *International Small Business Journal*).

Paper IV: Unpacking entrepreneurial learning: How prior related experience and uncertainty affect learning behaviors. *Babson conference, Boston- USA, 2019*.

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Forward

The primary aim of this thesis is to develop a theoretical model that enhances our understanding of entrepreneurial learning as a process by which personalized streams of experience become routinized and embedded in venture-wide behaviors. The aim is realized by exploring entrepreneurial learning as an experiential multilevel process. This process begins with learning at the individual level, which forms the basis for personalized experiences that permeate into the organization, and ends with learning being transposed into the organization via routinizing behaviors.

Routinizing behaviors is a necessary step for new ventures to perform activities reliably. Without routinization, new ventures can experience vagueness and confusion, which may challenge their ability to continuously transform ideas into new products, processes, or services. However, there is little understanding of how personalized streams of experience become routinized and embedded in venture-wide behaviors. This is because the focus of entrepreneurial learning research has been predominantly centered on how entrepreneurs learn and develop knowledge, with little understanding of how learning transposes into the venture. This is mainly a reflection of entrepreneurial learning being extensively researched using learning theories from psychology. Moreover, other studies of entrepreneurial learning focus on venture level learning, emphasizing the outcomes of learning manifested by the ability of new ventures to recognize opportunities or achieve growth outcomes. As such, existing research on entrepreneurial learning offers minimal understanding as to how learning at the individual-level interacts and connects with learning at the venture-level. With such a gap, it is difficult to explain how new ventures channel experiences in a way that they become routinized in venture-wide behaviors. Therefore, this research advances a new conceptualization of entrepreneurial learning, one that is dynamic and experiential and functioning on multiple levels.

The aim is realized via a longitudinal qualitative research design in technology-based ventures. These types of ventures are challenged by the dynamic environment in which they operate, which demands that they learn and perform activities with high levels of reliability and continuity. Given the vital role that technology-based ventures play in boosting employment and being engines of economic growth, understanding how they learn and develop becomes of critical importance.

1. Introduction

This introductory chapter provides an overview of the problem under discussion and presents a background of the research area of interest, linking it to the research question. Since this is a composite work, the chapter also presents a summary of the four appended studies and their connection to the overall purpose of the research.

Entrepreneurial learning and the routinization of behaviors in new ventures

The field of entrepreneurship has long recognized the challenges facing new ventures during the early stages of their development (Behave, 1994; Bird, 1992; Vohora et al., 2004). New ventures can be described as young firms that carry out entrepreneurial activities (Petersen & Ahmad, 2007). They are considered to be more vulnerable to failure compared to established organizations, mainly because they have fewer resources and struggle with internally derived barriers of newness such as learning new roles, gaining legitimacy, and formalizing social structures (Stinchcombe, 1965; Shepherd et al., 2000; König et al., 2018).

During this early development stage, new ventures are informally constituted, with few routines that inform organizational-level performance (Powell & Baker, 2014; Katila & Shane, 2005). Their simple form relies primarily on the learning that the entrepreneur(s) acquire through experience, and which provides the initial knowledge base on which opportunities are identified and pursued. Entrepreneurs can learn from different forms of experience, such as education or experience in management, specific industries, or prior start-ups (Politis, 2005).

However, the development process is characterized by high ambiguity. New ventures need to manage ill-defined technologies, whose context of use is as yet only vaguely understood or delineated. They also need to gradually make sense of the connections between technological functions, customer preferences, and market structures (Nagy & Lohrke, 2010). Therefore, the long-term development of their ideas requires learning from new experiences—such as interacting with industrial,

commercial, or research partners—or engaging new members whose knowledge and skills are complementary to the venture (Ravasi & Turati, 2005).

Nevertheless, during the early stage, these experiences tend to be personal, and embodied in specific individuals—typically the founder or founding team. Benefiting from these experiences and developing an enduring venture that can exist independently of any single individual requires that these experiences become embedded in the venture in the form of routines (Zollo & Winter, 2002; Franco & Haase, 2009).

Establishing organizational routines is recognized as crucial for stabilizing organizational activities, and is a necessary step for new ventures to create and maintain essential-for-survival processes such as “strategic decision-making, product development or financial planning” (Haase & Eberl, 2019, p. 2). Prior research has shown that established firms have higher survival rates than new ventures because they can transform their experiences into reliable routines (Levinthal, 1991). New ventures, however, almost always start with a blank slate (Aldrich & Yang, 2014). Therefore, the process of developing routines—termed *routinizing behaviors* in this thesis—plays a critical role in processes of adaptation and learning, since it allows the new venture to capture and benefit from individuals’ experiences, and stabilizes the way they operate and develop new products, services, and processes (Feldman & Pentland, 2003).

According to Pentland & Feldman (2003), routines—as repetitive sets of interdependent actions—represent dynamic transactions between individual, team, and organization. These transactions encapsulate the way individuals initially articulate and explain their experiences to other members. Moreover, such transactions also capture how these experiences are jointly discussed, interpreted, and adjusted at the group level, and subsequently integrated into the emerging organization (Brockman, 2013). In this way, routines mirror the experiences, cognition, skills, and habits of individuals that, over time, shape and guide organization-wide behaviors (Levitt & March, 1988).

However, existing literature in entrepreneurship has taken for granted that organizational routines, similar to those in established organizations, already exist (Haase & Eberl, 2019). For instance, Deakin and Freel (1998, p. 148), who study learning in small and medium-sized ventures, argue that “routines define the firm, its knowledge, and provide the fundamental skills of the enterprise.” Moreover, they consider that ventures learn whenever they experience a change to their routines. As such, they assume that routines already exist, without exploring how they might be created in the first place (Haase & Eberl, 2019).

New ventures do not follow a clear path during the early stage of development. They have to readjust their actions in response to problems, or simply through trial and error, until they identify successful patterns of action that could be routinized to inform successful behaviors in the future (Lumpkin & Lichtenstein, 2005). Therefore, routinizing behaviors is an experiential process that is primarily

embedded in processes of entrepreneurial learning, where shared understanding and the taking of coordinated action through mutual adjustments are formed and effectuated between the individual and organizational levels of learning (Dutta & Crossan, 2005). Organization-level learning represents the processes through which an organization acquires, assimilates, and institutionalizes experience in the form of routines (see Franco & Haase, 2009). Individual-level learning, on the other hand, creates the basis for individual streams of experience that permeate into the organization (Crossan & Berdrow, 2003; El-Awad, Gabrielsson, & Politis, 2017). In this way, entrepreneurial learning is conceptualized in this thesis as an experiential multilevel process, where new ventures develop their capability to perform particular activities—such as transforming ideas into new or improved products, services, or processes—reliably and continuously, by learning and internalizing an increasingly sophisticated set of routinized behaviors (El-Awad, Gabrielsson, & Politis, 2017). Thus, entrepreneurial learning is an emergent process that translates between different levels (individual, team, organization).

Nonetheless, the existing literature in entrepreneurship does not explain entrepreneurial learning as a multilevel phenomenon. Instead, most studies have concentrated on understanding entrepreneurial learning at either the individual or organizational levels (Wang & Chugh, 2014). At the individual level, scholars have explored how entrepreneurs learn from experience and develop the knowledge they need to start and manage a business (Holcomb, Ireland, Holmes, & Hitt, 2009; Minniti & Bygrave, 2001; Parker, 2006; Politis, 2005). Some of the significant contributions in this domain discuss how entrepreneurs learn in the broader context of entrepreneurship (Cope, 2003); how they learn from failure (Cope, 2011); and how they form an entrepreneurial identity in the process of becoming entrepreneurs (Rae & Carswell, 2001).

At the organizational level, studies have looked at the collective processes of knowledge creation, emphasizing how shared rules and procedures are coordinated and diffused within the organization (Brockman, 2013; Deakins & Freel, 1998). Other works have addressed learning in the context of opportunity recognition (Dimov, 2007; Dutta & Crossan, 2005; Lumpkin & Lichtenstein, 2005). They argue that opportunities are pursued along a continuum where entrepreneurs engage with social actors, and that learning transcends the individual and becomes embedded in the organization through transaction and dialogue. Other studies of learning in small organizations have focused on how entrepreneurial learning is associated with organizational learning (Voudouris, Dimitratos, & Salavou, 2011; Wang, 2008; Zhang, Macpherson, & Jones, 2006). These studies consider entrepreneurs' individual management style, learning mode, and learning orientation as antecedents that determine the firm-level output. For instance, Zhang et al. (2006), who compare stable firms with their more innovative counterparts, argue that the mode and scope of entrepreneurs' learning transactions with the environment shape the extent to which an entrepreneurial firm can create product and process

innovations. As such, they suggest that the owners of new ventures often act as gatekeepers, or as an interface between the new venture and its environment.

However, while these streams of research acknowledge the role of the individual and organizational levels of learning in the entrepreneurial process, they offer fewer insights into how these two levels connect and interact. Therefore, the existing understanding of entrepreneurial learning does not explain how new ventures engage in routinizing behaviors where individual streams of experience are transmuted into the organization (Wang & Chugh, 2014).

Aim and research questions

Given the above discussion, the aim of this research is:

To develop a theoretical model that enhances our understanding of entrepreneurial learning as a process through which personal streams of experience become routinized and embedded in venture-wide behaviors.

Realizing this aim involves exploring how entrepreneurial learning is translated between different levels. Therefore, I ask: How does entrepreneurial learning unfold as an experiential multilevel process?

Advancing the theoretical understanding of entrepreneurial learning as an experiential multilevel phenomenon is valuable for three reasons. First, it captures how learning is translated between different levels (individual, team, organization), thus demonstrating how organizations learn and routinize their experiences. Second, it illuminates the mechanisms that underlie how individual streams of experience permeate into the organization. Third, it offers better insights into the nature and form of the transactions that take place between individuals and the organization, and how these in turn define the way new ventures continue to learn and routinize behaviors.

To capture the aforementioned aim and research question, the following sub-research questions (SRQs) guide the appended empirical studies:

SRQ1: How do individual streams of experience become embedded in the venture?

SRQ2: What mechanisms in the entrepreneurial learning process facilitate or challenge the way individual streams of experience permeate between individuals in the venture?

SRQ3: What role does the interplay between prior related experience and uncertainty play in determining new ventures' learning behaviors?

Below are brief summaries of the appended papers that address these SRQs. In addition, Figure 1.1 provides an overall visual summary.

Paper I. This paper establishes a broad theoretical basis for understanding entrepreneurial learning as an experiential multilevel process. The study demonstrates conceptually how individual streams of experience are transmuted into the venture via routinizing behaviors. The paper identifies the team level of learning as a necessary bridge for connecting the individual and organizational levels of learning. In this way, the paper models different learning processes that function at the venture-team level, and that contribute to the evolution of experiences from individuals to the organization.

Paper II. This paper builds on the concepts developed in Paper I, and sets out to explore the mechanisms through which individual streams of experience permeate into the organization. As such, the paper demonstrates how learning is translated at different levels (individual, team, organization) and provides a deeper understanding of the routinization process.

Paper III. Given the importance of the venture-team level of learning for bridging the individual and organizational levels of learning (identified in the multilevel perspective on entrepreneurial learning in Paper I), this paper sets out to explore how the team context can facilitate or challenge the way individual streams of experience permeate into other members in the organization. New venture team members typically lack established norms and routines concerning what constitutes appropriate behavior. Therefore, they may find it challenging to coordinate different experiences toward achieving goals and working through disagreements. This challenge is particularly salient in cases where venture members come from diverse functional backgrounds and areas of expertise. Such a context may, therefore, instigate conflict and debate. Hence, this paper details the socio-cognitive mechanisms that underpin how learning is transferred between members of the venture team.

Paper IV. Having investigated the entrepreneurial learning process whereby new ventures routinize behaviors, this paper seeks to explain why new ventures learn and routinize behaviors differently, thus leading to ventures that favor exploration over exploitation when managing uncertainty and vice versa. The paper provides an overall understanding of how new ventures develop their learning behaviors over different phases of their development, illuminating the interplay between prior related experience and uncertainty as two critical factors that underlie learning behaviors.

The rest of this chapter is structured as follows. The next section presents technology-based ventures, the empirical setting of this research. It also discusses the distinctive characteristics of these types of ventures, elaborating on why it is essential for them to learn. Next, I provide a brief overview of existing literature on entrepreneurial learning, before discussing a multilevel perspective and demonstrating the importance of team learning processes for bridging the individual and organizational levels of learning.

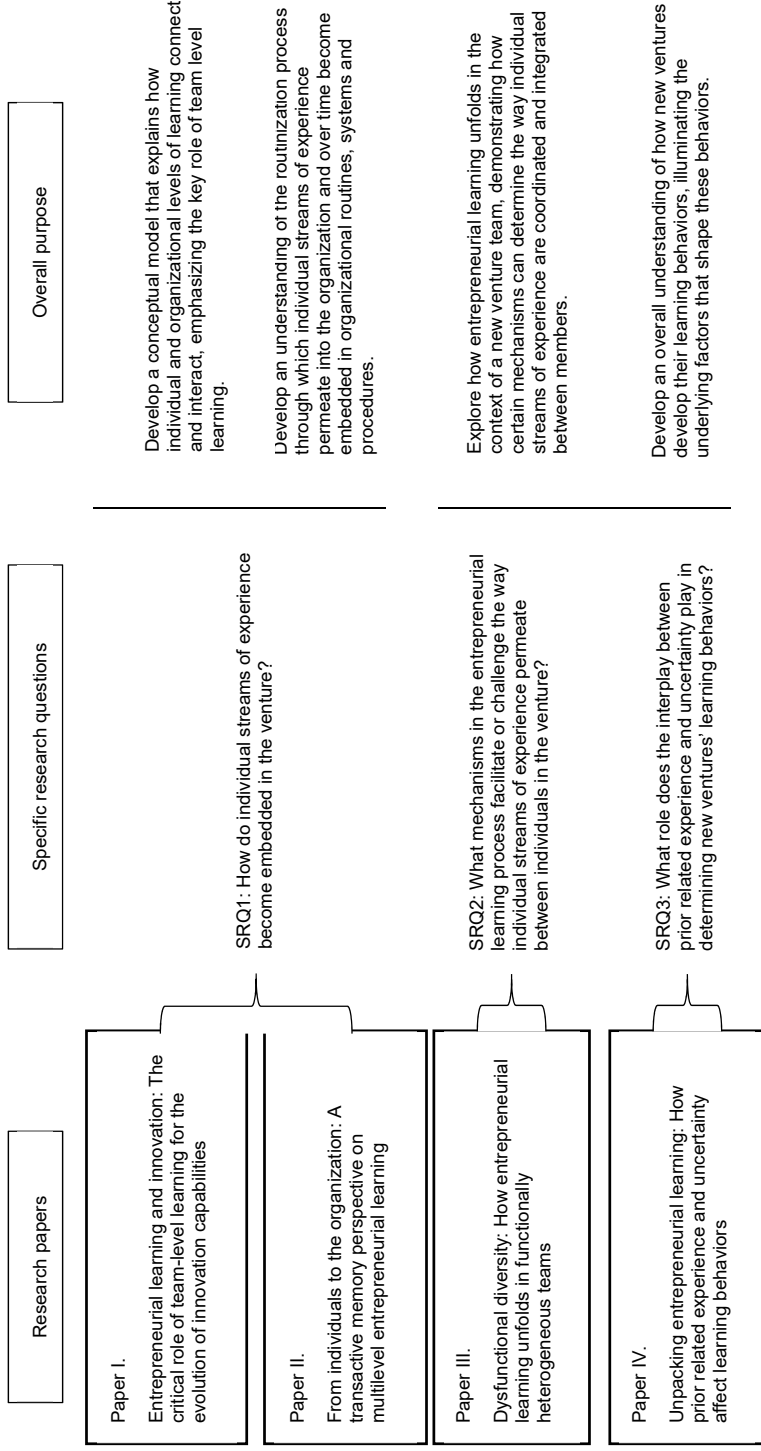


Figure 1.1
Summary of appended papers in relation to the SRQs

The empirical setting: technology-based ventures

In today's knowledge-based economy, innovation is considered a vital source of economic development and growth (Leyden, 2016). Innovation is a mechanism by which ventures recognize opportunities and operationalize them into new or improved products, services, or processes (Lawson & Samson, 2001). One type of venture that actively innovates and is considered a key contributor to job creation, technological change, and industrial renewal is technology-based ventures (e.g., Beckman et al., 2012).

Policy measures, such as those featured in the European framework program for research and innovation (Horizon, 2020), suggest that the current R&D gap is partly explained by the scarcity of technology-based ventures (Acs & Szerb, 2007; Grilli & Murtinu, 2014; Wright, 2007). According to the European 2020 agenda, the lack of technology-based ventures is deemed to be one of the structural weaknesses in Europe, and a primary obstacle to obtaining its goal of becoming the most dynamic and competitive knowledge-based economy in the world (European Commission, 2010). Thus, scholars and policymakers alike have directed their efforts towards understanding and supporting the development of technology-based ventures (Colombo, Mustar, & Wright, 2010; Klepper & Sleeper, 2005; Rasmussen, Mosey, & Wright, 2011).

Characteristics of technology-based ventures

Studies in entrepreneurship have defined technology-based ventures as young firms where most work is premised on the investment in projects that (i) assemble and deploy members with specialized knowledge and expertise; and (ii) are connected to advancements in scientific and technological expertise (Breschi, Lenzi, Malerba, & Mancusi, 2014). Fundamental to these ventures are their technical orientation, knowledge intensity, and scientific base (Rickne & Jacobsson, 1999). Given the significance of knowledge to their function, these ventures rely on well-educated human capital, often aggregated in teams, to mobilize their entrepreneurial activities (Hellerstedt, 2009; Madsen, Neegaard, & Uloi, 2008; Starbuck, 1992). Research demonstrates that the founders of technology-based ventures typically come with high levels of specialized educational attainment, such as degrees in engineering or science (Ganotakis, 2012). Results from prior studies also show that the majority of entrepreneurs who embark on a technology-based venture have worked in large (private-sector) firms or research centers functioning in specific industries, and where entrepreneurs have assumed high-level positions (Storey & Tether, 1998).

Although technology-based ventures are considered an engine of economic growth, there is general agreement among scholars and practitioners that they face

unique challenges, both internal and external (Colombo et al., 2010; Storey & Tether, 1998; Miozzo & Divito, 2016). These challenges are discussed below.

Challenges facing technology-based ventures

Internally, technology-based ventures suffer upheaval reflected in high rates of staff turnover (Delmar, 2005). Such disruption and instability severely impede their ability to benefit from the experiences and skills of their members—which, in turn, compromises their capacity to recognize entrepreneurial opportunities and capture quasi-rents (Saunila & Ukko, 2012). This situation is particularly germane for ventures operating at an “early stage,” where experiences are typically attached to the founders, and where organizational routines that allow the venture to reap the value of these experiences are not yet in place (Powell & Baker, 2014; Stinchcombe & March, 1965). Moreover, the founders’ specialized education typically creates a gap between their own scientific background and the broader managerial competencies needed to run the business (Storey & Tether, 1998; Vanaelst et al., 2006). As such, founders need to engage new staff members with complementary knowledge and expertise to mobilize their entrepreneurial activities and performance (Jin et al., 2016; Rasmussen, Mosey, & Wright, 2011).

Externally, technology-based ventures operate in a dynamic environment that features continuous technological change and constant imitation and replication strategies by competitors (Flatten et al., 2015). These challenges typically generate ambiguity concerning the outcome, timing, and commercial feasibility of the technology that the focal venture plans to introduce. Furthermore, they also increase the complexity involved in aligning internal processes with competition and industry regulations.

In order for technology-based ventures to counter these challenges and sustain their development, they must develop learning processes that allow them to organize, coordinate, and integrate the various experiences available to them via founders, stakeholders, and new staff members into the emerging organization in the form of routines (Andries & Debackere, 2006). As highlighted above, organizational routines play a critical role in capturing and coordinating the skills and cognition of organizational members. Therefore, routinizing behaviors is particularly vital for early-stage technology-based ventures, since it allows members’ experiences to be retained in a usable form—even if some of the organization’s originators subsequently depart (Argote, 2012).

Similarly, and with respect to the dynamic environment in which they operate, technology-based ventures must introduce innovations with varying degrees of novelty. For instance, incremental innovations typically require routinizing behaviors that support the exploitation of existing knowledge and activities that help improve efficiency and reliability (Fang, Lee, & Schilling, 2010). Conversely,

highly novel innovations require routinizing behaviors that support the development of new knowledge via processes of exploration, experimentation, and discovery. The fact that routinizing behaviors is largely embedded in processes of entrepreneurial learning suggests that the trade-off between exploration and exploitation is dependent on the choice of learning processes that new ventures institute early on in their development, and which underpin the transmutation of personal streams of experience into institutionalized learning in the form of routines.

However, the current state of the literature on entrepreneurial learning provides only limited insights into how these learning processes evolve, or how they are transposed between different levels in the organization. This limitation is mostly due to the prevailing separation of studies on entrepreneurial learning, which have so far done relatively little to connect the individual and organizational levels of learning. These two streams of studies are discussed in further detail below.

Entrepreneurial learning in literature

Earlier in this chapter, I emphasized entrepreneurial learning as a process that connects the individual and organizational levels of learning. While this conceptualization is necessary for explaining how experiences acquired by individuals transform into routinized behaviors that function on the venture level, the existing literature on entrepreneurial learning offers only a limited understanding of such conceptualization. Most studies on entrepreneurial learning have focused on either the individual or the organizational levels of learning—thus paying less attention to understanding the processes through which these levels connect and interact (Wang & Chugh, 2014).

Studies focusing on entrepreneurial learning at the individual level have predominantly focused on the process through which entrepreneurs develop knowledge to facilitate the discovery, evaluation, and exploitation of entrepreneurial opportunities (Corbett, 2007; Minniti & Bygrave, 2001; Reuber & Fischer, 1999).

The discovery of opportunities demands knowledge of markets, technology, or the environment, which entrepreneurs employ to inform their decisions and choices. This knowledge is often (but not exclusively) developed through experience—which, as noted above, takes the form of educational, management, start-up, or industry-specific experience (Holcomb et al., 2009; Politis, 2005). Experience in any of these forms, therefore, helps develop the entrepreneur's knowledge through a process of transformation (Politis, 2005). Therefore, entrepreneurial learning is central to developing knowledge that allows entrepreneurs to combine novel information and determine new means-ends relations (Rae & Carswell, 2001).

Several studies have used experiential theories of learning to explain entrepreneurial learning (Kolb, 1984). For instance, some studies build on the notion

of learning-by-doing (Cope & Watts, 2000; Rae & Carswell, 2001), and others on learning from critical events (Cope, 2003) or learning from failure (Cope, 2011; Ucbasaran, Shepherd, Lockett, & Lyon, 2013), to emphasize the cumulative knowledge formed through experience (Minniti & Bygrave, 2001). Studies within this perspective have also discussed how entrepreneurs grasp experiences and transform them into knowledge. The physical metaphor of “grasping” reflects how entrepreneurs engage in active experimentation or observation of an event or situation. Transformation, on the other hand, manifests how entrepreneurs decide to engage in that experience (Politis, 2005). Together, grasping and transforming produce a learning behavior. This behavior can either favor exploration, whereby entrepreneurs transform experiences in ways that reinforce experimentation and the search for new possibilities, or exploitation, whereby entrepreneurs replicate and reinforce prior knowledge.

Other studies that emphasize learning at the individual level have also focused on what entrepreneurs learn, and how (Parker, 2006). For instance, some studies consider learning as a dynamic and socially situated process in which entrepreneurs develop the capability to act through initiating, organizing, and managing ventures (Morris, Kuratko, Schindehutte, & Spivack, 2012; Rae, 2006).

On a different theme, studies investigating entrepreneurial learning at the venture level have emphasized the role of the individual entrepreneur in explaining firm-level outcomes (Brockman, 2013; Deakin & Freel, 1998). For instance, Deakin and Freel (1998) argue that SMEs’ growth process is contingent on the ongoing processes of learning through which entrepreneurs maximize the learning from critical events. Similarly, Lichtenstein, Lumpkin, & Shrader (2003) suggest that learning in new ventures depends on entrepreneurs’ ability to develop knowledge and transfer it to other members of the team or organization, where it becomes behavioral and based on stable habits or routines. At an early stage, firms depend on the entrepreneur’s own knowledge, experience, routines, and social capital (Aldrich & Yang, 2014; De Massis, Minola, & Viviani, 2012; Dencker, Gruber, & Shah, 2009; Reuber, Dyke, & Fischer, 1990). As they move on to later stages of development, it becomes more important to transfer learning to the group and organizational levels. This is mainly because more members join the venture at later stages, making it more critical to focus on collective processes of knowledge creation and accumulation, where shared rules and procedures coordinate action at the team and organizational levels (Franco & Haase, 2009; Brockman, 2013).

Other streams of studies that address entrepreneurial learning at the organizational level have attempted to explain opportunity recognition as a learning process that extends beyond the unique insight of the individual entrepreneur (Dutta & Crossan, 2005; Ravasi & Turati, 2005). These studies argue that opportunity recognition is linked to the dynamic experience of the individual entrepreneur, and thus these opportunities emerge through a learning process. However, when entrepreneurs engage with their social setting (e.g., customers, suppliers, and

stakeholders), such learning initially takes place at the individual level, and is then transmuted into the organization via processes of interpretation and integration that take place when individuals start to engage with other actors (Dutta & Crossan, 2005).

Overall, studies that address entrepreneurial learning at the organizational level have put little emphasis on understanding how individual streams of experience are routinized into the organization, where they can be accessed and impact venture-wide behaviors (Levitt & March, 1988). Such a gap warrants a multilevel perspective of entrepreneurial learning, which can help develop the theoretical knowledge of how new ventures learn and routinize behaviors over time.

Entrepreneurial learning: an experiential multilevel perspective

As argued above, individual-level learning provides the fundamental basis for individual streams of experience to permeate into the organization (Ravasi & Turati, 2005). However, and as proposed by Kim (1993), learning at the organizational level is not a simple aggregation of individual streams of experience. For experiences to transform from their intuitive format at the individual level into the organization where they become routinized, they must be assimilated by other members of the organization. Assimilation requires “interpretation” and “sensemaking,” where experiences are considered in relation to a specific task or domain (Politis, 2005; Weick, 1995). Assimilation involves experience moving from one individual into a coordinated group, with interpretation and sensemaking initiating change in the individuals’ understanding and actions (Brockman, 2013). Hence, experiences that provide the new venture with the primary knowledge base on which opportunities are recognized and pursued begin to be transmuted into the group, creating a new group-level knowledge repertoire that is not dependent on any one individual. Over time, and as the group starts to coordinate and mutually adjust their actions, they soon begin to select the most effective and appropriate patterns of action, which can be routinized to inform venture-wide behaviors (Aldrich & Yang, 2014; Franco & Haase, 2009).

Crossan et al. (1999) offer an evolutionary perspective on how learning occurs at the organizational level. They posit the way in which learning is transmuted from individuals to the organization based on a discussion of four interrelated processes: intuiting, interpreting, integrating, and institutionalizing. This framework assumes that “individuals create rather than discover their shared cognitive maps based on their experiences and individual knowledge base” (Brockman, 2013: 263). Therefore, experiences that are initially personal and *intuitive* can only become shared with other members of the organization through *interpretation*, whereby

individuals explain their insights via transactions with other members. Through *integration*, experiences are transmuted into the group level, where shared interpretation is developed and coordinated between the members involved (Dutta & Crossan, 2005). Finally, through *institutionalization*, the shared and mutually adjusted experiences are routinized in the form of routines, systems, or procedures. In this way, the framework suggests that routinizing behaviors is a progressive process of learning that translates between individual, team, and organization (Crossan et al., 1999). This process is supported by *mechanisms* that occur in both feed-forward and feedback loops of learning (Dutta & Crossan, 2005).

Mechanisms are commonly illustrated as the cogs and wheels that explain how two variables interrelate (Anderson et al., 2006). According to Hedström (2005), mechanisms consist of entities and the activities that these entities practice to bring about change. The change that occurs depends on the properties of the entities and how they are organized. Mechanisms enable us to open the black box and better explain how micro-level inputs (e.g., individual streams of experiences) translate into macro-level outcomes (e.g., routinizing behaviors).

Hedström & Wennberg (2017) argue that opening the black box requires specifying: (i) the entities engaged, (ii) the activities they undertake, (iii) the factors that drive them to behave as they do, and (iv) how their behaviors collectively bring about the macro-level outcome to be explained. Therefore, exploring the mechanisms through which individual streams of experience are transmuted into the organization requires investigating both the entities involved, and the activities that they practice to bring about change (e.g., routinizing behaviors). One level of analysis that could illuminate these entities and their interactions is learning at the venture-team level. In this thesis, I define the “venture team” as a group of individuals who are primarily responsible for the development of the venture’s strategy and operations (Klotz, Hmieleski, Bradley, & Busenitz, 2014b). The new venture team predominantly includes those who have a direct impact on the decisions, direction, and performance of a new venture (Bjørnåli & Aspelund, 2012). As such, a venture team can include founders, stakeholders, and key employees (Bjørnåli & Aspelund, 2012).

As noted earlier, entrepreneurial learning as an experiential multilevel process begins with learning at the individual level, which forms the basis for individual streams of experience that permeate into the organization. Individuals’ streams of experience, in their initial form, are intuitive and highly subjective. These experiences allow individuals to make sense of themselves and the world around them, and to recognize possible patterns or possibilities such as entrepreneurial opportunities related to prior experience (Politis, 2005).

Learning at the organizational level, on the other hand, is often approached as a cognitive process of learning that takes place at the system level (Nonaka, 1994). This logic is mainly premised on the notion that organizations are manifested as information-processing systems that acquire, interpret, distribute, and store

information (e.g., Wang & Ahmed, 2003). Organizations learn by institutionalizing individual and team-level learning in organizational memory, which refers to the knowledge that organizations retain in tangible and intangible repositories. These repositories can take the form of routines, norms, or systems (Franco & Haase, 2009). In this way, routinizing behaviors is considered to be a way for institutionalization to occur (Argote, 2012).

Learning at the venture-team level has been widely acknowledged to contribute to learning at the organizational level (Senge, 1990; Edmondson, 2002). However, few scholarly attempts have been made in the entrepreneurship area to examine the team-learning processes that help transmute learning from individuals to the organization (Franco & Haase, 2009; Wang & Chugh, 2014). The few studies in this domain have mostly examined learning at the organization level as a process of “heedful interrelating,” in which individual-level experiences and knowledge interconnect with those of other members and, over time, are transposed into the organization (Jones & Macpherson, 2006). However, these interconnections mainly illuminate *what* and *how* venture team members learn, without demonstrating how learning emerges from the team to the organization (Karataş-Özkan, 2011; Sardana & Scott-Kemmis, 2010).

Other studies (few directly related to entrepreneurial learning) have considered the venture team as an arena where individual mental models become shared through dialogue, negotiation, and argumentation, suggesting that learning at the organization level remains inherent in the cognitive connections made between individuals (Campbell & Armstrong, 2013; Edmondson, 2002). However, these studies provide few insights into the mechanisms that help explain how individual streams of experience channel into the organization.

Integrating team-learning processes into the understanding of entrepreneurial learning as a dynamic multilevel process is essential for three reasons. First, the venture-team level is a critical level at which individuals share, develop, and further discuss experiences (Roloff, Woolley, & Edmondson, 2011). According to Dutta and Crossan (2005), opportunities often begin with individuals’ intuition and then move into interpretation based on discussion with other members. Thus, it is in such discussions that individual interactions begin to develop into a shared understanding between the different members involved (Brockman, 2013). Second, the venture-team level is vital for understanding the transactive patterns through which members develop shared mental models. Through such models, venture members can coordinate action through mutual adjustment and, in so doing, create team-level knowledge that is not dependent on any one individual (Crossan et al., 1999). This knowledge is more organized and represented within the team, and allows team members to execute actions in a more coordinated way. As such, the team level offers valuable insights into how learning that starts as primarily individual and experiential shifts towards becoming collective and behavioral (Lumpkin & Lichtenstein, 2005). Finally, the venture-team level is critical for observing the

transactions through which venture members exchange experiences and discuss observed patterns that, over time, become routinized in organizational repositories in the form of routines, systems, or procedures.

Thus, the venture team is critical for connecting individual and organizational levels of learning, and deserves further integration into the overall understanding of entrepreneurial learning as an experiential process that functions on multiple levels.

Thesis outline

This thesis is composed of four studies that contribute to the overall aim of the research. The thesis consists of these introductory chapters (called *kappa* in Swedish translation) and four appended papers. The aim in this *kappa* is to provide an overall view of the research problem and a theoretical grounding that will support the studies as well as the methodology applied. Moreover, the overall contributions are elaborated and discussed in relation to the research questions. The *kappa* consists of the following chapters:

Chapter 1 (this chapter) is an introduction that provides an overall background to the research in focus. The chapter motivates the choice of empirical setting in relation to the overall aims of the thesis and problematizes the current approaches to understanding entrepreneurial learning when considered in relation to understanding how new ventures develop organization-level knowledge. Finally, the chapter provides a summary of the appended papers, demonstrating how they contribute to the overall aim of the research.

Chapter 2 introduces the theoretical background to entrepreneurial learning. It illuminates that the existing gap in understanding entrepreneurial learning as an experiential multilevel process is problematic when seeking to explain how individual streams of experience are transmuted into the organization. This chapter borrows from organizational learning and team learning literature to further advance a multilevel approach to entrepreneurial learning, which is currently lacking in the literature.

Chapter 3 outlines the methodology followed in this thesis. The chapter recounts the research journey and describes the development process of the different studies conducted. The chapter describes the main reasoning of the research design, the specific methods applied for data collection, and the analytical methods used for each of the empirical papers. The chapter ends with reflections on methodological choices and a note on research ethics.

Chapter 4 provides a summary of the four appended papers. The summary includes the aims, findings, and contributions of each of the papers, to provide a background for the following discussion of the main findings and contributions of the thesis.

Chapter 5 delineates the main findings and contributions of this thesis. It highlights how the four appended papers contribute to the overall understanding of the research aims by going back to the research questions formulated in the introduction. The contributions are highlighted and discussed in relation to prior research.

Chapter 6 outlines the theoretical and practical implications. It highlights how the findings in the papers collectively contribute to the research in entrepreneurship and suggests directions for future research based on the contributions made.

2. Theoretical background

The preceding introduction identified some deficiencies in the theoretical knowledge and understanding of entrepreneurial learning. These deficiencies relate to the way entrepreneurial learning studies have relied upon the individual level of learning to explain firm-level outcomes. This chapter discusses these shortcomings in more detail, synthesizing research from organizational learning and team learning to advance the theoretical understanding of entrepreneurial learning as an experiential multilevel process, demonstrating how this conceptualization can assist in explaining how new ventures routinize behaviors.

Routinizing behaviors in new ventures

Routinizing behaviors is considered to be essential for new ventures to perform activities consistently and reliably. Without routinization, new ventures can suffer from confusion and a lack of clarity that may undermine their ability to continuously transform ideas into new products, processes, or services. The founder or founding team, who embody the knowledge and experience on which the venture is based, typically attempt to transform their ideas into commercial ends (Brush et al., 2001). While these members might see their shared vision and understanding as sufficient to handle day-to-day activities, the truth is that these early characteristics of the new venture are not enough to surmount the obstacles to its long-term development. New ventures, as social systems, need to learn and routinize behaviors for stabilizing organizational activities (Feldman & Pentland, 2003).

Scholars in organizational studies commonly tie organizational learning to the establishment of routines. They argue that routines are executable capabilities that are learned by an organization through experience (e.g., Cyert & March, 1963; Levitt & March, 1988; Pentland & Feldman, 2005). For instance, Crossan et al. (1999) recognize that learning at the organizational level takes place when routines

are integrated and actualized at the system level. This theoretical perspective does not merely acknowledge routines as knowledge repositories, but also suggests that routines can capture skills, habits, and procedural knowledge at the individual level (Singley & Anderson, 1989). In this way, studying how new ventures routinize behaviors can explain how the personal experiences of organizational members become embedded in venture-wide behaviors and practices (Cohen & Bacdayan, 1994).

What are organizational routines?

Organizational routines are defined as “repetitive, recognizable patterns of interdependent action, carried out by multiple actors” (Feldman & Pentland, 2003, p. 96). Organizational routines are distinguished from habits, which represent repetitive patterns of action at the individual level (Aldrich & Yang, 2014). Organizational routines are “meta-habits that exist on a substrate of habituated individuals in a social structure” (Hodgson, 2008, p. 18). Since the groundbreaking work of Nelson and Winter (1982), organizational routines have been acknowledged as critical for the success of organizations, and recognized for their significance in explaining the micro-foundations of organizational phenomena including innovation and change (Pentland et al., 2012; Felin & Foss, 2004).

Scholars suggest that routines consist of two aspects: performative and ostensive (Becker, 2004). The performative aspect is practice-based, and consists of specific actions performed by specific individuals (Feldman & Pentland, 2003). The ostensive aspect, on the other hand, denotes the cognitive form of a routine, and thus manifests individuals’ understanding of it.

While these two aspects are intertwined, researchers argue that the ostensive aspect of a routine typically precedes the performative, since it provides a cognitive map or abstract conceptualization that supports individuals’ performance of a routine (Cohen & Bacdayan, 1994). According to Miller et al. (2012), the ostensive component of a routine consists of procedural, declarative, and transactive memory, suggesting that individuals draw on their own memories to perform a routine. For instance, the ostensive aspect of a hiring routine might consist of *attracting*, *screening*, and *selecting* applicants. These components of the hiring routine provide an abstract understanding that guides individuals’ behavioral dispositions. Behavioral dispositions typically trigger specific patterns of behaviors within an organized group of individuals (Hodgson, 2008). In this way, the ostensive component of a routine exposes the common understanding of a routine held by organizational members, and is often represented in the form of shared mental models with respect to how task work is structured and organized (Becker, 2004; Feldman, 2000; Dionysiou & Tsoukas, 2013).

Whereas research provides a strong theoretical understanding of routines and their granular components, the process by which routines develop is an area that has limited theoretical and empirical foundations (Pentland et al., 2010).

The development of organizational routines

Existing studies argue that the development of routines can take different forms (Miner et al., 2008). Initially, routines can emerge through founders' prior experience. For instance, founders with previous startup or management experience are likely to transpose critical knowledge into their new venture in the form of routines (e.g., Busenitz & Barney, 1997). According to Aldrich and Yang (2014), entrepreneurs develop habits and heuristics and gain knowledge through experiences both formal (e.g., education) and informal (e.g., interacting with parents, friends, and colleagues). While these experiences may not have been accumulated in anticipation of running a future business, the resulting habits and heuristics may still become relevant and useful when entrepreneurs come to initiate their new ventures.

Similarly, routines can emerge through employee mobility. For instance, Wezel et al. (2006) argue that new ventures can benefit from the practices that employees who have held multiple positions bring with them from their former organizations. Moreover, routines can emerge internally, through real-time experience (Gong, Baker, & Miner, 2005). Much of the research that focuses on the internal emergence of routines tends to emphasize their ostensive aspect. These studies illustrate the role of developing shared mental models in the development of routines (Crossan et al., 1999). Mental models are cognitive representations that inform thought processes relating to the way things work (Lin, Murphree, & Li, 2017). As such, mental models inform individuals' understanding, interpretations, and expectations (Jonker, Riemsdijk, & Vermeulen, 2011).

Individuals develop shared mental models by mapping categories of knowledge and experience during novel situations (Crossan et al., 1999). As they experience novel situations, individuals share their perceptions of problems and reveal their assessment of possible courses of action, which start to form the initial basis for routines to develop (Lin et al., 2017). According to Feldman and Rafaeli (2002), the development of shared mental models requires interaction between organizational members. These interactions allow members to discuss and develop a shared understanding of the actions to be taken in a specific routine, and how these actions relate or contribute to the organization (Felin & Foss, 2004).

Overall, research focusing on routines tends to put great effort into describing routines and their relevance to organizational outcomes, with the majority of cases being discussed in established firms (Haase & Eberl, 2019). However, there is less

emphasis on understanding how new ventures routinize behaviors (Felin & Foss, 2004; Gal & Hellman, 2010).

In this review, I explore how new ventures routinize behaviors, and consider this specific process as being embedded in broader processes of entrepreneurial learning. As argued in Chapter 1, entrepreneurial learning is a process that unfolds on multiple levels in the organization. This conceptualization illuminates how new ventures learn and disseminate learning on multiple levels, and, in doing so, move from a state of randomness, where learning is mostly individual and experiential (Politis, 2005), into a state where learning is collective and behavioral, and based on a set of coordinated and repeated activities (El-Awad et al., 2017). Therefore, the rest of this chapter will review the research on entrepreneurial learning, exploring how understanding entrepreneurial learning on multiple levels can help explain how new ventures routinize behaviors.

Research on entrepreneurial learning: an overview

The first real attempt to capture entrepreneurial learning is marked by the work of Deakins and Freel (1998), where the authors examine the process of entrepreneurship and entrepreneurial learning in SMEs. Subsequently, entrepreneurial learning research generated a steady flow of publications, which coalesced into two clusters. The first cluster formed in 1998, when the *International Journal of Entrepreneurial Behavior & Research* published a special issue on “Learning and the Entrepreneur.” The second cluster formed in 2005, when the *Journal of Entrepreneurship Theory & Practice* published a special issue on entrepreneurial learning (Harrison & Leitch, 2005). Having been given impetus by these two special issues, entrepreneurial learning began to enter mainstream entrepreneurship research, attracting more interest in understanding learning as a function of entrepreneurship (Minniti & Bygrave, 2001).

The majority of research in entrepreneurial learning appears to focus heavily on learning at the individual level. Studies within this stream investigate how individual entrepreneurs learn through experience and develop the knowledge necessary for starting and running a venture (e.g., Politis, 2005; Cope, 2005; Rae & Carswell, 2000). Other streams seek to explain learning at the organizational level, with an emphasis on collective processes where shared rules and procedures diffuse learning throughout the venture (Deakin & Freel, 1998; Franco & Haase, 2009).

However, fewer efforts have been made to explore how the personal experiences that entrepreneurs acquire during the early development stage of their ventures are transposed into the venture itself. A recent systematic review of studies of entrepreneurial learning has pointed to the need to bridge the individual and organizational levels of learning (Wang & Chugh, 2014). This review suggests that

there have been only minimal attempts to explore entrepreneurial learning on multiple levels, and that the literature therefore offers little insight into how learning translates at different levels, thus failing to explore the mechanisms and processes that bridge multiple levels.

The remainder of this chapter discusses the existing literature on entrepreneurial learning, demonstrating the prevailing gaps in understanding entrepreneurial learning on multiple levels. It then goes on to introduce literature that could help to fill this gap, and thus respond to the overall research question of how entrepreneurial learning unfolds as an experiential multilevel process.

An individual-level perspective on entrepreneurial learning

Research on entrepreneurial learning has predominantly focused on how entrepreneurs develop knowledge that allows them to recognize and act on opportunities. Studies in this domain have drawn on different perspectives to explain how entrepreneurs learn and develop in their entrepreneurial context. The three main theoretical perspectives adopted to explain learning at the individual level are *cognitive*, *experiential*, and *social* learning. Each of these is discussed below (see Table 2.1 for a summary).

The cognitive perspective

Research in entrepreneurship has drawn increasing attention to entrepreneurs' cognitive development (Keh, Der Foo, & Lim, 2002). Studies have sought to understand how entrepreneurial skills are learned, and how entrepreneurial thinking—i.e., thoughts, interpretations, and reasoning—is developed (Haynie, Shepherd, & Patzelt, 2012). This research interest is embedded in the social science tradition, where the primary aim is to explain why certain individuals see positive prospects in situations that others regard as too uncertain (Mitchell et al., 2002). Studies begin with the assumption that entrepreneurs think and process information differently from non-entrepreneurs (Holcomb et al., 2009). This line of thinking implies that the way knowledge is shaped and represented has significant implications for how individuals engage with action (Brockhaus, 1980).

Consequently, those with more experience are expected to have a higher capacity to see opportunities compared to those with less experience. Individuals with more experience can form deep linkages between new knowledge and prior related knowledge, which improves their capacity to draw on specific biases and heuristics in making decisions (Busenitz & Barney, 1997; Aldrich & Yang, 2014). Hence,

experience facilitates the way individuals process and interpret new information. It also supports their capacity to derive meaning and form relationships in memory, which reduces the cognitive load of processing information (Corbett, 2007).

Walsh and Cunningham (2017) argue that the way entrepreneurs attribute failure impacts how they frame and judge situations, and their responses to them, which in turn affect the way they act and learn. Research in this domain has also suggested that individuals' attribution of failure is embedded in their cognitive frames. Cognitive frames represent a broad range of mental activities—including perception, sense-making, categorization, value judgment, and emotions—that help individuals make decisions under various circumstances (Nooteboom, Van Haverbeke, Duysters, Gilsing, & Van den Oord, 2007). Overall, this stream of literature is particularly relevant, since it offers an understanding of how entrepreneurs frame situations that they encounter during the entrepreneurial process, which typically shapes the way they engage in entrepreneurial learning.

The role of experience

Moving beyond cognitive theories of learning, studies began to address entrepreneurial learning as a specific type of management learning (Cope, 2003; Dencker et al., 2009). Many studies in this tradition build on Kolb's experiential learning theory to describe how entrepreneurs evolve and develop knowledge through experience (Cope, 2005; Morris et al., 2012; Rae & Carswell, 2001). Learning through experience is manifested in the active participation of individuals in a specific context. For instance, the early development process of new ventures is action-oriented, and therefore learning in that context is mostly experiential. During the early stages, entrepreneurs learn by doing, and by reflecting on various events. They also learn through experimenting, adapting, and solving the problems that young firms face.

Entrepreneurs can also learn from experience before they start a venture. For instance, Politis (2005) identifies different types of career experiences that can trigger learning. These include experience in management, specific industries, or prior start-ups (Politis, 2005). Learning from these experiences provides entrepreneurs with direct knowledge of a specific discipline or domain, and can expand their knowledge of market conditions and general context, which improves their capacity to identify new opportunities and manage the liabilities of newness. Such liabilities typically relate to the organization of people and resources in new ventures, and also to the challenge of estimating the potential market value of new products or services (Stinchcombe, 1965; Davidsson & Honig, 2003).

A more recent study by Gabrielsson and Politis (2012) shows that entrepreneurs with more experience in a specific business function or domain are likely to (i)

achieve better venture performance; (ii) have a reasonably positive take on failure; and (iii) be able to recognize new opportunities that others might overlook.

Another contribution within the experiential learning domain highlights how entrepreneurs with varying degrees of experience differ in their reasoning when engaging in decision-making (Politis, 2008). Those with more experience are prone to undertake effectual reasoning, thus favoring experimental and iterative learning techniques and trial-and-error methods (Sarasvathy, 2001). Studies have also shown that entrepreneurs with knowledge related to a specific industry or technology have a greater tendency to follow an effectual line of reasoning when making decisions. Moreover, they are more likely to take smaller steps when engaging in action, thus reducing their investment in resources and potential losses (Politis, 2008).

Other studies that focus on the role of experience have shown that entrepreneurs may not necessarily learn all the time. Entrepreneurs can also become locked into previously successful patterns of behavior, which they tend to replicate in future situations (Minniti & Bygrave, 2001). Such “myopic foresight” is governed partly by conditioning from previous experiences of success and failure, which create path dependencies (Corbett, 2005). This condition is explained in the experiential learning theory by the predominant mode of transforming an experience (Politis, 2008). Entrepreneurs tend to replicate and stay close to actions that have proven successful, thereby exploiting pre-existing knowledge to pursue future action. Positive experiences, such as engaging in the successful development of a new venture, can provide a framework for processing information, which forms a clear path for entrepreneurs to take when pursuing subsequent ventures (Parker, 2006). This point emphasizes exploitation as a mode of transformation, in which entrepreneurs reinforce learning via local search, experiential refinement, and the selection and reuse of existing knowledge (Politis, 2005).

Studies also suggest that entrepreneurs can learn from failed experience (Cope, 2011; Reuber & Fischer, 1999) or discontinuous events (Cope, 2003). Entrepreneurs often credit their learning to unfortunate events, suggesting that learning from failure and performance errors provide an opportunity to locate uncertainties that enhance the entrepreneur’s knowledge base (Petkova, 2009; Walsh & Cunningham, 2017). According to McGrath (2001), failure stimulates entrepreneurs to engage in a new search for opportunities via experimentation. As such, experiential learning theory suggests that failure offers an opportunity for individuals to choose activities that depart from known certainties, thus broadening their search to a new domain as part of their coping strategy to manage uncertainty (Minniti & Bygrave, 2001).

Finally, education can also be a source of experiential learning. Pittaway & Cope (2007) argue that education, as an experience, can be either formal or informal. Formal education often aims to develop objective knowledge about entrepreneurship, which is typically acquired through lectures, seminars, or case studies. Informal education, on the other hand, takes the form of experience-based teaching that aims to develop knowledge for entrepreneurship. This form of

education is challenging, since it requires an emulation of the ambiguity of a new venture context to help individuals step out of their comfort zone and experience a context that is close enough to reality (Cope, 2003).

Overall, studies discussing experiential learning tend to emphasize experience as a practice-based approach to learning where knowledge is produced through engaging in the actual process of doing (Brown & Duguid, 1991). As such, knowledge produced through experience is unique to the person who engages in that experience, and thus subjective (Pittaway & Cope, 2007).

Social learning

Other types of studies in entrepreneurship have acknowledged the role of observation in individuals' learning process (Huovinen & Tihula, 2008). Knowledge required for recognizing opportunities may not depend exclusively on the direct knowledge of the individual entrepreneur, but could be a publicly framed skill (Zozimo, Jack, & Hamilton, 2017). As such, opportunities could be a function of knowledge available within the local contexts of operation (Shane & Venkataraman, 2000). Recognizing these opportunities may be subject to the entrepreneur's ability to vicariously integrate knowledge residing outside their own experience, and develop the social skills necessary to scan for such knowledge (Holcomb et al., 2009).

Entrepreneurial learning has derived some insights from Bandura & Walter's (1977) work on "learning by modeling" to explain how entrepreneurs learn different complex behaviors from observing others' positive or negative behaviors. Bandura & Walter (1977) acknowledged that individuals do not only learn from their own experience, but also by observing and modeling others' behaviors. However, entrepreneurs can only benefit from such observations if they can evoke, integrate, and organize the new information that they gain in their memories (Denrell, 2003). This argument, in connection with the previous argument in cognitive psychology (Busenitz & Barney, 1997), suggests that benefiting from external knowledge depends on entrepreneurs' ability to form deep linkages between new and pre-existing knowledge (e.g., Holcomb et al., 2009). Hence, the richer the repertoire of prior knowledge (Widding, 2005), the better an entrepreneur will be at integrating observed behaviors and actions into memory (Cohen & D. Levinthal, 1990).

Another stream of research that falls within the social learning perspective incorporates studies that aim to understand how entrepreneurs learn within their social setting (Rae, 2005). Such studies focus on how entrepreneurs learn through co-participation in communities, industries, or networks (e.g., Rae, 2005). Taylor and Thorpe (2004) take a social perspective to identify the influence of relationships that reside in networks available to the entrepreneur on their entrepreneurial learning. In broader terms, this stream of research tries to understand how networks

vary in the type of information they provide to entrepreneurs, and how that variation influences entrepreneurs' decision-making processes. A recent study by Soetanto (2017) aimed to understand the type of difficulties that encourage entrepreneurs to use networks for learning, and how those networks change according to the difficulties encountered. The study shows that entrepreneurs construct different types of networks in response to their difficulties, and suggests that entrepreneurs tend to reinforce existing networks when aiming to engage in exploitative learning, and expand their networks when they seek to develop new knowledge through explorative learning.

Overall, and whereas research has emphasized the role of experience in the learning process, the review posits that experience is not the only way individuals learn. Individuals learn through interaction with others through social learning, or can learn through formal educational methods such as lectures and case studies.

Table 2.1
Summary of the literature on individual-level learning

Author/Year	Main purpose	Theoretical Perspective	Definition of EL	Type of Learning	Unit of Analysis
Cope (2005)	Entrepreneurs learn key entrepreneurial skills as they launch a new venture focusing on critical learning events as an essential entrepreneurial learning mechanism.	Experiential learning & adult learning literature.	Learning experienced by entrepreneurs during the creation and development of a small enterprise, rather than a particular style or form of learning that could be described as entrepreneurial.	Experiential learning, learning by doing & reflective learning.	Individual
Cope (2003)	Critical events have the capacity to stimulate distinctive forms of 'higher-level' learning—learning that is fundamental to the entrepreneur in both personal and business terms.	Experiential learning.	Not provided.	Experiential learning, learning by doing, & higher and lower level learning.	Individual
Cope (2011)	A deeper conceptualisation of the process and content dimensions of learning from venture failure. Recovery and re-emergence from failure is a function of distinctive learning processes that foster a range of higher-level learning outcomes.	Entrepreneurial learning theory, social psychology perspective.	A negotiated and relational process.	Learning from failure, as a lived experience.	Individual
Cope & Watts (2000)	Learning through experience is a continuous process which every individual lives through and as such, learning is a complex dynamic phenomenon. Entrepreneurial learning is characterised as both accidental and unintentional with high emphasis placed on critical learning events.	Learning by doing.	Not provided.	Learning by doing, experiential learning, and reflectivity.	Individual
Corbett (2005)	The variance in behaviour and knowledge that affects the opportunity identification and exploitation is based on the existence of learning asymmetries – i.e. individuals acquire and transform their experiences (learn) in different ways. By using Kolb's (1984) experiential learning concept, the argument suggests that learning asymmetries- the different manner in which people acquire and transform information- account importantly for variations in the discovery of entrepreneurial opportunities.	Experiential learning.	Not provided.	Experiential learning.	Individual
Morris, Kuratko, Schindehutte & Spivack (2012)	An experiential view on entrepreneurship moves us past the static view perspective and approaches entrepreneurship as a dynamic and socially situated process.	Experiential learning	Not provided.	Experiential learning.	Individual
Politis (2005)	Entrepreneurs develop entrepreneurial knowledge through career experience.	Experiential learning.	A complex process through which entrepreneurs transform experience into knowledge in different ways.	Experiential learning (career experience).	Individual

Politis (2008)	Prior startup experience influences entrepreneurs' skills in coping with liabilities of newness, their preference for effectual reasoning and attitudes towards failure. These experientially acquired skills, preferences and attitudes are regarded as valuable organisational assets in new ventures, which can significantly improve venture performance and the likelihood of survival.	Experiential learning (Prior startup experience).	Not provided.	Habitual and novice entrep, and experiential learning.	Individual
Politis & Gabriellsson (2012)	The extent to which individuals are able to seize entrepreneurial ideas can be conjectured to be influenced by both industry specific experience and business function experience acquired through careers. Differences in how entrepreneurs prefer to acquire and transform experience throughout their career has a subsequent influence on the ability to generate new business ideas.	Entrepreneurial learning and human capital.	Not Provided.	Experiential learning.	Individual
Rae & Carswell (2001)	Entrepreneurial learning is concerned with how people construct new meaning in the process of recognising and acting on opportunities and of organising and managing ventures. It is much more than acquiring the functional knowledge, as it involves active doing as well as understanding what it is that works.	Entrepreneurial capabilities.	A dynamic process which enables entrepreneurial behaviour to be enacted.	Experiential learning.	Individual
Rae (2006)	Learning is defined an emergent, sense-making process in which people develop the ability to act differently, through knowing, doing, and understanding why.	Work-based learning.	Learning to recognise and act on opportunities, through initiating, organising and managing ventures in social and behavioural way.	Experiential learning (situated and active).	Individual
Rae (2005)	EL as a triadic model, including major themes of personal and social emergence, contextual learning, the negotiated enterprise.	Social theory of learning.	Learning to recognise and act on opportunities and interacting socially to initiate, organise and manage ventures.	Contextual learning.	Individual
Huovinen & Tihula (2008)	Entrepreneurial learning viewed from an experiential learning perspective in which entrepreneurs develop knowledge through the transformation of experience, by going through concrete experience, reflective observation, abstract conceptualisation and active experimentation.	Experiential learning & cognition.	A continuous process leading to the development of knowledge required for starting and managing a business (Politis, 2005).	Experiential Learning & transforming knowledge.	Individual
Taylor & Thrope (2004)	This study makes a connection between the entrepreneur's network of relationships and the solving of critical incidents in the business. The paper used a bibliographical approach to understand more about the personal network of the entrepreneur. A description of the network (the numbers in the network, the critical actors, the different relationships).	Social constructionist and activity theory perspectives (network-centred learning).	Not provided.	Learning through co-participation, problem-centred and critical incidents.	Individual
Wing & Man (2006)	Considering entrepreneurial learning as a concrete construct, which entails identifiable activities and behaviours that allow further measurement, generalisation and investigation of various individual, organisational and contextual factors affecting them.	Competency approach.	Entrepreneurial learning is about actively seeking learning opportunities, learning selectively and purposely, learning in depth, improving and reflecting upon and transforming experiences.	EL as a competency.	Individual
Minniti & Bygrave (2001)	Entrepreneurial decision to exploit an opportunity is a result of an entrepreneur's ability to process information (knowledge). The knowledge component is what determines the entrepreneur's selection of the most appropriate course of action in any specific uncertain environment.	Experiential learning.	Learning is a process involving repetition and experimentation that improves the entrepreneur's confidence in certain actions and improves the content of his stock of knowledge.	Learning by doing, learning from failure.	Individual
Holcomb, Ireland, Holmes & Hitt (2009)	Important to the study of entrepreneurship is the belief that people are different in their thinking and behaviours and thus their different cognition leads to different entrepreneurial action.	Experiential learning theory, vicarious learning & cognition (heuristics).	The process by which people acquire new knowledge from direct experience and from observing the behaviours, actions and consequences of others.	Experiential learning, vicarious learning.	Individual
Petkova (2009)	Entrepreneurial learning that emerges from performance errors.	Organisational learning.	Not Provided.	Learning from errors (experiential learning).	Individual

Parker (2006)	Entrepreneurial learning as a process by which entrepreneurs develop their skills and knowledge to enhance their future performance.	Economics, experiential learning.	What entrepreneurs learn, how they learn and why they learn (p.3).	Exploitation of new information.	Individual
Walsh and Cunningham (2017)	The purpose of this paper is to focus on the processes that occur between entrepreneurs' primary attribution of failure and the emergent learning dimensions from failure.	Cognitive, affective and behavioural perspectives.	Learning experienced by entrepreneurs during the creation and development of a small enterprise.	Attribution and learning from failure.	Individual
Zozimo, Jack & Hamilton (2017)	This study examines entrepreneurial learning through the observation of role models.	Entrepreneurial learning through observation.	Learning about oneself, managing relationships, the business and small business management.	Learning through observing role models.	Individual
Fange He et al. (2017)	While failure urges entrepreneurs to learn, it also generates strong emotions that may hinder learning behaviors. Drawing on affective events theory, the paper develops a model reconciling the countervailing effects of failure.	Affective events theory.	Not provided.	Learning through critical events.	Individual
Reuber and Fischer (1999)	Each prospective entrepreneur enters the startup process with a stock of experience consisting of background or history of the individual that has accrued up to that point.	Experiential learning.	Not provided.	Learning through failure.	Individual
Soetanto (2017)	Examines which type of difficulties that encourage entrepreneurs to use networks to facilitate learning.	Networks and Entrepreneurial Learning, and social capital.	Entrepreneurial learning is a social process where the ability to learn is dependent on the social context (p. 547).	Learning through networks.	Individual
Corbett (2007)	This study examines the relationship between opportunity identification and learning. The paper focuses on how individuals acquire and transform information and experience in order to identify opportunities.	Experiential learning.	Not provided.	Learning from experience.	Individual
Haynie, Shepherd and Patzelt (2012)	The paper investigates the ability of individuals without prior entrepreneurial knowledge to effectively adapt decision policies in response to feedback.	Cognitive adaptability and metacognitive processing.	Not provided.	Adaptive learning.	Individual

An organization-level perspective on entrepreneurial learning

Research that discusses entrepreneurial learning at the organizational level is highly relevant to this thesis. However, such studies are still scarce. Most studies that seek to understand organization-level learning appear in the literature on organizational learning, which is mostly focused on established firms with very little connection to entrepreneurship and entrepreneurial learning. The sections below explore this stream of literature in further detail.

Research on entrepreneurial learning at the organizational level has approached the phenomenon from three angles. Initial studies focused on the personal attributes of the individual entrepreneur; some focused on the role of experience; and others considered entrepreneurs' management style, learning mode, and learning orientation as antecedents that determine organizational-level output. These studies are summarized in Table 2.2, and each of these themes is discussed below.

Individual attributes

A few of the entrepreneurship studies that focus on entrepreneurial learning at the organizational level have discussed individual-level attributes to explain organizational-level output. For instance, Dencker, Gruber, and Shah (2009) ascribed variations in organizational performance to differences in the pre-entry knowledge and management experience of individual entrepreneurs. They argued that knowledge and experience moderate a new venture's chances of survival, since they improve entrepreneurs' ability to undertake learning activities such as business planning and product-line change. Similarly, Reuber et al. (1990) argued that the human capital of the founder(s) moderates the firm's ability to network, learn, and access critical resources, which influences long-term prosperity and performance outcomes. Another study that linked human capital and performance at the venture level is that of Aldrich and Yang (2014). The authors suggest that the knowledge required to organize a new business results from a lifelong process of learning that starts during childhood and grows over time. Entrepreneurs learn from their family, schooling, and careers before starting a venture. They also learn by doing, borrowing, and experimenting during the startup process. The authors demonstrate that those with high human capital are likely to run more successful ventures due to the routines, heuristics, and habits they carry with them from prior experiences, which allow them to learn more quickly from feedback during the startup process and transmute some of those routines into their ventures.

The role of experience

Another strand of work focused on the importance of experience as an input for organization-level learning. For instance, Deakin and Freel (1998) suggested that SMEs' growth process is dependent on the ongoing process of learning whereby entrepreneurs maximize their learning from critical events. In doing so, they discover routines that work, and extrapolate them into the organization. As such, the authors emphasized trial-and-error learning as an essential precursor to the development and modification of routines. A similar approach is taken by De Massis et al. (2012), who analyze the dimensions along which entrepreneurs learn in reaction to external stimuli triggered by their firm's stakeholders. They emphasize the importance of experimental learning, such as that originating from customers, suppliers, and partners, for developing technology and refining the venture's business model.

Other studies, such as that of Ravasi and Turati (2005), have conceptualized entrepreneurial learning as a self-reinforcing process, emphasizing the crucial influence of prior related knowledge and experience on the way learning unfolds in new technology-based ventures. They suggest that those with prior related knowledge in a specific domain can exercise greater control over venture-level

outcomes if such control is exercised in a similar domain. Moreover, prior experience influences the time, attention, and resources that entrepreneurs are able to dedicate to exploring specific opportunities at the expense of others, suggesting that learning at the venture level is influenced by these reinforcing antecedents.

Management style, learning mode, and orientation

Other studies attempting to explain learning at the organization level have taken a more behavioral approach. Some have explored individual-level behaviors to explain organizational outcomes. For instance, Wang (2008) and Hughes, Hughes, and Morgan (2007) explore how individual-level behaviors such as commitment to learning, open-mindedness, and shared vision mediate entrepreneurial learning orientation at the organizational level. Similarly, Voudouris et al. (2011) illustrate that decisions about which opportunities would be most profitable to pursue—in which firms are exposed to learning from first-hand experience—are shaped by personal and social interactions at the individual level. The pursuit of such opportunities by individual entrepreneurs helps to embed knowledge in the venture, which supports its longevity and growth. Another study by Zhang et al. (2006) demonstrates that differences in learning mode (i.e., experiential, information, or interactive types of learning) and learning scope (i.e., individual-, group-, or organization-level), among both stable and innovative firms, are embedded in the background and behaviors of managers who must decide how to respond to changing organizational contexts.

More recently, West and Gemmell (2018) examine how learning behaviors in new ventures lead to innovation. Their results demonstrate that individuals' learning behaviors influence learning at the venture level, mainly in terms of exploration and exploitation, which indirectly affects innovation outcomes. Similarly, Dimov (2007) explores entrepreneurial learning as a process of opportunity recognition, suggesting that opportunities initially arise as ideas that entrepreneurs recognize through being in contact with customers, suppliers, or trade partners. Ventures' ability to realize these ideas does not only rely solely on the entrepreneur's experience, but also on whether the entrepreneur's learning style matches the situation at hand. As such, domain-specific experience enables action when there is a person-situation match, and impedes it when such a match is absent.

Studies within the organizational learning literature

Other studies that have aimed at explaining learning at the organizational level form part of the literature on organizational learning. These studies have discussed the process of knowledge passing from individuals to the organization with respect to two main attributes: (i) the collective mind and (ii) absorptive capacity.

Collective mind

Studies in the collective mind stream typically discuss how learning makes the transition from individual to organization in terms of shifts in individuals' mental models (Kim, 1993). The individual is mostly considered as an agent for learning (Argyris & Schön, 1978). Therefore, when considering "who learns," studies within this stream suggest that organizations only learn when individuals within them learn and develop knowledge (Senge, 1990). As such, organizational-level learning occurs when individual mental models are made explicit through dialogue, negotiation, or argument. A mental model shared within a group functions as a repository of organized learning (Levine et al., 1993), which then serves as a general template that guides coordinated group action (Crossan et al., 1999).

When a group joins together, individuals' cognitive maps may not coincide exactly. Hence, a shared mental model only constitutes the overlapping parts of individuals' mental models, and not the summation of all the mental models in the group (Kim, 1993). In this way, organizational learning is not simply an accumulation of individual-level learning, but rather the shared body of knowledge that develops over time as a unique entity, different from that of any individual (Van den Bossche, Gijssels, Segers, & Kirschner, 2006).

In line with this argument, studies that borrow from this stream of literature commonly suggest that it is debatable whether all members of the organization need to establish a shared mental model for organizational learning to emerge. For instance, Campbell and Armstrong (2013) argue that since it is hard to capture shared mental models among each and every member of a firm, it is more sensible to examine the learning that takes place among senior managers, which often holds a key role in determining the objectives and strategy of the organization.

A closely related approach is that discussed by Edmondson (2002), who illustrates that organizational learning is a process of change in the cognition and actions of individuals and teams. When these individuals begin to interact, learning is transposed into the group level, at which point organizational learning starts to emerge.

Absorptive capacity

A number of studies that address organizational-level learning in relation to absorptive capacity (Jones & Macpherson, 2006) have argued that a firm's ability to explore and benefit from external knowledge resources is determined by its ability to recognize the value of external information, assimilate it, and apply it to commercial ends (Cohen & Levinthal, 1990). Almeida, Dokko, and Rosenkopf (2003), for instance, in their study of learning in start-ups, argue that the ability to learn and acquire external information depends on the size of the start-up (measured in terms of the number of members). Start-ups with more members can generate more extensive repertoires of alliance activities than smaller ones can. This could

be argued on the basis that larger start-ups enjoy a more substantial endowment of human capital, which forms the basis on which new knowledge could be developed. This view implicitly associates knowledge prevailing among the founder(s) with firm-level absorptive capacity, whereas West III and Gemmell (2018) suggest that venture members' knowledge does not particularly inform firm-level absorptive capacity. They go on to argue that new ventures are not mature enough to have fully developed the managerial structures and systems that support absorptive capacity. Hence, developing venture-level absorptive capacity requires new ventures to move from their early state, where learning is primarily individual and experiential, into a state where learning is institutionalized in venture-wide routines and behaviors (Franco & Haase, 2009; O'Connor, Corbett, & Peters, 2018). However, in their study, West III and Gemmell do not explore mechanisms that explain the process through which learning is transmuted from individuals to the organization.

Contemplating the literature on individual- and organization-level learning, it is surprising that there are so few comprehensive attempts to explain how learning is translated between these two levels (Wang & Chugh, 2014). There is a need for a coherent, integrated framework that captures how learning at the individual level translates into the organization, where it becomes routinized in venture-wide behaviors (Vera & Crossan, 2004). Against this background, the remainder of this chapter introduces theoretical frameworks that can develop our understanding of entrepreneurial learning as an experiential multilevel process. Moreover, these frameworks are synthesized and discussed with respect to the appended papers.

Table 2.2
Summary of the literature on organizational-level learning

Author/Year	Main purpose	Theoretical Perspective	Definition of EL	Type of Learning	Unit of Analysis
Dutta & Crossan (2005)	Entrepreneurial Learning as a process of entrepreneurial opportunity exploration, discussed from two contrasting views—Schumpeterian and Kirznerian.	Entrepreneurship & organisational learning.	Not provided.	Organisational learning (4I model).	Firm
Zhang et al (2006)	This study attempts to understand the learning processes in SMEs. The findings indicate differences in learning among ventures detailing the learning mode and learning style of these ventures.	Entrepreneurial learning, organizational learning.	Not provided.	Organizational learning.	Firm
Aldrich and Yang (2104)	Knowledge needed for organizing a new business is a life-long process of learning both before and during the organizing process. Creating profitable ventures is contingent on the ability of entrepreneurs to learn by doing and experimenting during the startup process.	Human capital.	Implicitly a process of developing know-how, know-what and know-who.	Learning by doing and from experience.	Firm
Wang (2008)	This study conceptualizes learning orientation as a mediator of the entrepreneurial orientation and performance relationship.	Organizational learning.	Not provided.	Organizational Learning orientation, adaptive and generative learning.	Firm
De Massis et al (2012)	The paper analyses the dimensions along which entrepreneurs learn in reaction to external stimuli triggered by the stakeholders.	Entrepreneurial learning.	Not provided.	Experimental learning.	Firm

Voudouris, Dimitratos and Salavou (2010)	A process that starts at the individual level and progressively encompasses the whole organisation and its networks.	Entrepreneurship	A continuous process leading to the development of knowledge required for starting and managing a business (Politis, 2005).	Individual and organizational learning.	Firm
Harrison and Leitch (2005)	The essence of entrepreneurial learning resides in the embodiment of the decoupled realities of organisational learning and practice.	Organisational learning.	Not Provided.	Organisational learning.	Firm
Campbell & Armstrong (2013)	Organisational perspective on entrepreneurial learning, whereby Individual mental models become shared through explicit dialogue, negotiation and argumentation. Examines organisational learning by examining the collective knowledge structure of top management, particularly when knowledge relates to the environmental-alignment decisions.	Organisational learning & individual learning	Not Provided.	Individual & organisational learning.	Firm
Lichtenstein, Lumpkin & Shrader (2003)	The ability to transform information into knowledge through organizational learning is a critical success factor for all businesses in the current knowledge-based economy.	Organisational learning	Not Provided.	Behavioural, cognitive & action learning.	Firm
Brockman (2013)	A process that starts with intuition within an individual, moving to interpreting among multiple individuals, proceeding to integration within groups and finally institutionalisation within the organisation.	Organisational learning 4I Model.	Implicitly defined as the process of discovering entrepreneurial opportunities as a developmental process.	Behavioural, cognitive & action learning.	Firm
Crossan & Berdrow (2003)	Illustrates the underlying processes that form the tension between exploration and exploitation.	Organisational learning 4I Model.	Not provided.	Organisational learning.	Firm
Lumpkin & Lichtenstein (2005)	Viewing EL from an Organisational Learning (OL) perspective, arguing that OL can strengthen a firm's ability to recognize opportunities and help equip them to effectively pursue new ventures.	Organisational learning.	Not provided.	Organisational learning.	Firm
Ravasi & Turati (2005)	Learning processes that underlie the successful generation and integration of knowledge in entrepreneurial ventures. Conditions that affect the successful development and refinement of knowledge in developmental efforts. The distribution of time and attention between opportunities and projects are influenced by self-reinforcing learning processes which lead entrepreneurs to dedicate increasing time and attention to the exploration of some opportunities at the expense of others, which rests on entrepreneur's previous knowledge.	Entrepreneurial cognition & organisational learning.	The learning process that occurs as entrepreneurs accumulate and organise knowledge and information within and across development efforts.	Generative learning.	Firm/ Project
Dimov (2007)	The paper views the emergence of opportunities as a learning process, it explores the intentionality that drives this process forward from the initial occurrence of an idea to its further exploration and elaboration by a potential entrepreneur. Previous knowledge of the opportunity domain increases their likelihood of acting on their initial opportunity insights only when their style of learning is compatible with the situation at hand.	Experiential learning & organisational learning 4I framework.	Not provided.	Experiential learning & entrepreneurial intention.	Firm

Hughes, Hughes, & Morgan (2007)	Entrepreneurial Orientation (explorative behaviour) explains high performance in firms and explains mediocre performance in regular firms. Explorative and exploitative learning reflect different capabilities for knowledge production and affect the nature of knowledge produced and the behaviors necessary to create it. EO: reflects behaviors such as creative experimentation, proactive discovery, change anticipation and tolerance of the unknown.	Configuration theory.	Not provided.	Exploitative learning.	Firm
Dencker, Gruber & Shah (2009)	Pre-entry knowledge of business activity, and pre-entry management experience indirectly increase (moderate) a firm's chances of survival by moderating the survival benefits of two types of learning activities: early stage planning and product line change.	Population ecology.	Not provided.	Adaptive learning, learning from experience.	Firm
Gibb (1997)	EL, is entrepreneurial knowledge acquired through trial & error Learning from mistakes and interpreting feedback from the environment (customers, suppliers) learning by copying, learning from experiment and learning by problem solving.	The learning organisation.	Not Provided.	Contextual learning & abstract knowledge.	Firm
Jones & Macpherson (2006)	Knowledge transfer is shown to typically involve a process of action learning in the sense that individuals work together sharing and interpreting collective experiences as they develop a distinct group identity through participation and socialisation.	Organisational learning (4I framework by Crossan et al., 1999).	Not provided.	Inter-Organisational Learning	Firm
Deakins & Freel (1998)	Deakins and Freel recognise the need to reflect on experience for learning to emerge. Previous experience can be poor preparation for entrepreneurship, even if experience is in the same sector. They denote learning from a crisis (critical event) p. 151 Through reflection on the experience that entrepreneurs learn and adjust their actions. Entrepreneurs at an early stage of development do not follow a smooth learning curve, but have to re-adjust when faced with a problem that they have not accounted for. Thus, learning and ability advance and progress in a series of disconnected jumps, which depend on the experience of the entrepreneur.	Organisational learning.	Implicitly described as composed of a number of entrepreneurial competencies: the ability to network at an early stage, to assimilate critical resources, including human resources to build the entrepreneurial team.	Experiential Learning, EL through networks, learning by doing; routine adaptation (internal search), and trial and error (external search)	Firm
Franco & Haase (2009)	A process that emerges at the individual level through intuiting, and which moves to a group level through interaction, combining two basic processes, namely interpreting and motivation. Interpreting acts as a bridge between the individual and the other levels. Interpreting is a double loop process involving feedback and feedforward processes regarding the individual intuitive process.	Organisational learning typology using mainly Crossan et al.'s (1999) framework to entrepreneurial learning theory thus bringing on a wider definition of the entrepreneur as a permanent learning.	Learning as what informs entrepreneur's quest for new opportunities.	Organisational learning, individual learning (experiential, reflective, imitation)	Firm
West and Gemmell (2018)	Investigate how founders' individual learning behaviors affect firm-level learning behaviors (exploration/exploitation), leading to successful innovation.	Entrepreneurial learning.	Not provided.	Explorative or exploitative learning	Firm

Reuber, Dyke and Fischer (1990)	The paper examines the founders' experience as a proxy that explains venture level performance.	Entrepreneurship	Not provided.	Learning from experience	Firm
Wang & Chugh (2014)	EL is often referred to as learning in the entrepreneurial process. Its definitions span from 'venture learning, learning to recognise and act on opportunities, and interacting socially to initiate, organise and manage ventures.	Entrepreneurship and organizational learning.	Mixed definitions.	Individual and collective learning, exploratory and exploitative learning, and intuitive and sensing learning	Not specified

Entrepreneurial learning as a multilevel phenomenon

As discussed above, routinizing behaviors requires understanding how learning is translated between the individual, the team, and the organization (Crossan et al., 1999). The goal of this section is to expound a multilevel conceptualization of entrepreneurial learning, which helps us understand how learning at the individual level coalesces and deepens as collective learning, which then becomes routinized in venture-wide behaviors (Chan, Lim, & Kuan Keasberry, 2003).

This section proposes an integrative framework as a foundation for understanding entrepreneurial learning as a multilevel phenomenon. This framework pays close attention to individual-level learning, since such learning creates the basis for personal streams of experience to permeate throughout the organization. Team-level learning is also highly relevant, since the team context constitutes the proximal social context that shapes and amplifies the emergence of learning as a collective phenomenon (Kozlowski, Chao, & Jensen, 2010). Finally, learning at the organizational level is realized when the flow of learning is intentionally routinized at the system level (Brockman, 2013). The “system-level” view is predominantly inspired by the information-processing perspective (Cyert & March, 1963), in which organizations are viewed as information-processing systems that acquire, interpret, distribute, and store information within their organizational routines and structures (Wang & Ahmed, 2003). The section ends with a preliminary model that illuminates entrepreneurial learning as an experiential multilevel process.

The 4I Model of Crossan et al.

A good starting point for understanding entrepreneurial learning as a multilevel phenomenon is the 4I model introduced by Crossan et al. (1999). The model illustrates learning as a dynamic process that permeates the organization through the social and psychological processes of intuiting, interpreting, integrating, and institutionalizing. These micro-foundational processes provide an overall

understanding of how different learning levels interact and determine how learning permeates into the firm (Brockman 2013; Crossan & Berdrow, 2003).

The 4I model is grounded in the social constructionist perspective, which suggests that individuals create rather than discover their shared mental models, based on their prior experience and individual knowledge base (Brockman, 2013). As such, at the *intuiting* stage of the process, members of the organization realize specific patterns or possibilities through their experiences, which can then be enhanced or used by other members of the organization. At this stage, these patterns and possibilities remain in the preconscious, as they are not yet made explicit to other members. Through *interpreting*, individuals verbalize their observed patterns, and, in doing so, share their intuitions with other members of the organization. While interpreting is often recognized as an individual process, it can also move beyond the individual, as other members of the group contribute to the discussion, embracing the ideas under discussion as they do so. *Integrating*, the third step in the 4I model, is a collective process whereby group members develop a shared understanding of new ideas and how to put them into action. Once these new ideas or changes are implemented and have a recurrent effect on organizational action, the changes become institutionalized. *Institutionalizing*, the final step in the 4I model, is a process of embedding learning that has occurred at the individual and group levels into the organization. Institutionalizing includes the routinization of behaviors, which is a deliberate process by which experiences that tend to be personal become a shared property that is judged to be useful to the organization.

Moreover, the 4I model demonstrates multilevel learning as a dynamic process whereby experiences that permeate into the organization are supported by individual- and group-level interaction in both feed-forward and feedback loops of learning. In this way, the model outlines learning as an evolutionary chain of interconnected processes that define learning at different levels of interaction (Brockman, 2013).

Various studies have used the 4I framework to explain how learning spreads through the organization (Brockman, 2013; Dutta & Crossan, 2005; Jones & Macpherson, 2006), each advancing the discussion of 4I in its own way. However, none has explored the mechanisms that explain how individual streams of experience are routinized in a way that informs venture-wide behaviors (Wiewiora et al., 2018). The majority of studies that use the 4I framework focus on developing a conceptual and empirical understanding of the forces that impact the early processes of intuiting, interpreting, and integrating, with an evident lack of institutionalization. For instance, Lehesvirta (2004) studied learning processes in a high-tech firm, where she found that conflict and confusion were central for intuition and interpretation to emerge from the individual to the group level. She also suggests that institutionalization is a process that guides or restricts future interpretation and integration (through the feedback forces), but did not examine the underlying mechanisms that lead to institutionalization.

Similarly, Lawrence, Mauws, Dyck, and Kleysen (2005) propose incorporating power and politics into the 4I framework to illustrate how new knowledge becomes the property of an organization, and how this knowledge can be used to create new knowledge. They concentrate on processes of interpreting and integrating as being facilitated by episodic power, and argue that the connection of these forms of power provides useful insights into how organizational politics influence organizational learning. More recently, Kostopoulos, Spanos, and Prastacos (2013) have applied the 4I framework to understand team learning. While their results conclude that team learning originates from individual intuition, which is then amplified to the team level through interpretation and integration, their contribution is confined to the measurement of team learning, with no further insights into the processes that connect the team with the organization.

For individual-level experiences to permeate into the organization, individuals must engage together in a way that allows their experience to feed forward, i.e., “to come to the surface, to be discussed, further shaped, adapted, and put to trial in conjunction with their colleagues and peers” (Doyle, Kelliher, & Harrington, 2016, p. 4). This argument alludes to the importance of considering team-level learning, which plays a key role in explaining how entrepreneurial learning is transposed to multiple levels within the organization.

Learning at the venture-team level

As explained above, entrepreneurial learning begins at the individual level. For instance, Dutta and Crossan (2005) argue that opportunities are primarily recognized by individuals, and are therefore initially intuitive, remaining within the subconscious. Therefore, opportunity recognition is attached to the specific knowledge and personal routines that individuals develop through experience. Entrepreneurs develop personal routines and heuristics that allow them to develop unique ways of viewing the world (Busenitz & Barney, 1997; Aldrich & Yang, 2014). Such personal routines also allow them to recognize new means-ends relationships, and focus their attention on new opportunities (Harrison & Leitch, 2005).

However, a key element in the new-venture development process is transferring these experiences into the fledgling venture (Breslin & Jones, 2012), since ventures that fail to do so may jeopardize their appropriability regime. Zollo and Winter (2002) suggest that for organizations to sustain their ability to recognize and act on opportunities, they must deliberately create learning processes where experiences are articulated and codified within the firm. According to Brockman (2013), the articulation of experiences requires discussions across multiple individuals. During such discussions, individuals verbally communicate their experiences to other members of the venture, often through metaphor (Crossan & Berdrow, 2003).

Through this process, individual-level experiences become available to other members in the team for evaluation, thereby linking individuals' experiential learning to collective levels of learning. In this way, learning from an individual member's repertoire is integrated into the team, creating a new team repertoire that is not dependent on any one individual. As soon as experience is jointly interpreted by multiple individuals, it becomes embedded in the consciousness of all team members, creating a shared mental model that allows members to develop coherent collective action (Brockman, 2013). Over time, and through collective action, these shared mental models become institutionalized and retained, both in tangible repositories (such as policies, procedures, and best practices) and intangible ones (such as norms, images, or beliefs) (Franco & Haase, 2009). In this way, the transmutation of experience from individuals to the organization is illuminated as a social multilevel activity, where the venture team serves as a critical bridge between the individual and organizational levels of learning (Wang & Chugh, 2014).

Studies in entrepreneurship have acknowledged learning at the venture-team level as a vehicle for experience to be transmuted from individuals to the group (Jones & Macpherson, 2006; Breslin & Jones, 2012). Learning at the venture-team level is referred to as "a process of cumulative knowledge, based on a set of shared rules and procedures which allow individuals to coordinate their actions in search for problem solutions" (Capello, 1999, p. 354). In their study, Jones and Macpherson (2006) discussed the transfer of experience among individuals as a process of action learning. Through action learning, individuals typically engage in sharing and interpreting collective experiences, and, in doing so, create a unique repertoire of group knowledge (Widding, 2005). Other studies have illustrated team-level learning as a situated context that incorporates transactions between individual-level experiences, practices, and everyday work tasks (Karatas-Özkan, 2011). Through these transactions, individual members learn about their strengths and weaknesses along with other members, and navigate the business venturing process by combining knowhow, "know-what," and "know-who" (Fang, Tsai, & Lin, 2010; Jones, Macpherson, & Thorpe, 2010; Sardana & Scott-Kemmis, 2010).

While the venture team is acknowledged as an essential learning unit that supports learning in the organization (Senge, 1990), there are few scholarly attempts to systematically examine how learning processes at the venture-team level connect the individual and organizational levels of learning. Therefore, the next section explores the literature on team learning processes, revealing how it can provide a better understanding of entrepreneurial learning as an experiential multilevel phenomenon (Crossan et al., 1999; Kozlowski & Klein, 2000).

Team learning processes

The majority of research on team learning processes has emphasized the triggers and outcomes of team learning (Zhang et al., 2007; Gino et al., 2010; Mell et al., 2014). For instance, Edmondson (1999) focuses on understanding how psychological safety influences team learning processes, considering factors such as individuals' willingness to share their different perceptions with other members of the team. She argues that higher levels of psychological safety promote higher levels of information sharing, feedback-seeking, and error-discussion, which promote shared mental models and overall team learning.

Other research on team learning processes emphasizes the change in a group's repertoire of potential behaviors, pointing to processes of trial and error as mechanisms through which learning takes place (Wilson, Goodman, & Cronin, 2007; Edmondson, 2003; Sole & Edmondson, 2002). Others adopt a cognitive perspective, showing team learning to be an ongoing process of action and reflection, whereby learning is realized by asking questions, seeking feedback, reflecting on results, and discussing errors or unforeseen events (Brown & Duguid, 1991).

However, little attention is devoted to understanding team learning as an emergent process. As discussed above, learning starts at the individual level and is then transmuted into the organization. As such, characterizing the processes and mechanisms by which individual-level learning emerges and manifests as collective learning is a necessary step for providing a multilevel perspective on entrepreneurial learning (Kozlowski & Ilgen, 2006). By treating team-level learning merely as a collective process, we are neglecting the underlying processes that lead to it. According to Kozlowski et al., (2010), learning at the venture-team level is fundamentally rooted in individual cognition, motivation, and experience, and it is through interaction that this learning becomes amplified to the collective level. As such, approaching team learning as a process that encompasses multiple levels is necessary for informing our understanding of entrepreneurial learning as an experiential multilevel phenomenon.

At an early stage, entrepreneurs explore different ideas and working patterns and experiment with them until they find the most effective ones, which can then be routinized into venture-wide behaviors (Aldrich & Yang, 2014). Before routinization, however, these ideas and working patterns must be discussed and negotiated with other members of the organization. Therefore, exploring team learning processes is necessary for understanding these interactions, and how the members involved develop a dialogical space where they share, discuss, and negotiate ideas (Gibson & Vermeulen, 2003). According to Crossan et al. (1999), the movement from intuition to interpretation takes place via processes of interpersonal sharing and dialogue that involve a transition from one individual to a coordinated group.

Many scholars emphasize processes of interpersonal sharing and dialogue as critical team learning processes to disseminate experience (Dutta & Crossan, 2005; Brockman, 2013). For instance, Altman and Iles (1998) argue that interpersonal sharing and dialogue are necessary processes for the transmission of information, ideas, emotions, and skills. Some scholars restrict interpersonal sharing and dialogue to the verbal interchange of thoughts and ideas (West, 2007), while others see them as processes by which new knowledge, routines, and behaviors are distributed across members (Wilson et al., 2007). However, there is general agreement that the depth (level of detail) and breadth (number of members involved) of interpersonal sharing and dialogue determine the quality of learning (Decuyper, Dochy, & Van den Bossche, 2010).

Moreover, team learning processes are vital for understanding how best practices are routinized in venture-wide behaviors. According to Brockman (2013), for experience to become institutionalized and manifested in the form of routinized behaviors, it is necessary to understand how “individual mental models are integrated with others to shape shared mental models that are then institutionalized within the firm” (p. 270). Shared mental models form the basis on which different experiences are coordinated and mutually adjusted (Becker, 2004; Nelson & Winter, 1982). However, understanding how shared mental models are created necessitates exploring the mechanisms through which experiences are initially shared and co-constructed. According to De Mole et al. (2015), it is through sharing and co-construction that team members refine, modify, and develop shared meaning and understanding of experience. Therefore, capturing the process of sharing and co-construction is vital for illuminating how venture members engage in communication where they discuss and investigate work processes via introspection, and mutually combine insights that allow them to converge on an explicit and practical solution (Edmondson, 2012).

In this way, team learning processes offer critical insights into how venture members acquire experiences and share them with other members of the team. Such processes also show how members negotiate and co-construct these experiences, and store them over time, making them easily accessible to other members via routinization.

Transactive memory systems

Another stream of literature that is helpful for exploring entrepreneurial learning as an experiential multilevel process is that on transactive memory systems. The theory of the transactive memory system (TMS) is a team learning perspective that reflects the way members of the venture team learn to encode, store, and retrieve information together (Lewis, 2004; Lewis & Herndon, 2011). A TMS is a shared cognitive system of “who knows what,” which allows team members to quickly

locate shared and differentiated knowledge domains that can be applied to perform a task (Dai et al., 2016). Hence, the performance benefits of a TMS are an improved shared understanding of how members operating in a team can divide, coordinate, and perform task work (Lewis & Herndon, 2011).

Studies on TMSs have spanned multiple levels of analysis (see Table 2.3 for a summary), and have focused primarily on understanding how individuals with specialized knowledge work together, learn “who knows what,” and work out the division of labor that best fits their knowledge and skills to coordinate the execution of a task (Argote & Guo, 2016; Ren & Argote, 2011).

Table 2.3:
Overview of the literature on transactive memory systems

Author and year	Level of analysis	Focus with respect to TMS
Hollingshead (1998)	Dyad	Dyads with TMSs were found to recall more words collectively compared to dyads lacking a TMS.
Hollingshead (2001)	Team	A TMS develops as group members learn about each other's areas of expertise and become dependent on one another for acquiring, remembering, and generating knowledge.
Zhang et al. (2007)		The study examines the relationship between team characteristics, TMS development, and team performance when carrying out a task.
Liang et al. (1996)		The study explores how a TMS develops better in groups whose members were trained together compared to those trained individually.
Michinov and Juhel (2017)		Examines the mediating role of a TMS on team effectiveness and performance.
Gino et al. (2010)		Through task experience, teams develop a TMS, which in turn mediates the relationship between task experience and team creativity.
Lewis et al. (2005)		TMSs help groups to apply learning from performing prior task to new tasks, and develop an abstract understanding of a problem domain, leading to sustained team performance.
Fan et al. (2016) Huang and Chen (2017)		Explore the relationship between TMS and team performance and creativity, emphasizing the important role that social interaction plays in TMS development.
Lewis (2004)		Explores how increased communication frequency in the team improves TMS emergence.
Mell et al. (2014)		Investigate the impact of TMS structure on team performance.
Jackson and Klobas (2008)	Organization	Organizational TMSs can be observed where knowledge of what others in the organization know is accessible, and where retrieval of that knowledge can be observed.
Argote and Ren (2012)		The TMS is discussed as a source of competitive advantage, as it develops from experience. It depends on organizational members who are idiosyncratic to a particular firm. A TMS is organization-specific, and thus hard to replicate.
Heavey and Simsek (2015)		Explores TMSs in relation to the environment, emphasizing that the top management team's external ties provide the organization with information about the market and facilitate the transfer of information.

Some studies have focused attention on the level of the dyad, arguing that pairs of individuals who share a TMS can perform better at a variety of tasks (Hollingshead, 1998a, 1998b). The TMS concept was further extended to explain interaction and coordination at the group or team level. Research focusing on the team level has been mostly concerned with the operational outcomes of TMSs, indicating that teams with strong TMSs were more creative, and could perform tasks more quickly, and with fewer errors (Fan et al., 2016; Gino, Argote, Miron-Spektor, & Todorova, 2010; Lewis, 2004; Mell, Van Knippenberg, & Van Ginkel, 2014). While only a few studies have extended TMSs to the organizational level (Ren & Argote, 2011), they have provided a basic extension of team-level TMSs to the organization (Argote & Ren, 2012; Heavey & Simsek, 2015; Jackson & Klobas, 2008). Studies exploring TMS at the organizational level argue that the extension of TMSs from the team to the organization represents individuals' knowledge of organizational expertise (Brauner & Becker, 2006). However, this perspective offers only a very limited understanding of how TMSs can be extended to the organization and, in so doing, explain the transmutation of learning from the team to the organization.

Scholars have frequently described TMSs as collaborative frameworks for encoding, storing, and retrieving information in social systems (Argote & Guo, 2016; Lewis & Herndon, 2011). Studies, however, typically focus their attention on the team level, with little bridging between the team and the organization. The following section discusses TMS development, and then illustrates how it can explain entrepreneurial learning on multiple levels.

Explaining TMS development

The first step in the TMS development process is *encoding*. Through encoding, individual team members articulate and share what they have learned with other members of the team. In doing so, team members develop a structural memory of who knows what (Lewis & Herndon, 2011). As previously discussed, entrepreneurs learn in many different ways (Sardana & Scott-Kemmis, 2010). They learn from experience. They learn from customers, suppliers, and rivals. They learn by doing, and they learn from what works—and, more importantly, from what does not (Cope, 2005; Politis, 2005). Whereas learning is necessary for enriching individuals' memory, encoding is a critical step for individuals operating in a team to learn about others' knowledge. Learning about what others know is necessary for promoting interdependence, knowing that individuals can retrieve information from other members when needed. Accordingly, creating a structural memory of who knows what creates the basis for learning to extend beyond individuals' memory into the team's memory. The memory of a team, therefore, is larger and more complex than that of any individual within it (Lewis, 2003).

Developing structural memory reduces knowledge overlap in the team, since it affords individuals greater freedom to learn and develop knowledge within their knowledge domains (Mell et al., 2014). As such, structural memory improves

differentiation in knowledge and experience among team members. When team members enjoy differentiation in knowledge, it improves credibility—that is, members will trust each other’s knowledge and expertise to complement task-critical information (Lewis & Herndon, 2011).

The second step in the TMS framework is *storing*. Storing is a transactive process through which team members discuss incoming information emerging from day-to-day tasks. As they engage in daily tasks, team members begin to recognize task-related patterns, which are discussed and mutually adjusted in a way that can be stored for future reference (Lewis et al., 2005). For instance, members of a team can learn a new technique in performing a task. Through discussion, they interpret what works and what does not—and, over time, store what is judged as beneficial for future retrieval. Discussion, therefore, involves the interpretation of task-related aspects, which alters an individual’s understanding of a task and their resulting action. Through discussion, team members develop a shared mental model that evolves into coherent collective action (Lewis et al., 2005).

It is noteworthy that the ability to locate different knowledge and expertise in the team has a significant influence on members’ ability to discuss working patterns and ask questions about the information associated with specific members (Gino et al., 2010). Hence, structural memory is necessary for the transactive process of storage to take place (Mell et al., 2014).

Retrieval is a transactive component and the final step in TMS development. Retrieval builds on structural memory—that is, the ability to determine the location of information—and is considered to be successful when individuals holding the information are not those who are asked to retrieve it (Wegner, 1986).

Overall, research on TMSs emphasizes the interplay between the structural and the transactive components of a TMS. Studies typically demonstrate how team members encode, store, and retrieve task information from domain experts, leading to sustained team performance (Peltokorpi, 2014). However, studies offer fewer insights into how these components can actually form the basis for learning to be transmuted into the venture in the form of routinized behaviors. I elaborate further on this discussion below.

TMSs and multilevel entrepreneurial learning

Both structural memory and transactive processes have the power to explain how learning makes the transition from individuals to the organization, thus explaining how learning is transmuted across multiple levels (Argote, 2015).

Individual level. As elucidated above, building structural memory helps members learn who knows what. Individuals often share their experiences and learn about other’s experiences through team activity. Team activity is particularly intense during the early stages of new venture development, and is acknowledged as a learning process that allows members’ knowledge to be built up and retained among a specific constellation of members (Decuyper et al., 2010). Through team activity,

individuals articulate their understanding of a problem or situation to their fellow members (Van den Bossche et al., 2006). Their colleagues, in turn, actively seek to understand the problem or explanation described. In doing so, they learn and construct meaning about each other's knowledge and limitations (i.e., who knows what). By learning who knows what, members attain a cognitive division of labor that encourages interdependence and ensures that critical knowledge is retained in the different linkages determined by member-task associations required for coordinating task-related efforts (Hollingshead, 2001; Lewis, Lange, & Gillis, 2005; Lewis & Hendon, 2011). Moreover, relying on one another in their specific area of specialty allows members to dedicate more time to developing knowledge in their respective domains of expertise (Fan et al., 2016; Hollingshead, 2001). In this way, the development of structural memory supports entrepreneurial learning at the individual level, by influencing the scope and content of individuals' specialized learning.

Team level. The fact that the structural component of a TMS promotes interdependence facilitates team-level transactions (Gino et al., 2010). Through such transactions, team members discuss and co-construct different working patterns. By doing so, they create a shared mental model that allows them to coordinate and refine these patterns (Baker, 1994). When team members discuss an existing working pattern, they build on an already-existing understanding of who knows what to retrieve information required for exploring and agreeing on a new working pattern. The result, hence, is a defined way to perform a task that becomes shared and integrated into the consciousness of all the individuals involved (Brockman, 2013). In this way, the transactive component of a TMS allows learning to evolve from individual knowledge to a common shared understanding, and then into coordinated group action.

It is worth noting, however, that coordinated group action occurs in tandem with individual insights and discussions that take place between individuals and small groups, suggesting that learning is not a staged process, but an emergent one that takes place continuously at multiple levels.

Organizational level. For learning to become embedded in the organization in the form of routinized behaviors, it must be agreed upon and mutually accepted as beneficial. Huysman and De Wit (2002) suggest that mutual acceptance constitutes an essential link between the individual and organizational levels of learning. Therefore, engaging in a transactive process, where team members create shared mental models that allow them to coordinate and refine working patterns, is a necessary precursor for team members to generate higher-order information that could be routinized and made available to other members in the organization.

As argued above, entrepreneurial learning can be transmuted into the organization through the internalization of an increasingly sophisticated set of routinized behaviors (El-Awad et al., 2017). However, using the TMS framework to understand entrepreneurial learning at the venture level is less emphasized in the

existing literature, and therefore little has been done to understand how TMSs can explain the development of routines in new ventures. A cross-fertilization of the TMS and organizational learning literatures (Argote & Guo, 2016) suggests that both TMS and organizational routines share common properties that indicate that the relationship between the two constructs is not mutually exclusive.

Routines, as previously defined, are repeated, interdependent patterns of action that involve multiple actors or performers (Pentland & Feldman, 2003). The TMS framework embraces two properties that constitute the underlying elements of organizational routines—namely, the division of labor and interdependence (see table 2.4). A cognitive division of labor occurs when organizational members learn who knows what, and build on the differentiated knowledge and expertise that provide the basis for task distribution. This property of TMSs resembles a division of labor carried out by multiple actors in organizational routines (Argote, 2015). Second, the fact that a TMS enables member-task association based on differentiated knowledge and expertise suggests that the recurring interaction that takes place when members consult each other for advice can develop into an interdependent process, which constitutes another central element of a routine (Argote & Guo, 2016). Overall, this discussion implies that a TMS is a suitable framework for understanding how entrepreneurial learning develops at multiple levels, and can therefore explain how learning is embedded in organizational routines and structures.

Table 2.4
TMS properties and organizational routines

System	TMS	Organizational Routines
Properties	Who knows what	Division of labor carried out by multiple actors
	Member-task association	Interdependence

Synthesis: A preliminary model of entrepreneurial learning as an experiential multilevel process

By synthesizing and combining multiple bodies of literature, including research on entrepreneurial learning, organizational learning, and team learning, Figure 2.1 offers a preliminary model that explains entrepreneurial learning as an experiential multilevel process. The model integrates the conceptual understanding obtained through the 4I model, team learning processes, and TMS theory.

The 4I model is used as an overarching theoretical framework to demonstrate entrepreneurial learning as a dynamic process that operates on multiple levels. This model illuminates learning as an emergent process that spans the individual, group, and organizational levels. While it is individuals who typically initiate experiences

and insights, the long-term success and development of new ventures requires learning that is transmuted into the organization. This process relies upon multi-faceted communication between individuals and groups (Brockman, 2013). In this emergent process, there is a strong emphasis on how organizational members interact in order to progress through feed-forward and feedback processes of learning. Through feed-forward processes, learning is transposed into the organization via intuiting, interpreting, integrating, and institutionalizing (indicated by the right-hand arrow). In turn, institutionalized learning that takes the form of routinized behaviors feeds back and impacts individual- and team-level learning (the left-hand arrow).

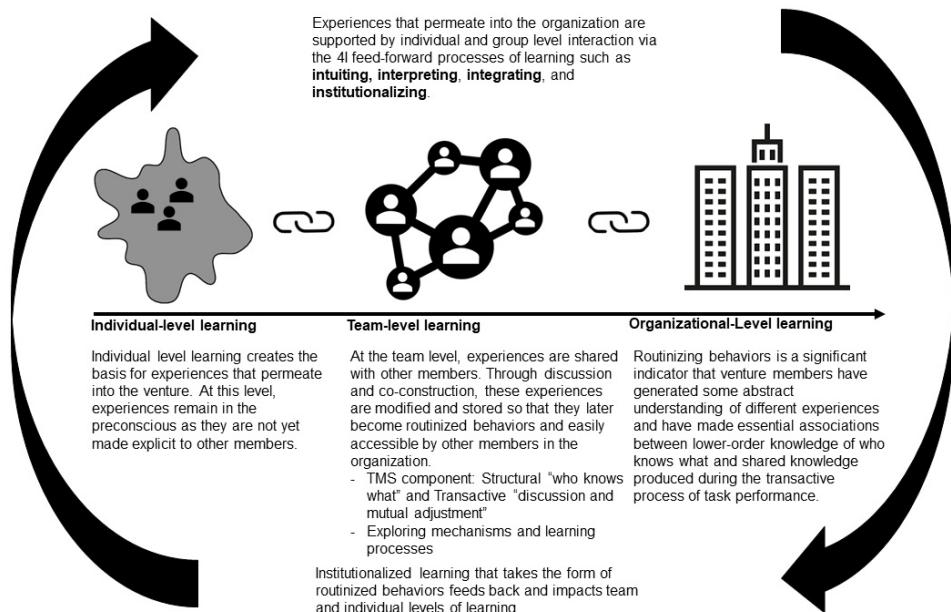


Figure 2.1
The logic of entrepreneurial learning as an experiential multilevel process

In order to gain further insights into the multi-faceted interactions that facilitate the transmutation of learning from individuals to the organization, the research integrates literature on team learning. Figure 2.1 demonstrates team-level learning as a bridge between individual- and organization-level learning. While the 4I model provides four associated processes that link three levels of analysis, the understanding behind the interaction between these processes is problematic and less precisely specified in this model.

For instance, moving from the individual to the team level of learning requires investigating the transition between two feed-forward processes: “interpreting” and “integrating.” Between interpreting and integrating, individuals must motivate personally constructed images and insights and integrate them into the team in such a way that they become understood and shared (Crossan et al., 1999). Understanding this process requires exploring how individuals communicate and surface these images and insights so that they become explicit to other team members.

Moreover, making something explicit may not directly imply that shared understanding is accomplished (Crossan et al., 1999). Therefore, a significant indicator of shared understanding would be achieving agreement and coherent collective action (Brockman, 2013). Gaining further insights into these collective processes requires an investigation into team-level transactions. Observing these transactions offers a more detailed and comprehensive representation of the mechanisms and learning processes that are involved when team members interact, refine, and influence each other’s patterns of thought, understanding, and action. Therefore, Figure 2.1 incorporates the core aspects of a TMS: the structural and the transactive.

On the structural side, a TMS elucidates how individuals exchange experiences and establish cognitive connections that clarify existing associations between members and specific types of knowledge. On the transactive side, a TMS helps demonstrate how team members exchange experiences and transmute them into collective knowledge through discussion and mutual adjustment, which leads to the cogeneration of various task-related solutions. Finally, by integrating the structural and transactive components of a TMS, it is possible to demonstrate how team members generate an abstract understanding of different experiences, and by making essential associations between lower-order knowledge of who knows what and shared knowledge produced during transactions, evolve routinized behaviors (Olabisi & Lewis, 2018).

3. Research design and methodology

This chapter details the research design and process. It describes the background idea behind the research and discusses the various steps taken during the research process. The chapter also explains the methods considered for each paper, including data collection and analysis, and concludes with a reflection on the methodological choices and limitations.

My research journey

I have always wondered: Why do so many new ventures perish during their early stages of development? Moreover, how do those that make it successfully develop the capability to do so? These questions drove my interest in understanding how specific aspects of entrepreneurship unfold in new ventures—particularly the process of entrepreneurial learning.

Early on in my research, I conducted a comprehensive review of the literature on entrepreneurial learning. In this review, I aimed to understand what has so far been researched in relation to entrepreneurial learning, and how this understanding can develop our understanding of how new ventures learn and develop. The theoretical review demonstrated that research on entrepreneurial learning is mainly focused on how entrepreneurs learn and develop knowledge in their entrepreneurial setting. Some other studies in the field aim to develop an understanding of entrepreneurial learning at the venture level, putting the primary emphasis on the individual to explain venture-level outcomes. However, we know far less about how these two levels interact and connect with one another (Wang & Chugh, 2014). This missing link makes it hard to explain how learning is transmuted from individuals to the organization. Therefore, bridging this gap is vital for explaining how new ventures learn and develop.

The theoretical review was initially presented at the European University Network on Entrepreneurship conference in Lyon, France (ESU 2016). Subsequently, this review was turned into a conceptual paper that explores entrepreneurial learning as an experiential multilevel process. I co-authored this

paper with my supervisor Prof. Diamanto Politis (from Lund University) and Prof. Jonas Gabrielsson (from Halmstad University). In this paper, we develop a conceptual model that explains how individual and organizational levels of learning connect and interact, emphasizing the key role that team learning plays in that process.

Moving on to the next step, it was necessary to empirically explore how the individual and organizational levels are connected. Therefore, the second study explores the mechanisms through which individual streams of experience permeate into the organization and, over time, become embedded in organizational routines, systems, and procedures. Capturing these mechanisms required deep empirical access where I could achieve triangulation through multiple methods, including real-time observations for a long enough period to capture these mechanisms (Langley, 1999; Langley, Smallman, Tsoukas, & Van de Ven, 2013). During autumn 2017, I worked closely with Venture Lab (an incubator at Lund University) to identify a suitable case for that purpose. The final selection was a technology-based venture called Shoptech (a pseudonym), which informed the empirical context for Paper II.

As argued above, in the discussion of the 4I model, learning is transposed across the organization by means of four key processes: intuition, interpretation, integration, and institutionalization. This model emphasizes the critical role of the team for processes of interpretation and integration to take place. According to Kozlowski and Klein (2000), the team comprises the proximal social context that shapes and amplifies the emergence of learning in new ventures. Therefore, understanding how learning unfolds in such a context is necessary for complementing our understanding of learning in new ventures.

Together with Anna Brattström, I engaged in a longitudinal case study of learning (Dec 2016–Dec 2018) in a technology-based venture called *Foodtech*. Initially, we aimed to understand what mechanisms underlie how individuals engage in processes of interpretation and integration to channel learning among themselves. However, it soon became clear to us that processes of interpretation and integration do not automatically materialize. Sharing and developing a mutual understanding of experiences is an intricate process. Moreover, making personal and intuitive experiences explicit to other individuals does not necessarily mean that they will assimilate and construct them in the same manner.

The case of Foodtech revealed that the team context can bring various challenges that can deter individuals from assimilating others' experiences. A salient matter in this context was the functional background of the team members. Through a process model, we demonstrate the tensions between venture members' compositional backgrounds and assimilating new learning or staying close to what has already been learned. We show that the way learning unfolds, and the channels between venture members, can be subject to a set of socio-cognitive *mechanisms* that can shape how individual experiences are coordinated and interpreted between members.

Throughout the work on this thesis, I recognized that some of the ventures I worked with tended to fall into specific learning paths. For instance, some ventures emphasized exploration over exploitation, and vice versa. To explore these variations, I conducted a comparative study on four technology-based ventures to investigate how and why new ventures vary in the way they learn and routinize behaviors. During spring 2018, I engaged with the Water Innovation Network (WIN) to gain access to some suitable cases. Having successfully secured such access, I selected four cases and conducted 21 in-depth interviews and gained access to company documents. Through a comparative analysis, the resultant study explains the development process of these ventures over three phases: (i) research and development, (ii) opportunity framing and reconfiguration, and (iii) organization. The study explores how these ventures develop their learning behaviors over time, and illuminates the underlying factors that shape their behaviors. It also emphasizes the interplay between prior related experience and uncertainty as two critical determinants of new ventures' learning behaviors.

Table 3.1 summarizes all four papers, and provides information about the vital contributions, the unit of analysis, the role I took, and the status of each paper.

Table 3.1
Overview of the appended papers

Paper	Author(s)	My role	Unit of analysis	Status
I.	El-Awad, Z. Gabrielsson, J. Politis, D.	I shared responsibility for synthesizing the literature and writing up parts of the paper, and took full responsibility for responding to reviewers	The venture	Published in the <i>International Journal of Entrepreneurial Behavior & Research</i> (Emerald)
II.	El-Awad, Z.	Single-authored	The venture	Published in the <i>Learning Organization Journal</i> (Emerald)
III.	El-Awad, Z. Brattström, A.	I took responsibility for data collection, data analysis, framing, and writing most parts of the manuscript	The venture team	Published in the <i>Academy of Management Proceedings</i> , Vol. 1, 2018 (Awarded "Best Paper" by the <i>International Small Business Journal</i>) Under revise and resubmit in the <i>Journal of Small Business Management</i>
IV.	El-Awad, Z.	Single-authored	The venture	Presented at the Babson conference, Boston, USA 2019

A note on philosophy of science

In this research, I base my ontological and epistemological assumptions on critical realism. The reason for this choice is that critical realism holds an explanatory power to evaluate and uncover the structures and mechanisms that underpin the emergence of social events (Hu, 2018). This perspective is particularly illuminating in view of the central role given in this thesis to mechanisms for explaining how learning is transposed into the organization.

Critical realism can be traced back to the work of Bhaskar (1978), who argues that reality is an open system of emergent entities. These entities are structured and organized at different levels, and their interaction produces specific social events. Entities—which can take physical, social, process, or human form—constitute the basic building blocks of any theoretical development or explanation (Easton, 2010). Hu (2018, p. 3) argues that “any social event (a higher-level entity) occurs when a set of internally related entities at the lower level is structured (structure) and acts in a certain way (mechanism) to generate effects (emergence).” This multilevel perspective on entities suggests that they can construct reality at different levels, and therefore that reality can be stratified into three ontological layers: the empirical, the actual, and the real (Bhaskar, Collier, Lawson, & Norrie, 1998). The *empirical* is related to the domain of observation and experience of reality that is exercised by entities (e.g., humans). At the empirical level, events or objects can be understood through individuals’ sensemaking and interpretation (Fletcher, 2017). The *actual*, on the other hand, relates to the actual happening that takes place through the enactment of generative mechanisms (O’Mahoney & Vincent, 2014). Finally, the *real* represents the social events that emerge as a result of exercising generative mechanisms (see Figure 3.1). While this multilevel perspective on emergence posits that lower-level entities generate higher-level ones, these higher-level entities often possess new properties that cannot be reduced to the characteristics of their lower-level counterparts (Easton, 2010; O’Mahoney & Vincent, 2014; Hu, 2018).

The division between the different ontological layers illustrated in Figure 3.1 does not imply that one ontological layer is more or less real than another. Rather, it implies that understanding reality as an open system requires us to understand the interaction that takes place between these layers. As such, mechanisms exist only by virtue of the entities and activities they govern, and therefore cannot be identified or studied independently of them (Fletcher, 2017). This argument aligns well with my approach to studying entrepreneurial learning as a process that translates between different levels in the venture.

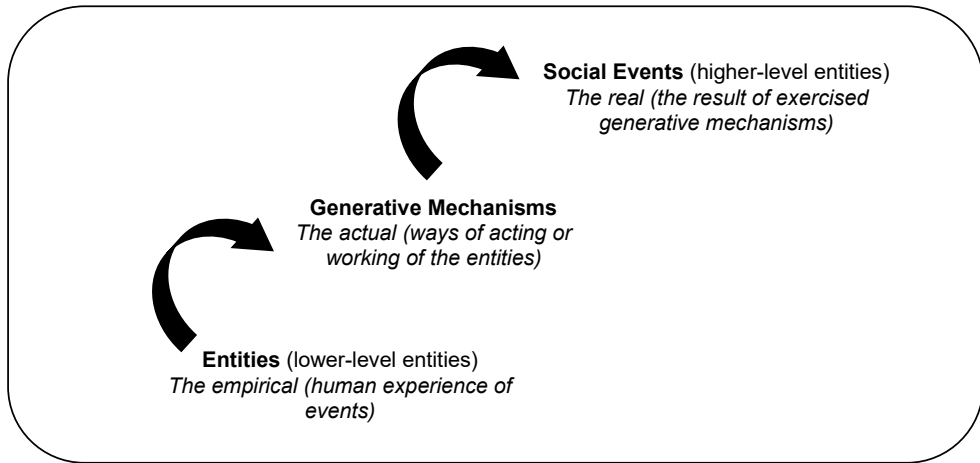


Figure 3.1
The ontological layers of critical realism

This multilevel perspective on ontology provides a dual apprehension of reality: one that is independent of our recognition, and one that is subjectively interpreted (O'Mahoney & Vincent, 2014). This view is situated at the mid-point between the positivist and constructivist perspectives, where the former suggests that reality can be empirically known (e.g., thorough experiments) and the latter suggests that reality is entirely constructed (Bhaskar, 1998). Critical realism provides empirically supported causal explanations rather than predictions of why and how things happen. Therefore, it focuses on the causal forces and mechanisms that underlie what *can* happen (tendencies), rather than what *will* happen (predictions) (Danermark et al., 2002). Concerning the three layers of ontology, critical realism suggests that not all levels of reality can be directly observed, and that therefore causal explanations are not developed by observing patterns, but rather by observing the tendency for specific mechanisms to explain these patterns (Wynn & Williams, 2012). This implies that a researcher may not be able to distinguish mechanisms through mere observation, but rather through discerning their effects (Bhaskar, 1978; Easton, 2010). The fact that mechanisms arise from the interaction of the components of different ontological layers suggests that in order to understand mechanisms, we must first understand the interactions that take place between these layers (Bygstad, Munkvold, & Volkoff, 2016). Capturing these interactions may have specific implications for the methodological choices a researcher must consider. These implications are discussed in the following section.

The methodological implications of critical realism

As noted above, critical realism does not aim to provide predictions or general laws, but rather to identify tendencies that can be explained by mechanisms. To do so, it is therefore necessary to systematically analyze the interplay between the different ontological layers, and understand how the components of these layers evolve and interact over time. This approach requires an intensive research design that builds on relatively few case studies, if not just one (Easton, 2010; Danermark, 2002).

While there is no well-established methodological view on how to study mechanisms, scholars in the critical realist paradigm have attempted to identify different activities or steps that could be of value. They include the *explication of events*, *retroduction*, and *corroboration* through empirical triangulation (Wynn & Williams, 2012; Hu, 2018).

Explication of events starts at the domain of the empirical, and focuses mainly on identifying the key events of the case. This process primarily entails a thorough illustration of the experiences and events observed, including the relevant actors and the activities in which they engage. These empirically observed experiences can then be abstracted with the aim of understanding what impels individuals to act the way they do, thus moving from the domain of the empirical into the domain of the actual, which describes what actually happened (Wynn & Williams, 2012).

Retroduction, on the other hand, involves making sense of the mechanisms that could possibly explain the empirical trends observed. In this way, and as emphasized by Hu (2018), retroduction requires that a researcher moves from individuals' own interpretations of what they think has happened into a deeper level that intuits the mechanisms that make the phenomenon possible, thus moving from the actual to the real. Crucially, researchers can integrate two or more theories to explain and develop their hypothesis on why the proposed mechanisms are sufficient for explaining the social event under study.

Finally, researchers in the critical realist paradigm emphasize the need to establish *corroboration*. Through corroboration, a researcher seeks to achieve empirical stringency by exploring competing alternative explanations for the phenomenon in question (Wynn & Williams, 2012; Danermark, 2002). Achieving empirical stringency is possible through data *triangulation*, which confirms that the hypothesized mechanisms can be supported across multiple data sources, thus bolstering their explanatory power.

Taken together, these tenets of critical realism had essential implications for the overall research design of this thesis. In the following section, I discuss my research design, presenting a detailed picture of the methodology and methods used to explore the phenomena in question. Following that, I outline the specific research design, including data collection and analysis, for each of the appended papers.

Research design

A longitudinal process-based methodology

Capturing entrepreneurial learning as an experiential multilevel process requires a longitudinal process-based research design. This process involves a sequence of individuals/collectives and actions/activities governed by mechanisms that determine the transactions through which entrepreneurial learning is transposed from individuals to the organization (Hjorth, Holt, & Steyaert, 2015).

As highlighted above in the description of my theoretical framework, learning at the organizational level begins with individual experiences and intuitions. For those experiences and intuitions to feed forward into the later stages of interpretation, integration, and institutionalization, transactions with other individuals must take place (Crossan et al., 1999). Investigating these transactions is instrumental for exploring how venture members create a dialogical space in which they can learn about each other, exchange information regarding task work, and share valuable insights. Over time, these insights are integrated into the consciousness of all the members involved (Wilson et al., 2007; Brockman, 2013). Capturing these transactions is also particularly critical for understanding how individuals co-construct task-related work and, over time, develop shared mental models that serve as the basis on which members coordinate a set of repeated activities.

Researching how these transactions unfold over time requires a close, real-time observation of the empirical domain (Langley, 1999). According to Fachin and Langley (2017), following a process over time requires understanding how entities and activities are related and interlinked, and how they come to constitute and reconstitute social events. Hence, a longitudinal exploratory approach is needed to follow the selected ventures for a long enough period to detect shifts in transaction patterns taking place among the involved entities. Fachin and Langley (2017) describe two approaches for researching a phenomenon as a process: (i) process as an activity and (ii) process as evolution.

Process as an activity

Investigating a *process as an activity* captures how entities undertake activities and interact as they perform a task. Such activities could take place during meetings, training, or daily task work. In this approach, a researcher explores micro-level interactions between entities with the aim of explaining macro-level outcomes (i.e., social events). This approach informed the empirical work in Paper II, where it was necessary to follow venture members' transactions and activities as they took place in real time (Fachin et al., 2017). This approach helped me capture how learning transitions took place on multiple levels (individual, team, organization). It was also necessary for illuminating the mechanisms that underpinned these transitions.

According to Hedström and Wennberg (2017, p. 92), investigating mechanisms requires that we “specify the relevant types of actors, the type of activities they engage in, what propels them to behave the way they do, and how their behavior collectively brings about the macro outcomes to be explained.”

Moreover, process as an activity informed the empirical work in Paper IV. Process as activity was essential for explaining the different phases of development and the activities undertaken in each phase. Moreover, it was vital for understanding how these activities build up and, over time, start to inform the learning behaviors of new ventures.

Research suggests that in order to capture process as an activity, it is vital to adopt a prospective data collection approach (Langley et al., 2013). As such, prospective methods such as participant observation were used to capture individuals’ transactions during face-to-face meetings or as they engaged in task-related work. Through observation, it was possible to observe how those involved in performing a task were able to learn from performing a task, how they discussed the task, and how they noticed specific patterns that were collectively negotiated, leading to new possibilities that were ultimately transposed into the venture via routinizing behaviors.

Process as evolution

In studying process as evolution, a researcher seeks to explain how and why an entity changes or shifts over time, and the implications of these shifts (Langley et al., 2013). This approach typically demands a longitudinal research design where it is possible to observe changes in the specific entities of the study. The process-as-evolution approach was utilized in Paper III, where it was needed to capture noticeable shifts in compositional characteristics, such as the functional background of the venture team, and how these shifts characterized the way learning was transposed between members as a result of these shifts (Gioia, Corley, & Hamilton, 2013).

Overall, the benefits of undertaking a longitudinal process-based approach are twofold. First, it is possible to identify events and relate them to each other, and hence establish event- and process-based sequences, which is necessary for illuminating mechanisms. Second, it incorporates the critical role of time in explaining how entities, processes, and events evolve, by affording the researcher the ability to compare these changes at different points during the process. Researchers describe this process as “temporal bracketing” (Langley, 1999). See Table 3.2 for a summary of both approaches.

Table 3.2

Process-based thinking for studying entrepreneurial learning on multiple levels

	Process as activity	Process as evolution
Focus	How entities negotiate meaning and develop a shared understanding of activities or task-related work from which routines, systems, and operating procedures emerge over time	How entrepreneurial learning unfolds and shifts over time, illustrating the mechanisms that underpin these shifts
Research design	Longitudinal research design with retrospective and prospective data collection, e.g., interviews, documents, and observations of real-time transactions	Longitudinal research design with retrospective and prospective data collection from multiple sources: e.g., interviews, documents, emails
Analysis	Analysis of transactions and conversations, and their contribution to learning on multiple levels	Temporal bracketing and mapping of learning processes

A qualitative case-study approach

Given the intensity and time required to undertake a longitudinal process-based research design, it is essential to focus on just one or a few case studies (Yin, 2011). Case studies are necessary for capturing the complexities of a specific phenomenon in its real-life environment (Yin, 2009). They offer the chance to study a phenomenon temporally, thus generating longitudinal data, which is necessary for tracing processes as they unfold and for capturing mechanisms as they emerge (Miles & Huberman, 1994). Using a case-study approach is particularly important in this research, given the richness and density of data needed to construct an understanding of the mechanisms that contribute to the emergence of learning on multiple levels (Fachin et al., 2017). Case studies are commonly used for understanding learning in entrepreneurship studies. For instance, scholars in entrepreneurship have used single or multiple case studies to explore how entrepreneurial learning takes place in action (Jones & Macpherson, 2006; Pittaway, Missing, Hudson, & Maragh, 2009), through critical events (Cope & Watts, 2000), or as a self-reinforcing process (Ravasi & Turati, 2005).

Case studies are also suitable for capturing activities as they take place. As discussed above, following a process as an activity requires the opportunity to collect fine-grained data that reflects naturally occurring transactions—i.e., observing events face to face. In this way, case studies offer the opportunity to take part in a dialogical transaction, or what Fachin et al. (2017) termed “situated dialogical action research,” to create socially useful knowledge specific to the practices of individuals whose situations are being studied. Case-based research design can also make use of multiple cases, which allow the researcher to achieve more robustness in research outcomes and to perform analytical comparisons across cases (Stake, 2005).

Case-study selection

Case-study selection should not be random, but pursued through a more purposive process where the researcher seeks to increase validity and reliability of the data gathered to explain the phenomenon in question. Stake (2005) identifies some case-study sampling strategies that are salient for this research. These strategies include seeking the *intrinsic* case (one that offers interesting insights), the *instrumental* case (one that is theoretically driven and used to gain a broader appreciation of an issue or phenomenon), and *comparative* cases (two or more cases that rely on variability in context and consistency in process and outcomes).

Scholars concerned with methodological rigor often argue that case-study selection is not only necessary to establish that the case is suitable for answering a research question, but also to guarantee the credibility, confirmability, and transferability of research outcomes (Lincoln & Guba, 1985).

When selecting cases, I paid careful and sustained attention to the data accessibility each one would provide, making sure that access to multiple sources of data would facilitate triangulation. This was required principally to demonstrate how different sources of information converge, and together achieve trustworthiness and generalizability in research outcomes (Eisenhardt, 1989a). For instance, credibility can be achieved by selecting a case that allows access to different sources of data to allow triangulation. Triangulation requires spending more time in the field and using different methods of data collection, such as interviews, documents, emails, or observations. Through triangulation, it is possible to establish confirmability, which highlights that the results are backed up by data (Lincoln & Guba, 1985). Once credibility and confirmability are achieved, it is possible to determine whether results are transferable. However, and as discussed above, the aim is not to provide predictions or general laws. Therefore, transferability does not necessarily require the discovery of the general conditions under which a finding or a theory is valid; instead, it involves a knowledge transfer from one study to a specific new situation—that is, transferring findings from the researcher to the person who can make use of them (Miles et al., 2013).

This is a composite thesis consisting of four papers. The first is conceptual, while the other three are empirical, and build on case studies. Below, I will elaborate on the case selection criteria for each paper. I will provide a summary description of each of the case studies followed by two sections on data collection and data analysis. Where necessary, the reader will be directed to the appended papers to see examples of specific figures, such as data structures or tables expending additional empirical manifestations.

Paper II: the Shoptech case

Paper II builds on an instrumental single case study of a firm called *Shoptech* (a pseudonym). Shoptech is a technology-based venture specializing in the e-commerce domain. Since its inception in 2015, the venture has served many successful B2B and B2C projects, and is one of the few certified Shopify experts in Sweden. The venture grew from an initial trio (the founder and two programmers) to six people: four based in Sweden, and two in Vietnam. Two interns joined the venture during the study. The Shoptech case was utilized to explore how new ventures learn and channel individuals' experiences by routinizing behaviors. Exploring this emergent process demanded that I follow participants for long enough to detect how entrepreneurial learning was translated between the different levels of the organization. Only a single case study approach could provide such depth (Edmondson & McManus, 2007).

Shoptech was carefully selected with the help of training experts from Lund's University incubator "Venture Lab." The selection process was based on three criteria: (i) the venture is less than three years old; (ii) the venture is operating as a team; and (iii) the venture is actively undertaking entrepreneurial tasks. Whereas, in the literature, "young" ventures are identified as those less than 10 years old (Najmaei, 2018), choosing a venture that was less than three years old was crucial to ensure that it was informally outlined, with few or no routines to inform its performance. Choosing a venture operating as a team was critical for specifying mechanisms that underpinned the transmutation of learning from individuals to the organization. As explained above, investigating mechanisms requires that we identify the relevant types of actors, the type of activities they engage in, and the triggers that drive them to behave the way they do. Therefore, exploring a venture team was particularly important for exploring relevant mechanisms. Finally, emphasizing an entrepreneurial task was necessary to ensure that the performed activities were novel, and had not been transformed into a routine before empirical work began (Haynie et al., 2012).

Paper III: the Foodtech case

Paper III is based on a single case study designed to explore the mechanisms that facilitate or challenge the way individual streams of experience are transposed between individuals in the venture. The selected case firm, *Foodtech* (a pseudonym), was established in 2011 and was five years old at the time of the study. Initially, the venture comprised five members (three technical entrepreneurs and two business entrepreneurs) who formed the core members of the venture team. Later on, the venture grew to nine members, with two board members, a researcher, and an entrepreneur joining the venture.

The technical entrepreneurs behind Foodtech found a strong correlation between the inclusion of viscous fibers in cereal-based foods and blood-sugar response. Informed by this knowledge, the research team developed a new measurement technique in which gauging physiological viscosity, among other parameters, made it possible to predict and communicate how cereal-based foods affect consumers' blood-sugar response. The case was identified through industry experts in the food technology department at Lund University.

Foodtech embodied some of the unique characteristics of technology-based ventures that have been identified in the literature (Martin, 1994; Dougherty, 2001; König et al., 2018). Technology-based ventures typically seek business opportunities that emerge from disruptive technologies. To complement the knowledge required to operate these technologies, most technology-based ventures are started in teams. Whereas the founders of technology-based ventures often come from backgrounds in science or engineering (Almus & Nerlinger, 1999), they need to engage actors whose knowledge and skills are complementary (Ravasi & Turati, 2005).

The characteristics outlined above formed the critical criteria based on which Foodtech was selected. First, Foodtech is a venture run by a team, and that team comprises members with a technical and business background. Second, the team works on a disruptive technology that demands continuous learning and sharing of experiences among the venture members. Third, the team comprises members with diverse functional backgrounds. Together, these criteria offer an illuminating context for understanding how members with different functional backgrounds—despite their divergent worldviews (Dougherty, 1992)—interpret and integrate their learning into a shared understanding that informs coherent collective action. Finally, Foodtech provided unprecedented access to different sources of data, which allowed triangulation. Data sources included interviews, emails, and board-meeting minutes.

Paper IV: Multiple cases

Paper IV builds on multiple case studies to understand why new ventures adopt different learning behaviors, thus leading to ventures favoring exploration over exploitation when managing uncertainty and vice versa. Four case studies were chosen from a pool of 50 companies that are all members of the Water Innovation Network. To allow comparability among these cases, it was necessary to apply three main criteria: (i) ventures were all three to five years old, to ensure that they were at a comparable stage of development with respect to their learning efforts (see Petersen & Ahmad, 2007); (ii) ventures had filed at least one patent during their first years of establishment, to ensure that all were operating technologies that were comparable in complexity; and (iii) all were operating in a similar industry, to ensure

that they were facing the same dynamics. Below is a summary of each of the four cases.

Sprintech

Established in 2014, Sprintech produces a unique, safe, and efficient technology for water purification through UVC LED technology. The patented technology is entirely free of toxins such as mercury, and is vastly more energy-efficient compared to most other techniques on the market today. With a simple installation, customers of Sprintech eliminate the risk of legionella in showers and prevent exposure to other harmful bacteria and viruses from drinking water straight from the tap. The company produces diverse applications of their technology, and works closely with customers and trade partners. Sprintech has also incorporated their technology with other technologies, and explored a range of markets in Europe and Africa. The venture consists of five members, three of whom are core team members and two are employees.

Swetech

Established in 2015, Swetech is dedicated to developing innovative solutions to cleaning storm-water. The patented technology is a filter that absorbs a range of harmful substances, such as oils and heavy metals including copper, zinc, and mercury. Swetech offers different applications of their technology, thus targeting different market segments such as municipalities, factories, and homes. The venture works closely with customers and suppliers seeking to co-create different variations in their technology. They venture is also exploring new networks of customers in Poland, South Korea, and Africa. The venture consists of four members, of whom three are core team members and one an employee.

Systech

Established in 2015, Systech produces electrified plastic pipes that are designed to handle various kinds of sensitive and dangerous liquids. The patented technology can be adapted to meet varying physical environments, fluids, and temperatures. The voltage level and conductive properties of the pipes are tested to inhibit the growth of bacteria. As such, the company is developing electrified pipelines to serve different market segments. In the effort to commercialize the technology, the venture focuses more on developing existing knowledge, making use of specific alliances, and devoting most of their time, resources, and attention to securing the efficiency and reliability of technological outcomes. The venture consists of four members, of whom three are core team members and one an employee.

Biotech

Established in 2015, Biotech has a patented technology in the form of a reactor that generates ozone. The uniqueness of the technology resides in its ability to produce ozone from ambient air, even in extremely humid environments. The ozone is used for purification and disinfection in water treatment systems. In their effort to commercialize the technology, Biotech are exploiting specific networks, refining existing knowledge, and spending most of their time, resources, and attention on securing the efficiency and measuring the capacity of the technology. As such, the venture relies less on customer inputs in the development of their technology. The venture consists of four members: two core team members and two employees.

Table 3.3 provides a summary of how the selected cases and research design met the different criteria for trustworthiness.

Table 3.3
Summary of case selection criteria

	Paper II	Paper III	Paper IV
Confirmability	Case study identified through Venture Lab experts	Case identified through a snowball sampling through experts in the Food Technology department at Lund university, and theoretically grounded in literature on technology-based ventures	Cases identified from an initial pool of cases from the Water Innovation Network (WIN), and from a theoretical grounding in entrepreneurial learning and innovation literature
Transferability	Purposeful single case study	Intrinsic single case study	Multiple case studies
Credibility	Instrumental case selection within a purposeful group of newly established ventures	Intrinsic case selection with three periods of learning that form subcases within a single case	Instrumental case selection within purposeful group of companies at WIN

Data collection

To realize the aims of this thesis, a range of data collection methods were used, including interviews, emails, participant observations, and document analysis. The relevance of each of these methods is summarized in Table 3.4 and discussed with respect to each paper below.

Table 3.4
Data collection methods

Interviews	Participant observations	Emails; document analysis
Semi-structured interviews <ul style="list-style-type: none"> • Build a case narrative/timeline • Define participants' background • Specify actors, their activities, and the way they behave • Understand events, their sequence, and their relationships 	Weekly meetings <ul style="list-style-type: none"> • How venture members share and discuss task performance • How members develop a shared understanding and co-construct task-related work • How venture members develop shared mental models Training sessions <ul style="list-style-type: none"> • Capture how learning is shared and applied in the venture 	Emails <ul style="list-style-type: none"> • Understand how venture members share information among each other, and the type of information they share • Track changes in the type of information discussed Document analysis <ul style="list-style-type: none"> • Capture learning that has been routinized in the form of written routines, rules, or standard operating procedures

Paper II

The Shoptech case provided access to multiple data sources, mainly semi-structured interviews, participant observations, and document analysis. Eighteen in-depth interviews were conducted with all six venture members (see Table 3.5). Interviews were initially crucial for understanding the overall function of the venture, the background of each of the members, and the roles/activities and tasks they performed. Given the purpose of this study—to understand how individual streams of experience permeate into the organization—interview questions (see Appendix A) were designed to explore how experiences were transposed between individuals.

Table 3.5
Summary of the Shoptech venture members

Participants	Education	Interviews
Arthur , Project Manager and Founder (29yo male): Before starting Shoptech, Arthur worked as an intern in an IT consultancy firm for one year. He also worked in e-commerce for a longer period, selling online e.g. through eBay. He also worked at Jack and Jones (a Swedish clothing retail shop) as they outsourced their e-commerce activities to Vietnam.	Bachelor in international trade, Masters in entrepreneurship	4
Daniel , Digital Business Developer (26yo male): Daniel joined Shoptech in July 2017, as a digital project manager responsible for managing clients' e-commerce needs. Daniel is also in charge of developing detailed project plans and monitoring progress. He is the main contact person for clients. Daniel also communicates with the team of developers in Vietnam, assigning them specific tasks.	Bachelor in international management	5
Helena , Marketing Officer (23yo female): Helena has worked in web development and design and has two years' digital marketing experience in a startup in Copenhagen. At Shoptech, Helena determines marketing strategy and selects the initial online marketing channels used, such as LinkedIn, Twitter, and blogging.	Bachelor in development studies, Masters in innovation and spatial dynamics	1
Eric , Project Manager (23yo male): Eric handles customers, generates new business, and communicates ideas to the developers. He also responds to customer requests and answers some technical questions, based on knowledge acquired through experience.	Experienced technician	3
Philip , Web Developer (22yo male): Philip joined Shoptech in Jan 2015 as a web developer. He has strong experience in web development, specifically coding and developing e-commerce websites.	Bachelor in information technology	2
Tom , Web Developer (25yo male): Tom joined Shoptech in 2016 as a web developer. Like Philip, he has strong experience in web development, specifically coding and developing e-commerce websites.	Bachelor in information technology	2

For instance, participants were asked to elaborate on how they shared their experiences of performing a task, and precisely what they had discussed concerning task performance. Interview questions also probed how the team members co-constructed a task, and how they explored different ideas and working patterns and experimented with them until they found the most effective ones that could become generalized practices to be shared with everyone in the venture.

In addition to interviews, I also used participant observations. Observation was a vital source of information, as it provided real-time data about individual interactions and the different ways venture members connected with each other. I made 20 hours of observations in total, attending both weekly meetings and the training sessions for the new interns who joined the venture at a later stage.

Through observations, I was able to understand how venture members discussed task-related experiences and communicated the opportunities and obstacles associated with those experiences. For instance, observing weekly meetings was crucial for capturing how members of the venture team shared experiences of task-related performance, as well as how they discussed performance errors and explored

alternative possibilities for performing a task. The temporal dimension of this study was realized by following events as they unfolded, which was critical for capturing how discussions progressed from meeting to meeting, and how patterns recognized during one meeting were followed up in the next, thus developing best practices that were agreed upon and routinized to inform general practices in the venture.

My role in the observation process was peripheral, with no engagement in the ongoing conversations. Participants were informed that my objective was to create a more in-depth understanding of the group's overall activities and transactions, but were given no details on the precise purpose of the study. Before starting the observations, I needed to build rapport with the venture members, so I attended some social events arranged by Venture Lab so people could get used to my presence.

Finally, I used company documents, such as operations manuals and the intern guide, to demonstrate how different work-related patterns that were discussed during weekly meetings were encoded and stored in written format, thus becoming accessible to other members of the venture. For instance, the intern guide included important information about procedures for working with customers, maintaining a positive working atmosphere, and procedures related to handling customer complaints. Similarly, the operations manual included information about work-related standard operating procedures linked to delivering task-related work.

Paper III

As outlined above, the purpose of Paper III was to explore how entrepreneurial learning unfolds in the context of a team, demonstrating the mechanisms that facilitate or challenge the way individual streams of experience make the transition between team members. Capturing these transitions required multiple data collection methods, including interviews, emails, and minutes of board meetings. At one time or another, Foodtech had a total of nine members (see Table 3.6), but not all of them were members for the entire study period.

Table 3.6
Summary of the Foodtech venture members

Participants	Interviews
Technical entrepreneurs	
Catherin (73yo female) is a professor of food engineering. She has a background in food and bioscience. She previously worked at Nestlé's research center in Switzerland and was involved in food-based consultancy and a creative food business. She is an owner and a member of the founding team.	5
Elizabeth (45yo female) is an associate professor of applied food science. Her research focuses on optimizing blood-sugar regulation in the body after the ingestion of carbohydrate-rich foods. She has more than 15 years' experience in implementing meal studies. She is an owner and a member of the founding team.	5
Marta (43yo female) is an associate professor of food technology. She specializes in the properties of starch and the physiochemical properties of starch-rich systems. She is an owner and a member of the founding team.	1
Jeni (28yo female) is a researcher who joined Foodtech in February 2016 to test the recipe and serve as a product developer.	1
Business entrepreneurs	
Carmen (55yo female) is a board representative and a member of a holding company that invested in Foodtech. With a background as a CEO and founder of several bioengineering companies, Carmen has more than 20 years' experience in business development and raising venture capital. Carmen joined Foodtech in June 2013.	1
Oloff (75yo male) is a board member and representative of another holding company that invested in Foodtech. He is a medical practitioner, and was previously a consultant physician and clinical doctor. Oloff joined Foodtech in June 2013.	1
Leif (53yo male) is an entrepreneur with many years' experience in business development, fundraising, and new venture creation. Leif joined Foodtech in October 2010.	3
Tobias (63yo male) joined Foodtech in October 2012 as a managing director and consultant. He has extensive experience in the baking industry.	2
Christopher (29yo male) joined Foodtech in 2014 as CEO. He holds a degree in entrepreneurship and was closely involved in commercializing the technology.	1
Documents and emails	
Board-meeting minutes, end-of-year reports, presentations, etc.	62 docs
Emails October 2011–November 2017	990 emails

To capture how experiences were channeled over different time periods, I had to interview all those who were engaged in the venture from start to finish. Interview questions (see Appendix B) were used to generate information about the participants' background, including their education, experience, and the role they played in the venture. Interviews also helped to reveal the story behind the invention, the market, and the working relationship between the venture members.

Email formed another critical source of data. Emails are said to provide an essential context for non-coercive, anti-hierarchical dialogue, and constitute “an ideal speech situation, free of internal or external pressure and characterized by equality of opportunity and reciprocity in roles assumed by participants” (Boshier, 1990, p. 51).

Access to email conversations between technical entrepreneurs, business entrepreneurs, and board members was granted. Around 990 emails were reviewed, in which it was possible to track the early discussion on venture development as well as discussions related to technology development that took place between the technical and business entrepreneurs. Emails were essential for providing a temporal perspective on the changes in the type of information the venture team pursued at different time intervals. Therefore, emails provided an essential source of information that was necessary for building the case timeline and for revealing details on the disputes that took place between technical and business entrepreneurs that were highlighted in the interviews. As such, emails were a vital source of corroboration.

Finally, I reviewed the minutes of 62 board meetings from March 2011 to June 2017. These documents were critical for understanding events and what had been discussed at board level over the entire period. The board-meeting minutes followed a specific structure, thus facilitating cross-meeting comparisons. For instance, each set of minutes included information about the participants involved, the outcomes of previous board meetings, the strategy discussed, and the planned agenda for the next meeting. Those sub-headings were vital for generating an overall understanding of what had been discussed, the information and experiences that had been shared, and the network of people utilized to develop the technical or business aspect of the venture. Like emails, board-meeting minutes were time-sensitive, and therefore provided a temporal perspective on the case.

Paper IV

Two data collection sources were used in this comparative study: interviews and company documents. Interviews were conducted from May 2018 to December 2018 with the venture members of four technology-based ventures. In all four of the cases, interviews were conducted with the inventor(s) of the technology, the engineers working to develop it, and the entrepreneurs aiming to commercialize it (see Table 3.7). Interview questions (see Appendix C) were designed to cover three phases. Phase 1 was designed to capture the early technology development phase for each of the cases, the number of patents filed, and the functional background of the venture members involved. In Phase 2, interview questions were focused on attaining a deeper understanding of the different events, patterns, and processes related to the innovation process. In Phase 3, interview questions were concerned with the learning behaviors of the studied cases, and therefore emphasized how ventures engaged in activities related to the technical and commercial development of their technology.

Table 3.7

Summary of the interviewed participants of the multi-case study

Case	Participants	Background	Role	Phase one (March-April 2018)	Phase two (May-Aug 2018)	Phase three (Sept-Dec 2018)
Sprintech	Participant A	Electrical engineering	Partner, COO	Participant A	Participant A	Participant A
	Participant B	Business and engineering	CEO	Participant B		
	Participant C	Water engineering	Partner		Participant C	
	Participant D	Water engineering	Partner			Participant D
	Participant E	Business	Financial officer		Participant E	
Swetech	Participant A	Entrepreneurship	Partner, CEO	Participant A		Participant A
	Participant B	Water engineering	Partner			Participant B
	Participant C	Finance, sales	CFO		Participant C	
	Participant D	Engineering	Technician		Participant D	
Systech	Participant A	Plastic manufacturing	Partner, CEO	Participant A		Participant A
	Participant B	Plastic manufacturing	Partner		Participant B	
	Participant C	Engineering	Partner			Participant C
	Participant D	Engineering	Technical developer		Participant D	
Biotech	Participant A	Entrepreneurship	Partner	Participant A		
	Participant B	Industrial engineering	Partner		Participant B	
	Participant C	Business, marketing	Marketing officer		Participant C	
	Participant D	Business, economics	Business development manager			Participant D

Online and physical company documents were reviewed, including company websites, technical information sheets, product brochures, and PowerPoint presentations. These data sources provided an official ongoing record of each company's activities. They were particularly helpful in understanding the progress of the technology, market exploration activities, and potential customers. They were also needed to corroborate results obtained through interviews.

Data analysis

The procedure for analyzing the data in this thesis followed a systematic process (Yin, 2011). The first step was to transcribe the empirically captured data into a Word document or Nvivo. At this point, reading through the empirical data, making notes, and assigning initial codes and categories was important for understanding the background of each of the studied cases, as well as the actors involved and the

activities they performed (Ryan & Bernard, 2003). As such, the first step in the analysis process provided a thorough description of the experiences observed (Wynn & Williams, 2012).

At this stage, we had to identify and label each of the emerging categories. Assigning such category labels is essential to achieve a level of abstraction that supports a description as close as possible to what has actually occurred—as opposed to what participants *think* has occurred. We also needed to develop working definitions for critical categories, and sketch out the relationships between them—e.g., how one category leads to another. Establishing relationships was instrumental in establishing a process perspective on the actual events that took place. As Langley (1999) suggests, process data consists of different categories that represent events, activities, and choices, and their sequencing over time. Hence, when conducting process studies, it is essential to demonstrate how these categories evolve and change over time.

The second step in the analysis process was retroduction. As discussed by Bhaskar (1979, p. 32), “retroduction moves from the manifest phenomena of social life as conceptualized in the experience of the social agents concerned, to the essential relations that necessitate them.” Through retroduction, we could effect the transition from the empirical experiences and descriptions of an unexplained event to a more profound level where we could identify the underlying mechanisms that might explain the pre-identified relationships between categories. At this stage, we had to rely on one or more theories to achieve a theory-laden explanation of the social event under study.

Mechanisms are challenging to observe directly. At the third stage, therefore, we had to examine to what extent the effects of the proposed mechanism were corroborated across multiple data sources. At this stage, data triangulation was critical in building on different sources in order to limit any bias. See Table 3.8 for the guidelines we followed for the data analysis process.

Table 3.8
Guidelines for data analysis

Step 1 (Empirical analysis)	Step 2 (Retroduction)	Step 3 (Corroboration)
<ul style="list-style-type: none"> • Transcribe data • Develop categories • Provide initial names and working definitions for categories • Understand how categories are related 	<ul style="list-style-type: none"> • Identify mechanisms • Use one or multiple theories to explain mechanisms 	<ul style="list-style-type: none"> • Use multiple approaches to explain causal relations • Data triangulation

Below, I describe the data analysis process for each of the appended papers, offering examples from each one as required. Table 3.9 provides a summary of the analysis process for each paper.

Paper II

As noted above, Paper II builds on three data sources: interviews, observations, and documents. The aim of analyzing the different sources was to capture the mechanisms through which individual streams of experience permeate into the organization. To do so, I had to understand the generative mechanisms underlying how individuals share, interpret, and co-construct experiences, and how they routinized those experiences into venture-wide behaviors. In line with the data analysis process detailed in Table 3.8, the initial step was to explore the empirical domain and identify the main actors involved in the case, the type of activities they performed, and the underlying drivers that explained their behavior. The empirical domain provided the first-order concepts, which were then abstracted into second-order categories. To explore mechanisms and observe their effects, it was necessary to factor temporality into the analysis process, exploring how these categories evolved. I captured their evolution by collecting data at different time intervals, thus seeking to document changes in these categories and then propose mechanisms that might have caused these changes. For instance, attending a weekly meeting in Shoptech was one way to track how a category such as “purposeful sharing and dialogue” evolved into team activity, and how an underlying mechanism such as “rotating task work” could explain this shift (see Figure 1, Paper II).

I needed to corroborate these results in order to exclude other possible explanations for the phenomena observed. Therefore, analyzing data such as documents and interviews, and aligning them with the observations, was crucial for uncovering further manifestations of the underlying mechanisms that contributed to how individual streams of experience evolved into the organization.

Paper III

As discussed above, Paper III identifies the socio-cognitive mechanisms that underlie how learning unfolds in the context of a team, demonstrating how individual streams of experience are coordinated and integrated between members. The main focus is on how this process unfolds with respect to changes in the functional background of the team members. To identify these mechanisms, the data analysis process moved from a first-order coding category towards a more abstract level (see Figure 2 in Paper III). Initially, we constructed a case narrative describing critical events, based on interviews, emails, and board-meeting minutes. We focused on the time of occurrence, the people involved, and the excerpts that illustrated each event. This led to the construction of a timeline, which allowed us to divide the case into subcases, each representing a period (refer to Figure 1 in Paper III). This process of temporal bracketing was necessary to analyze the events and activities that contributed to how learning unfolded in each period with respect to the functional background of the members involved. Through temporal bracketing, we could track

different learning patterns and observe essential shifts in the underlying mechanisms that could explain how experiences were transposed between individuals in each period. To explain these mechanisms, our analysis drew upon multiple theoretical frameworks. For instance, theories such as social identity theory (Lau & Murnighan, 1998) grouping theory (Tajfel & Turner, 1986), and research on attitudes (Wiklund et al., 2003) were used to explain our proposed mechanisms. Finally, we demonstrated how these results were corroborated across multiple data sources by triangulating results from interviews, board-meeting minutes, and emails.

Paper IV

The purpose of Paper IV was to develop an overall understanding of how new ventures develop their learning behaviors, illuminating the underlying factors that shape these behaviors. In this study, each case was analyzed separately before comparing the emerging results. Data obtained from interviews and documents were initially transcribed and coded into Atlas ti. This process generated 341 codes across all four cases. At this initial stage, it was possible to identify important information about the technology, the actors involved, the activities they engaged in, and more about the background of each venture. The next step was to identify the learning behaviors of each venture, and the mechanisms that underpinned these behaviors. At this stage, I used theories concerning entrepreneurial action (McMullen & Shepherd, 2006), opportunity recognition (Shane & Venkataraman, 2000), and uncertainty (Milliken, 1987) to construct relationships and explain possible mechanisms.

To achieve empirical stringency across the data—in order to support cross-case comparisons—emerging mechanisms were tabulated and reinforced with supplementary representative quotes (See Appendix in Paper IV).

Table 3.9
Data analysis process for the appended papers

	Paper II	Paper III	Paper IV
Confirmability	Triangulation among multiple sources of data (e.g., interviews, observations, and documents).	Triangulation of data from multiple sources (e.g., interviews, emails, board-meeting minutes). Data analyses verified by interviewees	Triangulation among multiple sources of data (e.g., interviews, documents, and event-based observations).
Transferability	Extensive data analysis	Extensive data analysis with supplementary tables demonstrating reoccurring themes (see Table 2, Paper III)	Across-case data analysis in addition to supplementary tables demonstrating reoccurring themes (see Table 3, Paper IV)
Credibility	Data analysis verified by interviewees through debriefing	Data analysis verified by interviewees through debriefing (including timeline verification meeting) (see Figure 1, Paper III).	Data analysis verified by interviewees through debriefing

Reflection on methodological choices

The aim of this research was to understand the entrepreneurial learning process through which new ventures routinize behaviors. I approached this aim by exploring entrepreneurial learning as an experiential multilevel process: demonstrating the mechanisms that underpinned the way in which learning at the individual level was transposed into the organization. This section provides a critical reflection on the challenges encountered during the research process, and highlights how these challenges might have influenced the progress of the research and its emerging results.

One of the main challenges I encountered was how to conceptualize organization-level learning. This challenge is mainly methodological, since it is difficult to draw a clear boundary between the organization and the members who run it. This is particularly salient in newly developed ventures, which are typically started by one or a few members, who largely constitute the venture. This begs the question: Where does individual-level learning end, and organization-level learning begin?

To overcome this challenge, I needed to define the boundaries between these two levels. Therefore, Chapter 1 argues that organization-level learning is not merely the sum of individual-level learning, but rather an emergent process in which organizations acquire, assimilate, and institutionalize knowledge in the form of routines (Franco & Haase, 2009). Individual-level learning, however, does form a critical input to organizational-level learning, since it creates the basis for personal streams of experience that subsequently permeate into the organization (Argyris & Schön, 1996). While this conceptualization resolved and defined the boundaries between these two levels, it posed a methodological challenge in terms of how to capture learning as an emergent multilevel process that evolves from individuals to the organization.

As argued earlier, capturing learning as an emergent multilevel phenomenon requires a longitudinal, process-based methodology. Moreover, it demands rich data collection methods from multiple data sources. Gaining longitudinal access to multiple data sources was indeed a significant challenge. The new ventures that were approached were almost overwhelmed by the struggle to impose stability and order on their young businesses. Therefore, they had less time to participate in research. As such, attaining access to some cases was difficult. For instance, in Paper III, the aim was to conduct research on multiple case studies. However, and due to the depth of data required (e.g., access to board meeting minutes and emails), many ventures would only grant access to interviews, and nothing further. Therefore, I had to settle for a single case. Whereas this case ultimately yielded many illuminating insights that I might never have discovered if I were to conduct the same study on multiple cases, incorporating more cases would have conferred greater generalizability on the findings.

Another problem faced when seeking to capture learning at the organizational level was to identify, empirically, what constitutes a routinized behavior. Determining what constitutes a routinized behavior as opposed to other types of behavior (e.g., improvised behaviors) was critical for differentiating behaviors that represent organization-level learning from those that represent individual practices. Identifying routinized behaviors that represent organizational learning demanded much corroboration across multiple data sources. For instance, when I observed the routinization of an experience, I constantly needed to triangulate these observations with follow-up interviews and documents to further validate that the observed experience was indeed emerging into a routine.

Concerning the choice of methodology, this thesis builds on case studies as a primary source of empirics. Case studies constitute a good source for gaining “thick data” (Clifford, 1973). However, they also come with some disadvantages. On the one hand, and given the longitudinal approach adopted, I had to immerse myself in these cases and build a strong relationship with participants to gain deeper access. However, too much immersion may run the risk of the observer “going native,” thus losing the advantage of an outsider’s richer perspectives on the case at hand. To safeguard against this problem, I always tried to keep a distance, so as to retain my role as a researcher. Moreover, when analyzing data, I frequently benefited from the friendly reviews provided by colleagues and supervisors, which provided a “sense check” on my outcomes for the question I was trying to answer.

Another challenge with case studies is the potential for errors of memory or judgment in the way individuals reconstruct the past. This challenge was mainly encountered in the case of Foodtech (Paper III), where technical and business entrepreneurs each provided different perspectives on the emerging challenge. When considering various aspects of their lives, people tend to focus on issues that they find most important, which leaves room to form a prejudice. Due to these prejudices, it was necessary to move beyond the empirical domain and seek to determine the underlying mechanisms that explained why and how these complexities arose. Moreover, and instead of relying on inferences from a single entity to explain a social event (in this case, how learning unfolded between individuals in the context of the team), it was necessary to establish connections between the different entities involved and explain how these entities and the social events were causally intertwined.

Finally, and concerning the selected cases, the research drew on results from technology-based ventures that took part in a specific entrepreneurial ecosystem (e.g., incubator/network). The manner in which a specific ecosystem might impinge on emerging research outcomes merits further consideration. For instance, the Shoptech case was drawn from an incubator. An incubator context offers many advantages to its member ventures, which may facilitate successful leaps in their development and accelerate their learning compared to ventures operating on their own. Shoptech exhibited intensive efforts towards learning and routinizing

behaviors, which its location within an incubator might have reinforced. Research suggests that one of the critical benefits of incubators is that they allow new ventures to focus (Bruneel et al., 2012). They provide infrastructure and the necessary coaching and guidance, reducing the burden on new ventures in terms of the administration and infrastructure side of getting their business up and running. Thus, ventures can devote more time and attention to developing and stabilizing their business. Moreover, an incubator context offers communal spaces and plentiful opportunities to interact and communicate. This open setting allows members to create a dialogical space and get involved in the interpersonal sharing and dialogue that form the primary grounds on which learning emerges before being translated across the venture.

Research ethics

Given the deep access to data provided in this research, several ethical considerations had to be addressed. Access to cases was one of the main issues; it was necessary to obtain the consent of those participating, and make sure that they understood what participation would involve. As part of asking for consent, all participants were given a summary of (i) the research topic, (ii) the duration of the research, (iii) the type of resources needed, and (iv) and what would be expected of them as participants. Consent was usually obtained in writing, by email—although some participants were happy to give their consent verbally. It was made clear to all participants that they could withdraw their consent at any time, for any reason. As such, verbal consent was renewed when more time was needed in the field, or if new sources of data were needed.

Moreover, all participants were assured of written and verbal confidentiality before data collection began. This included (i) nondisclosure of information, (ii) obfuscation of individual and company names, and (iii) storage of information during and after the research. Some participants requested a written confidentiality agreement, particularly those who were providing access to emails and corporate documents (e.g., Foodtech and Shoptech). Concerning nondisclosure of information, the agreement included clauses regarding personal data, stipulating that the researcher to whom confidential information is disclosed agrees to keep such information confidential and not to disclose or discuss such data with a third party. On obfuscation of names, all individuals and companies were given a pseudonym to ensure privacy and ensure that statements representing a venture or a person could not easily be associated with them. Finally, and concerning storage of data, transcripts of interviews or observations were coded and kept separately from any identifiable content (i.e., list of names, numbers, etc.). Moreover, all printed documents that were provided by participants, such as brochures, board-meeting

documents, or product information sheets, were kept in a securely locked cabinet. Similarly, digital data such as transcription files and audio recordings were all stored in an encrypted format. Finally, ethical considerations were also given to co-authorship: All authors who contributed to the documentation, analysis, or writing of a specific part of this thesis were acknowledged as co-authors or cited where needed.

4. Summary of appended papers

This chapter presents a summary of the four appended papers that constitute the empirical part of this thesis, providing a brief introduction to the purpose, theory and methods, and findings of each one.

Paper I

Title

Entrepreneurial learning and innovation: the critical role of team-level learning for the evolution of innovation capabilities in technology-based ventures

Purpose

The study develops a theoretical model that illuminates entrepreneurial learning as an experiential multilevel process, demonstrating how personal streams of experience become institutionalized in the venture via interaction, group conversation, and dialogue. The model provides novel insights into the critical role of the team in bridging the individual and organizational levels of learning.

Theory and methods

The conceptual study builds on the 4I organizational learning framework of Crossan et al. (1999) as an overarching theoretical structure to facilitate the understanding of entrepreneurial learning as an experiential multilevel process. Embedded in this logic, the study synthesizes literature on team learning to examine how learning processes at the venture-team level connect the individual and organizational levels of learning.

Findings

The study demonstrates that team learning processes have significant implications for how new ventures continue to routinize the behaviors that underpin their capabilities to innovate. The conceptual analyses contribute to the overall purpose of this thesis by demonstrating how technology-based ventures develop and channel

experiences, which supports their capability to innovate. The study demonstrates three ways in which team learning processes play a crucial role in the evolution of innovation capabilities. First, team learning processes have “basic” components—mainly sharing, co-construction, and constructing conflict. These components are instrumental for establishing a dialogical space that facilitates the development of shared mental models that promote understanding and the taking of coordinated action. Second, team learning processes include “facilitating” components, mainly team activity, boundary-crossing, and team reflexivity. These components provide context and focus for the behavioral patterns, which determine how team members begin to coordinate action. Third, the theorizing in this study discusses “preservative” team learning processes, mainly storage and retrieval, as being essential processes for developing stability in the cognitions and actions of organizational members that lead to routinized behaviors over time.

Paper II

Title

From individuals to the organization: a transactive memory systems perspective on multilevel entrepreneurial learning

Purpose

The paper builds on the learning processes proposed in Paper I and develops a process model that details generative mechanisms that contribute to the emergence of entrepreneurial learning on multiple levels. The model explains the process of routinizing behaviors, thus specifying how individual streams of experience become embedded in the organization in the form of routines, systems, and procedures.

Theory and methods

The study builds on the transactive memory systems (TMSs) framework to explain how experiences are transposed across different levels: individuals, transactions, and structures. The paper demonstrates the interactions that take place between individuals, transactions, and structures, illuminating how each one contributes to the overall understanding of entrepreneurial learning as an experiential multilevel phenomenon. The study employs a single-case methodology, building on 18 in-depth semi-structured interviews, 20 hours of non-participative observations, and internal company documents.

Findings

The process model provides a deeper understanding of the learning process through which individual streams of experience are transposed into the organization. The

paper demonstrates how venture members establish social cognition, consisting of memory structures and transactive processes that define the existence, location, and form of knowledge and experience in the group. The paper illuminates how such memory becomes the foundation on which members develop their coordinated action and engage in the co-construction of tasks—which, over time, become routinized behaviors that inform venture-wide action.

Paper III

Title

Dysfunctional diversity: how entrepreneurial learning unfolds in functionally heterogeneous teams

Purpose

Learning at the venture-team level constitutes an essential element in how learning is transposed into the venture. However, learning in a team context can be challenging, particularly when members come from functionally heterogeneous backgrounds. Therefore, this paper explores how learning unfolds in a team context, demonstrating how certain socio-cognitive mechanisms can determine the way individual streams of experience are coordinated and integrated between members.

Theory and methods

The paper borrows from social identity theory to explain how members from diverse functional backgrounds can form subgroups in which emotional and task-related conflict can arise, which could prevent experiences from permeating between the subgroups. The study builds on a single case study, collecting rich longitudinal data from 990 internal emails, 62 sets of board-meeting minutes, and 20 retrospective interviews with all team members.

Findings

The results of this study suggest that learning in a venture-team context can be subject to socio-cognitive mechanisms that could either help or hinder the way personalized streams of experience are channeled between venture team members. The findings show that socio-cognitive mechanisms such as faultlines and attributions of failure are commonly activated in teams that are functionally heterogeneous, which could influence how learning unfolds in that context. In so doing, the study advances the understanding of entrepreneurial learning as a dynamic process that encompasses socio-cognitive processes through which members can reject or assimilate new information.

Paper IV

Title

Unpacking entrepreneurial learning: how prior related experience and uncertainty affect learning behaviors

Purpose

The paper aims to elaborate an overall understanding of how new ventures develop their learning behaviors, illustrating the underlying factors that shape those behaviors. The paper explores the development phases of new ventures, highlighting the interplay between prior related experience and uncertainty as two critical factors that moderate how new ventures routinize behaviors and continue to learn.

Theory and methods

The study integrates research on entrepreneurial learning, experience, and uncertainty to explain learning behaviors in new ventures. The study applies a multi case-study methodology, building on 21 in-depth semi-structured interviews and internal documents to compare the learning behaviors and their underlying determinants in four technology-based ventures operating in the water innovation sector.

Findings

Evidence from the study illuminates that variations in learning behaviors are embedded in the interplay between prior related experience and new ventures' judgement of uncertainty. The study demonstrates how these constructs are interrelated, and how they trigger varying degrees of entrepreneurial proactivity and commitment among new ventures that, over time, influence how they continue to learn and routinize behaviors.

5. Discussion

This chapter returns to the research questions and discusses the findings of the appended papers in the light of previous research. The chapter also offers an integrative model that explains entrepreneurial learning as an experiential multilevel process, illuminating the mechanisms and processes that underlie that process.

Returning to the research questions

This research aimed at developing a theoretical model that enhances the overall understanding of entrepreneurial learning as a process by which personalized streams of experience become routinized and embedded in venture-wide behaviors. To realize this aim, the research explored entrepreneurial learning as an experiential multilevel process. The component studies of this thesis addressed three critical questions:

SRQ1: How do individual streams of experience become embedded in the venture?

SRQ2: What mechanisms in the entrepreneurial learning process facilitate or challenge the way individual streams of experience permeate between individuals in the venture?

SRQ3: What role does the interplay between prior related experience and uncertainty play in determining new ventures' learning behaviors?

This chapter offers a synthesized model that integrates these questions into an overall discussion that advances the understanding of entrepreneurial learning as an experiential multilevel process, illuminating how new ventures routinize behaviors in that process (see Figure 5.1).

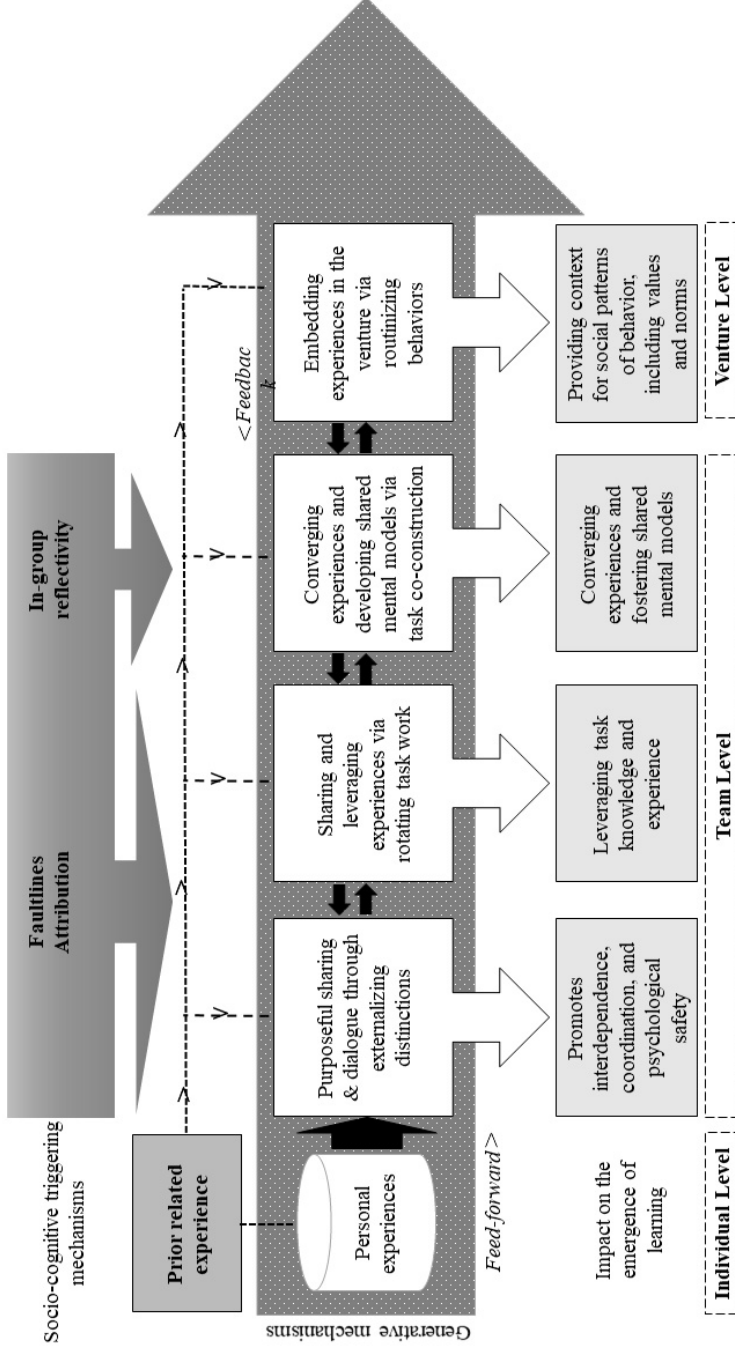


Figure 5.1:
A synthesized model of entrepreneurial learning

The model makes several contributions. First, it shows how personal streams of experience are transposed into the organization, by highlighting generative mechanisms and their underlying learning processes that operate at each level in the learning process. Second, the model stresses the social aspect of entrepreneurial learning, suggesting that learning is embedded in patterned activities that are social, dynamic, and recursive. Such patterned activities can be subject to socio-cognitive triggering mechanisms that influence whether individuals reject or assimilate new information. The model also demonstrates where and at which level in the learning process these socio-cognitive mechanisms affect the way experiences permeate between members. Third, and finally, the model highlights how the interplay between prior related experience and uncertainty can define and shape patterns of thoughts, language, and actions, which in turn influence how new ventures continue to routinize behaviors.

How do individual streams of experience permeate into the venture?

As noted, new ventures typically rely on the experience of managers and staff members to solicit customer information, seek feedback, experiment, and react to market opportunities (Edmondson, 1999; Flatten et al., 2015). Over the long term, however, this is not enough to support a sustainable venture that can consistently create new products, services, or processes. Instead, new ventures must build productive learning processes so that experiences can be routinized and embedded in venture-wide behaviors. Routinizing behaviors is necessary for coordinating the skills and cognitions of organizational members, and is a critical step for new ventures to continuously interpret and serve new market demands (Cohen & Bacdayan, 1994; Benner & Tushman, 2003).

Given the ever-changing demands of knowledge-intensive sectors, technology-based ventures must continually routinize different behaviors to remain agile and successful (Lubik & Garnsey, 2016). For instance, rapid changes in technologies typically demand experimentation in search of greater variation and novelty (March, 1991). Such demands call for “routinizing explorative behaviors” that foster experimentation and discovery (He & Wong, 2004). Alternatively, technology-based ventures may need to incorporate incremental changes to existing procedures or technology features, which call for “routinizing exploitative behaviors” that favor efficiency and productivity (Smith & Tushman, 2005).

The balance between explorative vs. exploitative behaviors can characterize entrepreneurial learning in new ventures—such as the pattern of activities and learning processes undertaken by venture members (Chen & Katila, 2008). Existing literature highlights conflicting task demands and firm design requirements to

explain how organizations tend to choose between exploration and exploitation (Tushman & O'Reilly, 1996; Chang & Hughes, 2012). However, we know less about how these choices are embedded in learning processes that span multiple organizational levels (Crossan et al., 1999).

As demonstrated in Figure 5.1, entrepreneurial learning as an experiential multilevel process starts with personal experience at the individual level, and ends with it being transposed into the organization in the form of routinized behaviors. In this experiential multilevel process, individuals at the leading edge of the learning system transact and converge over specific task-related experiences. Over time, these experiences “feed forward” (represented by the right-pointing arrows in Figure 5.1) and evolve into a routinized pattern of behaviors that allows the new venture to capture and benefit from these experiences and stabilize the way it operates and develops products, services, and processes (Feldman & Pentland, 2003). At the same time, routinized patterns of behaviors could also “feed back” (represented by a left-pointing arrow in Figure 5.1) in the form of routines, systems, or procedures that determine how members will collaborate and coordinate action in future tasks (Lewis, 2005; Kozlowski, 2012; Crossan *et al.*, 1999).

For these feed-forward and feedback processes to take place, new ventures must identify mechanisms and learning processes to channel individuals' experiences and insights into the emerging organization through transaction. According to Ostroff, Kinicki, and Muhammad (2012), individuals constitute the “raw material” of emergence, since they embody the cognitions, affect, perceptions, and mental representations that permeate through the organization. A transaction symbolizes the process of emergence—i.e., how individual experiences are shared “through communication and information exchange, sharing of ideas, exchanging work products and other forms of interaction among employees” (p. 660).

Table 5.1
Generative and triggering mechanisms and their underlying learning processes

Generative mechanism	Learning processes	Triggering mechanisms	Impact on the emergence of learning	Level of learning	Learning direction
Externalizing distinctions	Purposeful sharing and dialogue	Socio-cognitive e.g., faultlines, attribution, in-group reflectivity	Interdependence, coordination, and psychological safety	Venture team	Feed-forward
Rotating task work	Team activity Learning by doing Learning through observing others		Leveraging task knowledge and experience	Venture team	Feed-forward
Co-construction	Drawing patterns Constructive conflict Coordinating action through mutual adjustment		Converging experiences and fostering shared mental models	Venture team	Feed-forward
Routinizing behaviors	Coding/storing and sharing practices Drawing analogies	Prior related experience	Provide context for social transactions, values and norms	Venture-level	Feed-forward and feedback

One of the main contributions of the synthesized model is to illustrate the mechanisms and their underlying processes through which experiences are channeled into the organization. Table 5.1 details each mechanism and its underlying learning process, and how these influence the emergence of learning. The table shows the level at which the mechanism takes place, as well as the direction it takes (i.e., feed-forward or feedback).

Purposeful sharing and dialogue via externalizing distinctions

Entrepreneurial learning is first channeled when venture members begin to share personal experiences with their colleagues. Personal experiences typically provide individuals with knowledge and reasoning in a particular domain, which form the basis on which they develop insights, identify patterns, and act and behave (Politis, 2008). However, these experiences are subjective and intuitive, and often remain within individuals' preconscious (Crossan et al., 1999). Therefore, moving from the preconscious stage and explaining these insights and patterns to other members in the organization requires discussion with those other members. Discussion demands that individuals go from the preverbal stage, where experiences are personal and tacit, into a stage where experiences are verbalized and made explicit (Brockman, 2013). One critical mechanism that contributes to this is *externalizing distinctions*. This mechanism builds on individuals' ability to exchange, clarify, and interpret specific task-related insights and experience, based on processes of *purposeful sharing and dialogue*. According to Crossan et al., (1999) interpersonal sharing and dialogue are fundamental processes that foster the transaction of experiences between venture members. Literature has commonly posited that such processes are necessary for knowledge integration (e.g., Decuyper, Dochy, & Van den Bossche, 2010; Wilson et al., 2007). However, most studies have taken a broad view on interpersonal sharing and dialogue, emphasizing their transactive component without specifying how they contribute to knowledge transfer. Working definitions include:

- A verbal interchange of thoughts and ideas (e.g., West, 2007)
- A process by which new knowledge, routines, or behaviors become distributed among members (e.g., Wilson, Goodman, & Cronin, 2007)
- The transmission of information, ideas, emotions, and skills by using symbols, words, and pictures (e.g., Altman & Iles, 1998, Edmondson, 2002)

These definitions regard interpersonal sharing and dialogue as the main conduits for knowledge transmission. However, and with respect to the findings in this research, not all interpersonal sharing and dialogue efforts are necessarily conducive to learning and knowledge transfer. Individuals might communicate in a certain way without establishing or building on the information exchanged (Boer, 2005). Therefore, not all conversational styles are equally effective for developing a shared

understanding or collective mind (Crossan et al. 1999). Dialogue is “a discipline of collective thinking and inquiry” (Isaacs, 1993, p. 25). Hence, dialogue must convey a *purposeful* message and a deep interconnected meaning if it is to contribute to the emergence of learning and its transmission between individuals.

Observations from the Shoptech case (Paper II) illuminated this point. Only a specific and “purposeful” subset of “experiences” contributed to the channeling of knowledge across individuals. Members of the Shoptech team engaged in interpersonal sharing and dialogue as a type of “introspection” where they externalized specific skills, insights, perceptions, and framing of task-related experiences. In doing so, they were able to form task-member associations whereby they matched members with particular knowledge to specific task requirements. In this way, “externalizing distinctions” allowed individuals to recognize others’ more “abstract” experience, which clarified knowledge gaps or possible dependencies and promoted a shared cognitive view of how to divide work. In this way, externalizing distinctions is a necessary first step for supporting interdependence and coordinated action that contribute to the transference of knowledge across individuals.

However, externalizing distinctions could also be a challenging phase for multilevel learning to materialize. The nature and quality of social interactions that begin to develop during this stage may impose specific opportunities and demands for entrepreneurial learning. Results from the Foodtech case (Paper III) demonstrate that social interactions at this particular stage of the learning process can be subject to *socio-cognitive mechanisms* that may help or hinder sharing and dialogue (represented by the downward pointing arrow in Figure 5.1). These mechanisms are likely to emerge among functionally heterogeneous teams—i.e., those where members share diverse functional knowledge and expertise. Since social interactions are a necessary precursor to multilevel learning, the quality of these interactions will determine the transmutation of learning from individuals to the organization. Moving from individuals’ intuition requires interpretation and integration at the venture-team level (Crossan & Berdrow, 2003). However, individuals who interact could bring different judgments and interpretations to an event or situation, which they typically derive from prior experience (Dougherty, 1992). According to Sardana and Scott-Kemmis (2010), individuals’ prior experience, along with their cognitive frameworks, routines, and heuristics, shape their judgement and framing of situations.

The results in Paper III show that differences in perceptions and framing of a situation could potentially prevent individuals from leveraging the experiences available in the team. Observations indicated that at the outset, when the Foodtech team was heterogeneous, understanding and perceptions of the business diverged sharply. For technical entrepreneurs, with their scientific backgrounds, their framing of Foodtech’s viability was entirely centered on the product and whether it could be scientifically proven. Business entrepreneurs, on the other hand, were solely concerned with whether customers would judge the product as useful. These

contrasts fed into differences of opinion over product development and offering, which in turn divided the team into two subgroups—a process known conceptually as a *faultline* (see Lau & Murnighan, 1998). The Foodtech faultline was salient, since informants referred to fellow venture members with similar functional experience and background as “us,” and to those with different experience and background as “them.”

Arguments between the two subgroups soon degenerated into a blame game, with each group attributing failure to the other. Following established insights from social psychology (e.g., Tajfel & Turner, 1986), this is termed “*outgroup attribution*.” Attribution is a process through which individuals ascribe success or failure to a particular person or circumstance (Weiner, 1986). At Foodtech, technical entrepreneurs blamed business entrepreneurs for undermining the scientific validity of their product, while business entrepreneurs blamed technical entrepreneurs for sticking too rigidly to their scientific contributions and ignoring market needs. In such a social setting of outgroup attribution of failure, members exhibited a very negative attitude toward competing information.

Research in social psychology suggests that when subgroups form, emotional and task-related conflict can arise, which can prevent information from flowing between sub-groups (Lau & Murnighan, 2005; Walsh & Cunningham, 2017). In this way, processes such as faultlines and outgroup attribution are critical factors that could inhibit the early transmutation of learning as members engage in purposeful sharing and dialogue through externalizing distinctions.

In order for externalizing distinctions to contribute to learning, individuals—particularly those assuming leadership positions—must endorse an environment that encourages establishing shared goals and supports exposing different skills, perceptions, and framing of task-related experience. Doing so allows members to gain a higher sense of “psychological safety,” which shapes the pattern and quality of their social transactions. With psychological safety, individuals can cultivate an atmosphere that encourages acceptance without fear of judgment (Edmondson, 1999). In such a case, promoting a culture of flexibility where members can freely externalize distinctions could be conducive to multilevel learning. Hence, it is reasonable to argue that the sharing of different perceptions and framing of task-related experience is affected by the nature and quality of members’ social interactions at this very particular stage.

Sharing and leveraging experiences via rotating task work

A second mechanism that contributed to sharing and leveraging experiences across venture members is *rotating task work*. This mechanism captures how venture members work together to mobilize different physical and psychological means of attaining task-related goals. It allows venture members with experience of

performing a task to share their knowledge and experience of it with other members—particularly the tacit component (Nonaka, 1994). Whereas externalizing distinctions helps members create a map of “who knows what,” rotating task work gives less experienced members the chance to level up their expertise through concrete experience (i.e., learning by doing). Moreover, it allows members to develop their own situated understanding and interpretation of task-related work.

This mechanism was observed in the Shoptech case, when members who were building an online platform rotated some development tasks with less experienced members. Over time, members began to leverage knowledge and experience that were essential for the task, and could also share different ways to approach it. Rotating task work often resulted in fundamentally different opinions and interpretations of a task. This opened up windows of opportunity for members to discuss the diverse experiences and perspectives acquired from task performance, which created a fertile ground where a myriad of task-related problems and possible solutions could be discussed (e.g., Decuyper et al., 2010; Van den Bossche et al., 2006). Whereas diverging interpretations always have the potential to flare up into conflict when social interaction is subject to socio-cognitive mechanisms, as highlighted in Figure 5.1, promoting psychological safety early on in the process is essential for multilevel learning to evolve. Results from the Shoptech case demonstrate that promoting open discussion where members can share different interpretations of a particular experience requires that members feel safe to acknowledge their weaknesses, ask questions, seek feedback, and propose new ideas. The empirical data in this case show that the founder of the company had, on several occasions, explicitly encouraged team members to share their input on their work problems and suggestions, emphasizing that learning about others’ skills and experiences can only be realized through openness and fostering a conducive environment for members to accept their limitations without fear of being judged by others.

However, if faultlines and outgroup attributions are present, it becomes harder for some team members to accept conflicting views that might emerge during task rotation. As such, they might systematically reject information from competing viewpoints, which might hinder their ability to channel experiences and perspectives that could complement their learning.

Converging experiences and fostering shared mental models through task co-construction

Those who accept competing information and opinions emerging from task rotation can integrate experiences by exchanging different ideas, interpretations, and perceptions through task co-construction. In research, task co-construction is discussed as a team-level mechanism where the knowledge and meaning of a task

become jointly shared by undertaking different cycles of refining and modifying original insights or ideas that members encounter during task work (Decuyper et al., 2010). Through these individual transactions, shared understanding starts to develop, and becomes integrated into the consciousness of all the members involved (Dutta & Crossan, 2005). In this way, task co-construction represents a transactive process, whereby learning from an individual member's repertoire is integrated into the team, creating a new group repertoire that is not dependent on any one individual (Lewis et al., 2005).

Task co-construction was observed in the Shoptech case, when venture members who were interdependently engaged in task rotation discussed their experiences on the task. It allowed venture members to elaborate on different work-related processes and, over time, converge their ideas, interpretations, and perceptions of work processes, which was instrumental for clarifying images and creating a shared understanding of task work. In this way, task co-construction contributes to the development of shared mental models: emergent states that characterize how knowledge is organized and represented among team members (Ensley & Pearce, 2001). It also engenders mutual views of the context and content of task work, which helps venture members to coordinate action through mutual adjustment (Jonker et al., 2011).

In some cases, task co-construction can force venture team members out of their comfort zones when they attempt to converge conflicting cognitive interpretations of a task (e.g., Dougherty, 1992). This instigates faultlines and attributions among venture members, creating conflict when members face new interpretations that clash with prior beliefs, ideas, and knowledge domains (e.g., Jehn, 1997). However, the results of the Shoptech case show that mechanisms such as externalizing distinctions can play a significant role in uncovering diversity embedded among venture members, which helps them cope with differences of opinion. Therefore, instead of emphasizing differences, members can engage in constructive conflict, whereby they nurture a shared understanding that opens up opportunities for modifying and exploring experiences of task-related aspects through mutual adjustment (Savelsbergh et al., 2009).

Similar results from the Foodtech case revealed that when technical and business entrepreneurs did not share the same framing of a situation, faultlines emerged. Faultlines, in turn, instigated outgroup attribution, which led to a negative attitude towards competing information that diverged from prior knowledge and beliefs. As a result, technical and business entrepreneurs were unable to integrate and leverage their knowledge to co-construct a solution that would contribute to their commercial success.

However, the results also showed that the Foodtech members could only integrate experiences and develop shared mental models through co-construction when they fostered in-group reflectivity (represented by the downward-pointing arrow in Figure 5.1). This is a collective process through which team members reflect on

goals, work methods, and responsibilities, and see how different members could contribute to a shared work process. For instance, Foodtech's technical entrepreneurs were able to cultivate a positive attitude toward information from outside their own technical domain. As such, in-group reflectivity is a necessary step for team members to promote shared understanding, which opens up opportunities for modifying and exploring new knowledge through co-construction.

Embedding experiences in the venture via routinizing behaviors

In order for learning to be institutionalized, an experience must become embedded in the venture. The process of embedding experience in the venture is an emergent multilevel process that starts with individuals and moves into the group, where an experience is discussed and co-constructed, before moving to the venture, where it becomes routinized and accessible to all members in the form of routines, systems, or procedures.

New ventures can routinize behaviors tacitly or explicitly. Tacit methods are mostly captured through individuals' ability to draw on their transactive memory of "who knows what" to determine, recall, and communicate different information regarding a task. For instance, the Shoptech case offers a good example of how individuals performing a task could locate information and retain knowledge in the linkages identified by member-task associations. These associations were clarified to other venture members via transaction (e.g., during performing tasks) and promulgated to other members through daily task work over time. Other tacit methods of routinizing experience in the venture took the form of analogies. These were used for instituting specific values and assumptions that delineated a normative territory where organizational members could learn what constituted appropriate organizational behavior (e.g., Levinthal & Rerup, 2006; Brown & Starkey, 2000). One example relates to Shoptech adopting the image of a "Swedish firm." Team members discussed how they could create a framework for their actions as a venture—more specifically, organizational norms and values such as the tone of customer communications and taking a professional attitude to tasks. In this way, the image of a "Swedish firm" shaped the patterns and qualities of organizational social transactions.

Explicit forms of routinizing behaviors included the development of written rules and standard operating procedures. These enabled venture members to recall and trigger substantial chunks of past behaviors without onerous deliberation (e.g., Olivera, 2000). Explicit forms of routinizing behaviors were observed in written documents such as work procedures, programming codes, methods for working with external networks and partners, guidelines for best practices, etc. These routinized behaviors were accessible to all members in writing, and in some cases used to train newcomers. Overall, the process of routinizing behaviors starts when members

begin to share different ideas and perspectives on task-related experiences and discuss different ways of performing a task. Through such task co-construction, members can develop a mutual understanding that, over time, coalesces into shared mental models. These models help members coordinate action through mutual adjustment so they can agree on specific methods or patterns of performing a task. Ultimately, these methods or patterns of behavior feed back into the organization in the form of routines, procedures, or systems that determine how members act and behave going forward. In this way, routinizing behaviors represents the final stage in the entrepreneurial learning framework, and is marked in Figure 5.1 by inverted arrows that feed back into the other mechanisms, completing a dynamic cycle of learning.

Different forms of routinizing behaviors

While the discussion above provides an overview of the routinization process, results from this research demonstrate that new ventures could routinize behaviors differently. As explained in Chapter 1, technology-based ventures operate in dynamic environments, dealing with the challenges of ill-defined technologies, whose context of use is still poorly defined or understood (Eisenhardt, 1989). They are also continuously trying to make sense of their external environment—responding to new policies, for example, or technological advances from competitors, customers, or suppliers. As such, the way they routinize behaviors is primarily embedded in the meaning that venture members impose on events. Venture members construct and reconstruct meaning by comparing situations to their prior experience (Karatas-Özkan, 2011). In doing so, they generate predominant frames about how things work, why they work, and how new things should work (e.g., Kaplan, 2008; Weick, 1995). Thus, prior experiences that venture members accumulate can form the basis on which they derive meaning from different information or signals, which guides their thoughts, behaviors, and activities as they share and co-construct experiences (Salancik & Pfeffer, 1978). Weick (1988) argues that actors' judgement of a situation depends on the richness and accuracy of the mental frameworks they use to interpret it. Hence, mental frameworks are formed and shaped by the experience individuals carry with them. Increasing experience in a specific domain will, therefore, increase the richness and accuracy of individuals' mental framework, which helps reduce negative perceptions and improves their motivation for a specific behavior or course of action (Harrison & Klein, 2007).

While there is a strong theoretical agreement that prior experience provides the necessary knowledge required for future action (Politis, 2005; Cope, 2005; Rae & Carswell, 2001), it is also evident that not all prior experiences generate equally

valuable knowledge that could be automatically transferred to a new context. Transferring experiences to a new context requires that individuals foresee that the knowledge possessed from prior experience is relevant to, and valuable in, the new context. According to Dokko et al., (2009), experiences that include structurally related activities are likely to produce knowledge that is relevant and transferrable across contexts. Therefore, lacking or possessing prior *related* experience will determine their judgement of a situation, and in turn, their reaction and routinization of it.

The empirical evidence from Paper IV demonstrated that ventures with prior related experience were able to see structural similarities between previous and current activities, and therefore, increase the repertoire of knowledge available for venture members to exercise control over the development and outcomes of the technology. Moreover, results from the same study show that the way new ventures ascribe meaning to external policies and technical developments imposed by customers or suppliers is mediated by the relatedness of the prior experience they exhibit. For instance, ventures that had closely related experience in a similar technological domain displayed a stronger grip on the technology, and exposed a positive judgement of uncertainties associated with external policy or technical changes, compared to those who lacked prior related experience. As a result, new ventures with prior related experience were prone to routinizing behaviors that supported exploration. Through exploration, they engaged in a trial-and-error approach to learning, launched their technology on a smaller scale, and mitigated uncertainty while learning about changing patterns of customer demand. This approach to learning is in line with effectual reasoning (Sarasvathy, 2001)—namely, the “affordable loss” principle—whereby entrepreneurs test the ground in small steps rather than big, one-time decisions.

Ventures with little or no prior related experience in the technology saw few structural similarities between previous and current activities. They also possessed little relevant knowledge to transfer to their new context and, therefore, were less appreciative of the value of external knowledge and exhibited a lower capacity to assimilate it. As a result, they judged uncertainty to be high and suffered from a restricted view of the market and externally imposed changes, which forced them to routinize behaviors that supported exploitation (Cf. Beckman et al., 2004). Through exploitation, the ventures reinforced specific networks and invested time and resources in learning about technology (Holmqvist, 2004). This approach to learning is in line with causal reasoning (Sarasvathy, 2001), whereby entrepreneurs focus on what ought to be done given predetermined goals and possible means, aiming to enhance their logic of prediction (Politis & Gabrielsson, 2006).

Synthesizing the model

The model presented in this chapter offers four novel insights. First, it provides a comprehensive understanding of entrepreneurial learning as an experiential multilevel process. The model builds on some theoretical perspectives, mainly the 4I framework of organizational learning (Crossan et al., 1999), team learning processes (Decuyper et al., 2010), and transactive memory systems (Lewis, 2004; Olabisi & Lewis, 2018). The 4I framework provided a theoretical structure for developing entrepreneurial learning as an experiential multilevel process. It also provided an evolutionary perspective on learning, demonstrating that learning can feed forward between individuals and the organization via interaction and dialogue. To detail these interactions, the model integrates research on team learning processes and transactive memory systems to explain the mechanisms that underlie how personal streams of experience transpose into the organization. The model demonstrates how team-level learning operates as a bridge between entrepreneurial learning functioning at the individual and the organizational levels. Through team-level learning and transactive memory, the model explores the transactive component of entrepreneurial learning, demonstrating how venture members articulate and share experience and how, in doing so, they create cognitive links that help them cogenerate task solutions.

Second, the model emphasizes the routinization of behaviors as a form of sharing experiences in an implicit or explicit form to benefit other members of the organization. Moreover, the model illuminates how experiences embedded in the organization in the form of routines, systems, or procedures feed back, influencing the future behaviors of venture members. Hence, the model offers a recursive and coevolutionary perspective on learning, demonstrating how it translates across different levels.

Thirdly, while the identified mechanisms may suggest a linear causality—that is, the presence of these mechanisms will eventually produce the same effect every time they are enacted—this is not in fact the case. The model emphasizes that a coevolutionary perspective of entrepreneurial learning is embedded in patterned activities that are social, dynamic, and recursive. Such patterned activities can often be subject to socio-cognitive mechanisms that could influence whether individuals reject or assimilate new information. In this way, mechanisms that produce a specific outcome in one context may produce a different outcome in another. This is manifested in the results of Paper III, which demonstrate that context matters when learning is undertaken in diverse or homogeneous structures. With different experiences and skills comes the challenge of collaborating and developing a shared understanding of how to transform the different specialized knowledge into a cogenerated solution (Dougherty, 2001; Majchrzak, More, & Faraj, 2012). Indeed, individuals possessing specific knowledge diverge in their worldviews, which could

reinforce certain perceptions and localized practices that often lead to conflicting interpretations, incorrect attributions, and coordination barriers.

Fourth, the model highlights how prior related experience available among venture members can define and shape the pattern of thoughts, language, and actions—which, in turn, determine how new ventures continue to routinize behaviors. Finally, and given the recursive nature of this model, it is necessary to highlight that we can only grasp how entrepreneurial learning is channeled within a firm if we understand the interaction of different mechanisms and their learning processes at different levels as a dialogue; hence the inclusion of the feed-forward and feedback arrows becomes a key element of this model.

6. Contributions

This chapter presents the main contributions of the thesis for research and practice. It also suggests future research paths that relate to the major findings and contributions of the four appended studies.

Contributions to research

The primary goal of this composite thesis was to understand the entrepreneurial learning process by which personal streams of experience become routinized and embedded in venture-wide behaviors. To achieve this goal, the research advanced the theoretical perspective of entrepreneurial learning as an experiential multilevel process. Table 6.1 provides a summary of the main contributions of each of the appended papers, followed by a discussion that demonstrates how these papers jointly contribute to the aforementioned aims of this research.

Table 6.1
An overview of the studies and their contributions

Paper	Purpose of study	Empirical base	Main contributions
I	Develop a conceptual model that explains how individual and organizational levels of learning connect and interact, emphasizing the key role of team-level learning	Conceptual paper	Generate theoretical concepts demonstrating the critical role of team learning processes for bridging entrepreneurial learning on multiple levels
II	Develop an understanding of the routinization process through which individual streams of experience permeate into the organization in the form of routines, systems, and procedures	Single case	Offer an empirical manifestation of multilevel learning, illustrating how individual streams of experience permeate into the organization via routinizing behaviors
III	Explore how entrepreneurial learning unfolds between venture members as they operate in a team, demonstrating how certain mechanisms can determine the way individual streams of experience are coordinated and integrated between members	Single case	Detail the socio-cognitive mechanisms that help or hinder how entrepreneurial learning is transposed between individuals in the venture team
IV	Develop an overall understanding of how new ventures develop their learning behaviors, illuminating the underlying factors that shape these behaviors	Multiple cases	Integrate uncertainty and prior related experience into the understanding of entrepreneurial learning, demonstrating how their interplay shapes the way new ventures learn and routinize behaviors

Conceptualizing entrepreneurial learning as an experiential multilevel process

One of the main contributions of this research is demonstrating how personal streams of experience are channeled into the organization. The research advances this understanding by conceiving entrepreneurial learning as a dynamic multilevel process, thus bridging an underspecified connection between the individual and organizational levels of learning.

Entrepreneurial learning has largely been studied at the individual level (Politis, 2005; Cope, 2005; Parker 2006; Minniti & Bygrave, 2001), reflecting a longstanding reliance on learning theories drawn from the realm of psychology (e.g., Cope, 2011; Petkova, 2009). A predominant focus has been on individual entrepreneurs' learning during the process of creating new ventures (e.g., Politis, 2005; Cope, 2005; Walsh & Cunningham, 2017). On the other hand, studies focusing on entrepreneurial learning at the organizational level have focused on the outcomes of learning such as the ability to recognize opportunities (Dutta & Crossan, 2005; Dimov, 2007) or the ability to achieve growth outcomes (e.g., Voudouris et al., 2010). Moreover, studies exploring entrepreneurial learning at the organizational level have acknowledged that learning at an early stage is experiential, and credited it to the individual entrepreneur (Aldrich & Yang, 2014; Zhang et al., 2006). Over time, learning starts to embrace the entire organization via collective processes of knowledge creation and accumulation where shared rules and procedures coordinate actions in the search for problem solutions (Franco & Haase, 2009). However, while these studies acknowledge social transaction as the primary means for learning diffusion, they offer fewer insights into the complex generative processes by which learning evolves and becomes routinized and embedded in organizational routines, systems, and procedures.

The coevolutionary characteristic of multilevel entrepreneurial learning

The theory and logic highlighted in this thesis demonstrate that entrepreneurial learning is a coevolutionary process, heavily embedded in the social interactions that take place at the venture-team level. The team comprises the proximal social context that shapes and amplifies the emergence of learning on multiple levels, and therefore, we must understand how learning unfolds in such a context. The core statement in the conceptual model of entrepreneurial learning (Figure 5.1) suggests that mechanisms such as externalizing distinctions, rotating task work, and co-construction are instrumental for providing the foundation for the development of team cognition and action, which advances the development of shared understanding amongst individuals and the taking of coordinated action through mutual adjustment. The conceptual and empirical findings in this research

demonstrate how learning processes at the venture-team level bridge and connect with learning processes operating at the individual and organizational levels, thus providing a more complex and complete understanding of the mechanisms and learning processes that are involved when venture team members interact, refining and influencing each other's existing patterns of thought, language, and action.

While team-level learning has been acknowledged as an input for organization-level learning (Bruneel et al., 2010; Breslin & Jones, 2012), there is a scarcity of entrepreneurial learning research demonstrating how team-level learning can explain how learning translates between the different levels (individual, team, and venture). Entrepreneurial learning research that considers the team level has mostly illustrated the cumulative nature of team learning, recognizing the team as a vehicle for temporal and spatial knowledge diffusion (Bruneel et al., 2010). For instance, Jones et al. (2010) stressed the social context in which learning takes place between individuals and the organization, underlining that organizations learn by developing norms, rules, and procedures, and that these accumulate over time through venture members' learning. However, the literature offers little understanding of how the venture-team level of learning can explain the coevolutionary characteristic of multilevel entrepreneurial learning.

The triggering mechanisms of entrepreneurial learning

As noted above, the coevolution of entrepreneurial learning on multiple levels is embedded in the social interactions that take place between the members involved. It is through these interactions that experiences continue to be channeled, allowing new ventures to reap value from their individual members continuing to explore and adapt to their environment (Edmondson, 1999; Senge, 1990). However, it is reasonable to expect that the early development phase can pose opportunities as well as threats for entrepreneurial learning. On the one hand, interactions among venture members offer abundant opportunities for learning, especially when members originate from divergent functional backgrounds. Research suggests that diversity provides a clear potential for learning and innovation (Powell, Koput, & Smith-Doerr, 1996). Moreover, encompassing diverse social capital among venture members can offer rich paradigms and perspectives, enabling members to cross-fertilize ideas and goals among themselves (Davidsson & Honig, 2003; Van Der Vegt & Bunderson, 2005).

Conversely, the early development phase can also impose specific challenges on learning. During the early stage, venture members have little shared experience of working together, and therefore fall into conflict and disagreement that makes it difficult for members to integrate and benefit from the experiences they share (Breugst, Patzelt, & Rathgeber, 2015; Johnson, Van De Schoot, Delmar, & Crano, 2015). The research demonstrates that social interactions at this phase of

development can be subject to socio-cognitive mechanisms such as faultlines and attribution, which can determine how venture members reject or assimilate experience when operating in a group.

Integrating routinization into entrepreneurial learning research

The theorizing in this thesis also suggests that mechanisms operating at the group level provide context and focus for members' patterns of thought, language, and action, which in turn determine how they routinize behaviors at the venture level. Venture members could seek exploration as a learning behavior, in which they routinize specific patterns of thought, language, and action that reinforce boundary crossing. Through boundary crossing, new ventures seek or provide information, views, or insights by interacting with other individuals or units outside the venture. Alternatively, new ventures could seek exploitation as a learning behavior, through which they routinize behaviors that support efficiency and reliability through team activity.

Moreover, this research integrates the role of prior related experience to explain routinizing behaviors in new ventures. It suggests that prior related experience plays a critical role in determining how venture members organize, evaluate, and give meaning to specific events (Milliken, 1987). Actors' interpretation and judgement of these events will depend on the accuracy and richness of their mental models. While mental models are formed and shaped by individuals' knowledge of a specific domain, this research suggests that increasing such knowledge will improve the accuracy of their judgment, and their willingness to engage in specific behaviors. Based on this, prior related experience influences how venture members judge the events and situations around them, which in turn affects their judgment and the behaviors they decide to routinize as a result. In this way, this research brings valuable new theoretical insight to the notion of routinization, by extending this concept into the entrepreneurial learning literature and highlighting how the dominant cognition and actions residing among venture members become embedded in venture-wide behaviors over time (see El-Awad et al., 2017). Together, the discussed contributions provide an input to an evolutionary perspective on entrepreneurial learning, demonstrating how entrepreneurial learning evolves and unfolds from individuals to the organization, and how it is shaped by specific mechanisms and learning processes that explain its transmutation and routinization at the system level.

Implications for entrepreneurs

The research findings provide four practical implications for entrepreneurs and their ventures. These are discussed in turn below.

Routinizing behaviors

The outcomes of this research offer a reference for entrepreneurs to understand how routinizing behaviors take place. As noted earlier, routinizing behavior is a critical step that needs to be taken seriously if a new venture is to perform activities reliably. New ventures are informally outlined during their early development. Without routinization, they can face a challenge in terms of how they can sustain their ability to transform ideas into new products, processes, or services. The experience embodied in the founder, or the founding team, may not be enough to surmount the challenges facing the venture's long-term development. Therefore, as new ventures grow, they need to develop formal structures for learning and developing knowledge. In this way, entrepreneurs must treat their new ventures as social systems that need to learn and routinize behaviors to stabilize organizational activities.

This research offers fundamental mechanisms and processes that could help entrepreneurs routinize behaviors. In particular, I highlight that there are specific mechanisms and learning processes that set the boundaries for how venture members can create a dialogical space where they can communicate and share their experiences. The research emphasizes that in order for routinizing behaviors to take place, venture members must consciously voice specific information and its purpose so that they can define the boundaries of individuals' knowledge. In doing so, venture members can recognize the more abstract knowledge they possess in the venture—and, more importantly, the existing knowledge gaps that they can work towards filling, either by crossing boundaries or through task rotation. Furthermore, the research suggests that engaging in interpersonal sharing and dialogue is necessary but not sufficient for an experience to transcend individual knowledge repertoires and be transposed into the firm. Shared experiences must be co-constructed, whereby venture members can establish a collective understanding of how these experiences can inform future action. Finally, managers need to ensure that the agreed-upon ways of working are made available to other members of the venture, either by making an effort to codify those experiences in the form of rules, systems, or procedures, or by communicating them as shared values.

Supporting various learning behaviors

Entrepreneurs starting new ventures in dynamic settings must ensure that their ventures are capable of adapting to the demands enforced by their environments. These demands may oblige entrepreneurs to consider multiple innovation paths, each of which may require a different set of learning behaviors. Entrepreneurs may need to routinize behaviors that support exploration or exploitation. Both exploration and exploitation require the allocation of different learning processes. The outcomes of this research offer entrepreneurs access to different sets of learning processes, demonstrating how each could help them adapt, anticipate, and respond to such environmental challenges. For instance, entrepreneurs could routinize behaviors that foster higher levels of *boundary crossing*. Through boundary crossing, entrepreneurs could increase the potential for achieving novel recombinations of knowledge and resources that support explorative paths of innovation. Alternatively, entrepreneurs could engage in higher levels of *team activity*, whereby they could increase efficiency when coordinating action and thus routinize behaviors that support exploitative paths of innovation. Moreover, and in order to strike a balance between exploration and exploitation, entrepreneurs must foster and institute processes of *reflexivity*, whereby venture members can continuously question and evaluate their activities, which will eventually help them reduce the likelihood of overemphasizing one learning behavior over the other. New ventures need both learning behaviors to improve their efficiency and sustain their ability to innovate and create new things.

Promoting psychological safety

As highlighted above, routinizing behaviors requires all members of the venture to discuss, co-construct, and develop a shared understanding of their experiences. This process can be challenging at an early stage, given that venture members often have little experience of working together, and lack norms and routines to define their working structure. This challenge is typically exacerbated when members are drawn from diverse functional backgrounds. Individuals derive significant meaning from their experience, which shapes how they judge and interpret events or situations. As such, individuals with different functional backgrounds are expected to frame situations differently, which could make it difficult to reconcile their views into a mutually shared understanding.

Developing a shared understanding and coordinating action are two of the fundamental bases on which behaviors can be routinized. Therefore, entrepreneurs must foster common goals and a shared framing for the business from the outset. This requires strong leadership from the founder(s) in identifying challenges early on, and appreciating what unique contributions each member could make by fostering purposeful sharing and dialogue through externalizing distinctions. A

failure to do so might allow faultlines to emerge, creating unnecessary division among venture members. As such, entrepreneurs need to ensure that members feel psychologically safe and free to express differences in opinions and perspectives without fear of judgment. In this research, promoting psychological safety is considered to be a critical step for learning to emerge across venture members. Without this sense of safety, venture members are less likely to reveal their opinions concerning critical issues, increasing the risk of the venture missing out on essential learning opportunities—particularly in dynamic sectors.

Coalescing the right experiences

Entrepreneurs pursuing novel innovations must ensure that they are combining the right experiences to manage and realize these innovations. As noted earlier, entrepreneurs need to develop ventures that are capable of learning in both explorative and exploitative ways. This requires that they can routinize behaviors that could facilitate both learning paths. To do so, they must have an initial base of experiences that allows them to accumulate sufficient knowledge on which they can absorb and assimilate new information to facilitate their learning. As demonstrated in Chapter 5, ventures with prior related experiences possessed relevant knowledge that could be easily transposed into their new context. Therefore, they were better able to control and manage their innovation process and had stronger confidence in their abilities to handle external challenges and direct them to their advantage compared to those lacking prior related experience.

Moreover, results from this research demonstrate that prior related experience can affect how venture members judge uncertainty and, accordingly, the behaviors they routinize to manage it. Ventures that incorporate prior related experience among their members exhibited more confidence in their ability to manage uncertainty. Therefore, they showed greater entrepreneurial proactivity and committed more time to exploring different market options. Those lacking prior related experience, on the other hand, were more reserved over to how to approach their market, and hence displayed less entrepreneurial proactivity and dedicated more time to refining what they already knew. This importance of prior related experience, however, in no way minimizes the importance of learning in the venture, which can yield critical knowledge that fits even more closely with the demands of the venture. Having said that, prior related experience is particularly beneficial and relevant during the early stages of development, since it accelerates new ventures' learning and provides them with the necessary knowledge that moderates how new ventures approach uncertainties and routinize behaviors as a result.

Limitations and avenues for future research

In an effort to investigate how personal experience becomes routinized in venture-wide behaviors, this research studied entrepreneurial learning as an experiential multilevel process. The purpose of doing so was to illuminate certain mechanisms and learning processes through which experiences transcend individuals and are propagated throughout the firm. However, the generative mechanisms depicted in Figure 5.1 might have been triggered by the dynamic nature of the environment in which these ventures operate. For instance, the mechanisms derived from the Shoptech case might have been engendered by the fact that the venture was operating across boundaries, making it urgently necessary to leverage learning from task performance. Therefore, a potential limitation could be that these mechanisms were formed and instituted in such a way that accommodates the complexity posed by their dynamic context. As such, future research could test whether these mechanisms hold for ventures operating within the same boundary.

Second, I argue that individuals generate predominant framing about how things work, why they work, and how new things should work by drawing on their prior experiences (e.g., Weick, 1995; Kaplan, 2008). As such, prior experience forms the basis on which individuals derive meaning from different information or signals. This, in turn, could influence the dominant cognitions that guide their thoughts, behaviors, and learning. However, this research abstracts away from the organizational dynamics that might influence how new ventures learn and behave. For instance, how do power relationships facilitate or inhibit learning, whether in the feed-forward or feedback directions (Crossan et al., 1999)? The role that leaders play in enabling processes of multilevel learning, and the type of power relations they enact with their colleagues, might well have an impact on the learning behaviors of the new venture.

Other potential factors may relate to “political” dynamics within or across organizational boundaries. At an early stage, new ventures seek to gain legitimacy and alignment with potential stakeholders (König et al., 2018). Therefore, the successful transition and development of the business might be contingent on meeting the requirements of stakeholders such as funders, customers, or suppliers, which could also impose on the strategic directions that a new venture takes. These directions, could, in one way or another, frame the specific learning patterns and strategies that new ventures take and, therefore, the behaviors they routinize to improve their chances of success.

Third, this research demonstrates that functional diversity may trigger socio-cognitive mechanisms that may either help or hinder the transfer of learning between venture members. However, these results might have been specific to the context of the study—i.e., technology-based ventures operating in a dynamic and uncertain environment. Venture members operating in such environments may not have

enough time to develop shared goals and understanding of their business; therefore, they may initially find it hard to coordinate action through mutual adjustment, particularly if they come from different functional backgrounds. As demonstrated in Paper I, in order for venture members to coordinate action through mutual adjustment, they must first develop shared mental models, which requires them to spend enough time together and develop a shared understanding of each other's experience. Entrepreneurs operating their new ventures in such a dynamic and uncertain environment may overlook these critical dynamics, and put more effort into dealing with the day-to-day demands of the business. This situation may leave venture members unable to attain a shared framing of their problems, potentially leading to conflict. Future research could investigate how entrepreneurial learning unfolds among venture members who have diverse functional backgrounds, yet work in less dynamic environments, to determine whether the effects of compositional characteristics on entrepreneurial learning are amplified in dynamic environments.

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Appendix A

Interview Protocol – Paper II
<p>Team Activity – Interpersonal sharing and dialogue:</p> <p>How do you divide tasks among the team?</p> <p>How does the division of work help you coordinate your work among each other?</p> <p>Does the division of tasks affect what and how much each member decides to learn?</p> <p>How do you coordinate to solve problems together?</p> <p>Are business-related decisions made together? If so, how?</p> <p>How do you agree upon venture- or task-related goals?</p> <p>Do you give each other feedback? If so, how?</p> <p>How do you exchange and share information about how to perform a task?</p> <p>Do more knowledgeable team members provide others with specialized knowledge?</p> <p>Do team members know what others know and what they are doing? How did you establish that knowledge?</p> <p>Do any team members have specialized knowledge that no other team members have?</p> <p>Do different team members take responsibility for expertise in different areas?</p> <p>Would you consider the team to have a good map of each other's talents and skills?</p>
<p>Task coordination and co-construction:</p> <p>Do you regularly discuss the progress of the teamwork or task? If so, how? Why? When? And can you give me an example?</p> <p>Do you assess the overall performance? And what changes does that imply for the way you work?</p> <p>Do you reflect on and communicate objectives and information among team members?</p> <p>Does reflecting and questioning goals facilitate any changes to the product/service, or the way you deliver your product/service to the market?</p> <p>How do you coordinate task-related knowledge with other members' roles and expertise?</p>
<p>Routinizing behaviors:</p> <p>How did you agree on creating working templates, rules, and working procedures?</p> <p>Do you collectively store and update information related to your project work? Please explain.</p> <p>How do you discuss and select best practices? And how do you store them for future reference?</p> <p>Do you store data on each project for future decision-making? If so, how do you do that?</p>

Appendix B

Interview Protocol – Paper III
<p>Information about the business: Let's go back to the beginning. Can you tell me about when you started the venture? Why did you create this business? What were the key events in the development of your business? What problem did you think you were solving by starting your venture? Has that changed over time? What kind of previous knowledge did you have before starting this business? Did you have any previous knowledge about the market? Did you know exactly what you wanted to do/Did you have a clear vision of what your business should be?</p>
<p>The team: Was there anyone who helped you to start the business? Who did you start it with? Why did you start it with them? Can you give me a career history of the founding team, or those who were involved in setting the strategy or building routines? Did the team change over time, and if so, why? Were you working well together as a team? And how did differences in team knowledge and background benefit or challenge the work progress?</p>
<p>The market: Could you describe the market you are serving? How do/did you obtain information about the market? Could you give a few examples of some information from the market that directly changed your operations? <i>Change in routines enforced by external environment</i> Is the market volatile/stable? What will be the market's challenges in the future?</p>
<p>Decision-making (Revealing conflict management): How do you generally make decisions about your business? What were the toughest decisions you had to make in the past? What are the toughest decisions you face now, or will have to make in the future? What important decisions have you made lately, and what was your reasoning? Think about an average working day. What kind of decisions do you face? Could you describe how you reason when you make such decisions? When it's about market investments, do you follow your gut feeling for business, or do you gather more information about the decision, or do you have certain routines you follow? Who do you consult before you make important decisions? Is it easy for you to listen to and consider other people's point of view on your work? Can you give examples of wrong or poor decisions you've made? Could you describe a successful event for which you've taken the initiative and why you succeeded?</p>

Appendix C

Interview Protocol – Paper IV
<p>Phase 1. Information about the business:</p> <p>Could you tell me about your company, namely the innovation, the product/service, or process being developed?</p> <p>Could you tell me about the team—who does what, and what function each one of you fulfills in the company?</p> <p>Does your team combine a rich and diverse knowledge base, or do they have focused and specialized knowledge? Please explain.</p> <p>How do you generate new ideas?</p> <p>Where does new knowledge come from?</p> <p>How do you exchange knowledge within the team/firm?</p> <p>Do you engage in teamwork? How does that work in relation to the delivery of the product/service you are offering?</p> <p>Could you tell me about the diverse knowledge in the team—how do you use this knowledge in different ways?</p>
<p>Phase 2. External collaboration/boundary crossing and challenges facing the venture:</p> <p>How often do you engage with external parties or actors to get new ideas or information? Could you give me an example and why did you do so? Moreover, how did it contribute to your knowledge or innovation?</p> <p>Was it important to have specific knowledge to make it easier to absorb and benefit from external knowledge?</p> <p>How did you get into these collaborations? Was it championed in the team or were you approached? Is it something you often do or it happened by chance?</p> <p>Could you identify some changes that were featured in your product, service or technology or organizational structure?</p> <p>How did these changes come about?</p> <p>Were they triggered internally or externally?</p> <p>Could you tell me about the most burning challenge that is external to your firm? E.g. technological changes, market volatility and complexity?</p> <p>How do you react to these challenges? Could you give me an example?</p>
<p>Phase 3. Learning behaviors:</p> <p>How do you sense problems that might challenge your operations? Could you give an example?</p> <p>How do you respond to these challenges?</p> <p>Where do you spend most of your resources?</p> <p>Can you tell me about a challenging situation you overcame at work and how did you overcome it?</p> <p>Can you tell me how you approach technology development?</p> <p>What knowledge do you think the venture processes as a whole? How does that knowledge facilitate the work you do?</p>

Why do some new ventures thrive, while others fall at the first hurdle?

Entrepreneurial learning, or the ability to gain new knowledge from experience and use it to develop the business, is a crucial part of the answer.



This book advances a theoretical model that explains entrepreneurial learning as an experiential multilevel process in which personal streams of experience become routinized and embedded in venture-wide behaviors.

Routinizing behaviors is crucial if new ventures are to perform activities in a consistent, reliable way. Without routinization, new ventures can suffer from confusion and a lack of clarity, which may undermine their ability to transform ideas into new products, processes, or services.

This book presents four complementary studies that combine to offer novel insights into how technology-based ventures learn and routinize behaviors. It explores how individual streams of experience become embedded in the venture, and the mechanisms that help or hinder the way such streams permeate between individuals. It also highlights the critical role that prior experience plays in explaining why technology-based ventures learn and routinize behaviors in different ways.