Lean Startup and organisational learning capability: a case study in a Research and Technology Organisation

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Lean Startup is an iterative, hypothesis-driven approach consisting of five key principles for business creation and product development, which involves potential users and customers from the beginning in a trial-and-error process. We argue that the application of Lean Startup encourages organisational learning, based on its facilitating dimensions: experimentation, risk taking, interaction with the external environment, dialogue, and participative decision making. Thus, we examine the effects of Lean Startup implementation on organisational learning capability through a case study in a Research and Technology Organisation, providing evidence of its positive impact.

Keywords: Lean Startup; organisational learning; products and services development; experimentation.

Introduction

The Lean Startup approach (Ries, 2011) is used in the innovation process by entrepreneurs and established organisations (Blank, 2013; Blank & Euchner, 2018; Moogk, 2012), and it is based on the process of validating business models through market testing and customer feedback (Ghezzi & Cavallo, 2020) in order to allocate resources to generate customer value, pursuing the product-market fit (J. L. York & Danes, 2014, p. 21).

While Lean Startup is gaining more attention from academia (Harms, 2015), the discussion about its usefulness and benefits is still ongoing (Bocken & Snihur, 2020; Felin et al., 2020). Therefore, its theoretical foundations have not yet been fully developed (Yang et al., 2019), which hinders its adoption and implementation (Ghezzi, 2019).

Previous literature underlined the importance of theoretically relating Lean Startup with Organisational Learning (e.g. Contigiani & Levinthal, 2019; Rübling,

2016; York, 2020, 2021). While some articles indirectly connect the two concepts, they do not analyse how the implementation of Lean Startup is positively associated with organisational learning capability (e.g. Bortolini et al., 2021; König et al., 2019; Mansoori, 2017; Mansoori et al., 2019; Zeng & Honig, 2016). Thus, it is essential to analyse the implications of implementing Lean Startup in organisations in terms of their capability to learn and their innovation performance (Alegre & Chiva, 2008; Ghasemzadeh et al., 2021; Jiménez-Jiménez & Sanz-Valle, 2011).

Organisational learning is a process of improving actions through better knowledge and understanding (Fiol & Lyles, 1985). Consequently, it is not merely the accumulation of individual and group learning (Levitt & March, 1988). Organisations develop and maintain learning systems influenced by contextual factors such as organisational culture, strategy, structure, and systems (Fiol & Lyles, 1985). If what has been learned is not codified and institutionalised into the organisation's systems, structures, and procedures, individuals may have acquired knowledge, but the organisation as a whole will not benefit from it (Argyris & Schön, 1978). In this sense, we argue that the application of Lean Startup, with the necessary adaptations considering the internal and external factors of the organisation, can enhance the organisational learning capability, understood as the organisational and managerial characteristics that facilitate the organisational learning process or allow an organisation to learn (Chiva & Alegre, 2009; Dibella et al., 1996; Goh & Richards, 1997; Hult & Ferrell, 1997; Jerez-Gómez et al., 2005).

The organisational learning process comprises the acquisition, diffusion and use of knowledge and is closely intertwined with product innovation performance (Argote et al., 2003): the higher the level of organisational learning capability, the higher the degree of performance in the product innovation function (Alegre & Chiva, 2008;

Gomes et al., 2021; Jiménez-Jiménez & Sanz-Valle, 2011; Peris-Ortiz et al., 2018). In this vein, experimentation has been found as a fundamental learning mechanism for firms to drive innovation, as the development of a new product requires a series of experiments to test market challenges and technologies (Thomke, 2001).

The conceptualisation of organisational learning capability also considers the distinction between internal and external learning, requiring an appropriate balance that aligns with the organisation's resource configuration and strategic objectives (Cohen & Levinthal, 1990). Internal learning occurs when organisational members generate and disseminate new knowledge within the boundaries of the firm, while external learning happens when new knowledge comes from external sources through acquisition or imitation and is transferred throughout the organisation (Bierly & Chakrabarti, 1996).

The integration of Lean Startup principles in the products and services development process appears to facilitate both internal and external organisational learning. This is supported by the facilitating dimensions of organisational learning or organisational learning capability dimensions: experimentation, risk taking, interaction with the external environment, dialogue and participative decision making (Alegre & Chiva, 2008; Chiva et al., 2007; Gomes et al., 2021). Thus, Lean Startup involves internal reflection on new value propositions, their market fit, and the organisation's strategy; it encompasses the design and execution of experiments, fostering internal communication among different organisational roles; it promotes iterative interactions with the environment to validate hypotheses related to value proposition and business model, promoting increased engagement with stakeholders; furthermore, the incremental approaches of Lean Startup allows a clearer understanding of the risks involved in the validation process for all parties.

Therefore, we argue that the adoption of the Lean Startup approach might be associated with enhanced organisational learning. Additionally, the adoption of Lean Startup promotes the establishment of a set of routines, procedures, and rules that guide the behaviour of individuals within the organisation, further facilitating learning (Levitt & March, 1988).

Thus, this paper aims to examine the impact of Lean Startup implementation on organisational learning capability. Through a case study, we analyse the enhancement of organisational learning capability following the implementation of Lean Startup principles through a series of strategic initiatives in the products and services development processes of a Research and Technology Organisation (RTO).

Theoretical Background

Organisational learning capability

Organisational learning capability is defined as the set of organisational and managerial characteristics or factors that facilitate the process of organisational learning, or enable an organisation become a learning organisation (Chiva et al., 2007, Chiva and Alegre, 2008). This conceptualisation emphasises the significance of the facilitating factors for organisational learning and the organisational inclination towards learning.

Organisational learning capability (Dibella et al., 1996; Goh & Richards, 1997; Hult & Ferrell, 1997; Jerez-Gómez et al., 2005) consists of five dimensions: experimentation, risk taking, interaction with the external environment, dialogue, and participative decision making (Alegre & Chiva, 2008; Chiva et al., 2007; Ferreras Méndez et al., 2018).

Experimentation refers to searching for new solutions to organisational problems. This search requires a Risk-Taking approach since Experimentation implies

trial and error initiatives. Risk-Taking consists of tolerating ambiguity, uncertainty, and errors. Interaction with the external environment refers to the scope of relationships with different agents within the external environment. Dialogue is described as a process of advocating and inquiring and implies that communication among employees is encouraged by the firm. Finally, participation in decision-making refers to the degree of influence that employees have in the decision-making process (Alegre & Chiva, 2008; Berndt et al., 2023; Chiva et al., 2007; Ferreras Méndez et al., 2018).

Previous research on organisational learning capability has focused on the dimensionality of the concept (Chiva et al., 2007; Jerez-Gómez et al., 2005) as well as its effects over organisational performance (Alegre & Chiva, 2013; Migdadi, 2019); innovation performance (Alegre & Chiva, 2008; Gomes et al., 2021; Peris-Ortiz et al., 2018), frugal innovation (Berndt et al., 2023) and exports intensity (Fernández-Mesa & Alegre, 2015). Other prior studies have underscored how different types of leadership such as altruistic leadership (Mallén et al., 2015) or transformational leadership (Ferreras Méndez et al., 2018; Gomes et al., 2021) could have a positive impact on organisational learning capability. Furthermore, other research has analysed how several behaviours or attitudes such as trust (Guinot et al., 2013), altruism (Guinot et al., 2016) or compassion (Guinot et al., 2020) affect organisational learning capability. In this study, we want to deepen on the antecedents' view of organisational learning capability by suggesting that the implementation of a Lean Startup approach in a particular organisation could develop its organisational learning capability further, generating a virtuous positive cycle between Lean Startup and organisational learning. Moreover, we aim at providing a detailed description and a rigorous interpretation on the dynamics of Lean startup implementation in a specific organisation such as a Research and Technology Organisation.

The Lean Startup approach

Building upon the principles of Lean Manufacturing (Ohno, 1988), which focus on waste and optimising resource allocation, and customer development (Blank, 2013; Blank & Euchner, 2018), the Lean Startup approach can be considered as a mindset based on validated learning that aims to change the way businesses are developed and new products are launched (Nirwan & Dhewanto, 2015). The Lean Startup approach emphasises flexibility and cost-effective strategies when engaging in activities that generate value for potential customers (Frederiksen & Brem, 2017).

Through a trial-and-error process, Lean Startup provides solutions to cope with uncertainty in business contexts (J. M. York, 2018). By employing a disciplined approach that starts with hypotheses about product functionalities and business models (Aulet, 2013) it minimises the risks associated with new business initiatives (Grossman, 2016). Specifically, Lean Startup consists of five key principles (Ries, 2011):

(1) Entrepreneurs are everywhere: Entrepreneurs are visionaries, who possess visionary capabilities and are willing to take risks, so they can be found in various settings, from startups to established companies, rather than being confined to the stereotypical garage.
(2) Entrepreneurship is management: Startups are institutions and, like any other institution, require effective management practices.
(3) Validated learning: Startups exist to learn how to build sustainable business, and this learning can be validated through experiments to test the viability of the business model, while considering the entrepreneur's vision.
(4) Build-Measure-Learn: All the above principles are integrated into the present. The iterative development of products and services follows the

Build-Measure-Learn (BML) cycle, which describes the sequence of steps for conducting experimentation starting from an initial idea.

(5) Innovation accounting: Organisations should establish milestones and targets, and continuously measure progress against forecasts to track their degree of advancement.

Gbadegeshin (2018) explains that the first principle highlights the notion that individuals capable of recognising and seizing opportunities can be found anywhere, including within large companies. The second principle means that the process of seizing opportunities must be well planned and executed, leading to valuable lessons learned (as reflected in the third principle). Finally, the fourth and fifth principles are more practical in nature, representing the implementation aspects of Lean Startup.

The Lean Startup approach employs small iterative learning cycles using minimum viable products (MVPs), which can be defined as a version of a product or service that allow for validation and learning (Blank, 2013). An MVP should possess minimum functionalities and requirements to address the needs of early adopters, be implemented on a small scale, and requires minimal effort to gather maximum validated learning (Lenarduzzi & Taibi, 2016). Consequently, an MVP can take the form of a PowerPoint presentation, an animation, a screenshot, a web page, a video, a landing page, a mock-up, pre-sales, or an online campaign for A/B testing (Alvarez, 2014; Bland & Osterwalder, 2019; Knapp et al., 2016; Ries, 2011).

The Build-Measure-Learn (BML) cycle of validated learning (Exhibit 1) is iterative and helps entrepreneurs to act on whether to continue on the current path or make changes. According to Ries (2011), the cycle begins by formulating an idea related to a problem and its possible solution, which is then broken down into hypotheses (Blank & Dorf, 2012). These hypotheses are translated (BUILD) into an

MVP which is used within a controlled experiment to validate the value proposition and associated elements of the business model. As tests are conducted, data and information are collected (MEASURE), subsequently analysed and interpreted to draw conclusions. The third phase, LEARN, involves reflecting on the results and validating the initially proposed hypotheses.

Once the entire learning cycle is completed, and if the hypotheses are deemed valid, a decision must be made regarding whether the iterations carried out are sufficient to develop the product further or continue confirming the defined hypotheses. In cases where the hypotheses are not confirmed, new ways must be explored to develop alternative hypotheses that align with the overall strategy (pivoting), or the value proposition must be discarded to pursue a new strategic direction. By continually going through the BML cycle and rapidly iterating to gather feedback, the team incrementally progresses in refining its business model to accurately target customers and respond to new information (Eisenmann et al., 2012), thus enhancing the likelihood of success.

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Lean Startup and organisational learning capability

Harms et al. (2015), König et al. (2019), Rübling (2016) and Vliet (2020) briefly outline the connections between Lean Startup methodologies, principles, processes and activities, and theories of organisational learning. In a more comprehensive analysis, Contigiani and Levinthal (2019) argue theoretically that the Lean Startup framework has important roots and points of connection with individual and organisational learning, by linking the sequential process of experimentation, based on trial-and-error,

and the learning that occurs during the continuous refinement of the value proposition.

However, there is a distinction between the Lean Startup approach and traditional organisational learning as described in the literature (Crossan et al., 1995; Levitt & March, 1988). In traditional models, experiential learning is seen as a by-product of action, whereas in the Lean Startup approach there is a deliberate and conscious design of actions (experimental trials) and the information they provide is useful for future design efforts (Contigiani & Levinthal, 2019). Lean Startup explicitly distinguishes between an intensive learning phase, where the firm seeks market fit, and a scaling phase that follows once fit is achieved. While the Lean Startup literature acknowledges the importance of learning throughout the entire development process, Contigiani and Levinthal (2019) and Ries (2011) emphasise that the dedicated effort and conscious experimentation are specific to the initial phase, while leveraging the acquired learning becomes critical in the subsequent phase.

Research methodology

By means of a case study developed through semi-structured interviews and other primary and secondary sources of information, the novel phenomenon associated with the application of Lean Startup and the link with organisational learning capability is analysed within a Research and Technology Organisation (RTO).

Case study

A single exploratory case study was conducted within an RTO located in Valencia, Spain. The aim was to obtain a comprehensive understanding of the contemporary and complex phenomenon, identifying recognisable patterns (Yin, 2013a) regarding the implications of implementing Lean Startup principles in the products and services development processes and their connection to organisational learning. Due to the

absence of previous studies, a qualitative approach was chosen to explore the phenomenon within its specific context and gather accurate information (Patton, 2015).

In Spain, RTOs are private not-for-profit institutions with public support (Santamaria et al., 2002), born fundamentally at the initiative of industry sectoral associations of small geographical areas or from university environments to address common technological needs (Bresó, 2002). In this context, RTOs are considered the main agents of territorial innovation (Rincón-Díaz & Albors-Garrigós, 2017), assisting companies in their surrounding environment to enhance their competitive position (Barceló Roca & Roig Juan, 1999). An RTO possesses unique characteristics such as diverse funding sources, a high volume of R&D&I activities, and a workforce consisting of technical staff with extensive experience in managing complex projects (EARTO, 2007).

In this case study, the RTO analysed embarked on a strategic change process during 2018, leading to the adoption of Lean Startup principles in the development of new products and services with the objective to better adapt them to companies considering their needs (Roessl et al., 2010), and achieve a more balanced focus between technology push and market pull (EARTO, 2007). The adoption was facilitated by the establishment of self-managed multidisciplinary teams with a certain degree of autonomy within the organisation.

It is worth noting that the adoption of Lean Startup was started, following the strategic reflection process, through a limited set of pilot initiatives to observe the obtained results and fine-tune its implementation before transitioning to a scaling phase throughout the organisation, which started in 2021. Therefore, the results presented in the following research combine partial and final outcomes related to the limited pilot applications of Lean Startup with partial results and insights associated with the scaling

of Lean Startup implementation to other initiatives and teams within the RTO, which are in an early phase. Nevertheless, it is important to note that during the process analysed in this study, 43 value propositions were evaluated following the principles of Lean Startup. As a result, 3 of them have been transformed into products or services that are currently being marketed, representing new sources of income for the RTO, and 2 are in the final stages of development prior to their market launch.

The selection of an RTO as the case study unit is justified by its innovative nature and its prominent role in the National Innovation System (Rush et al., 1996). RTOs contribute significantly to improving the competitiveness of companies through knowledge and technology transfer processes (Gracia & Segura, 2003; Rincón-Díaz, 2014), particularly within regional innovation systems. They serve as innovation support organisations that provide opportunities to access, test, acquire, and disseminate knowledge, technological ideas and solutions (Cooke & Memedovic, 2006).

Case study design

Case study is considered the appropriate method for building theory from qualitative data (Yin, 2013a), such as the enhancement of organisational learning capabilities that takes place through the incorporation of Lean Startup principles. As the literature points out, single case studies are suitable when they provide revealing insights, extreme examples or particular opportunities for unusual research access (Eisenhardt & Graebner, 2007; Yin, 2013a).

Following an inductive research approach, the study began with a broad perspective to understand Lean Startup, its current state of knowledge, theoretical development, and its application in organisations. For this reason, a systematic review of the scientific literature conducted in 2021 guided the research methodology, defining the necessary information and the sources to obtain it through the case study.

Additionally, the most relevant profiles and roles within the organisation were selected to be interviewed based on their involvement in the process.

Data collection encompassed transcribing semi-structured individual interviews (Eisenhardt & Graebner, 2007; Yin, 2017), attending strategic and retrospective working meetings, direct observation by the lead researcher, and using secondary sources of evidence such as business plans, internal reports, journal articles, websites, and industry reports. This secondary data was used to complement primary information (interviews and strategic and retrospective meetings), as collecting data from multiple sources improves the reliability and credibility of the results (Yin, 2017), as well as providing robustness to the conclusions. Therefore, the concept of triangulation applies to the data collection phase (Jick, 1979) of this research.

The information collected in the interviews was coded and analysed using Grounded Theory (Glaser & Strauss, 2000) with an open, axial, and selective coding system. This process allowed for the definition and organisation of codes related to concepts, their relationships, and integration with other codes, ultimately employing parts and relationships (Hernández Carrera, 2014). The analysis and data collection process were iterative and concluded upon reaching theoretical saturation.

Information gathering

Between 2018 and 2022, information was collected through four methods: (1) individual semi-structured in-depth interviews conducted in 2022 with staff involved in the process; (2) project strategy and retrospective meetings involving staff participating in Lean Startup initiatives from 2019 to 2022; (3) direct observation by the lead researcher throughout the period, including involvement in the analysis initiatives; and (4) secondary sources of information collected since 2019. Exhibit 2 provides an overview of the four methods used to collect data and the corresponding time periods in

which they were used. In this section, the information sources are described in order of their significance for analysing the research results.

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Semi-structured interviews

Semi-structured individual interviews were the primary source of information as a common method in qualitative research (Bryman & Bell, 2015), providing an in-depth understanding of the events, their causes, how they unfolded and their outcomes, eliciting the lived experiences of those involved in the process (Cope, 2005). Semi-structured interviews allowed for a focus on predefined research topics while remaining flexible to address unanticipated information (Robson & McCartan, 2015).

Main questions in interviews, aligned with the research objectives, included: Has the adoption of Lean Startup principles impacted on organisational learning capabilities? Which dimensions of organisational learning capabilities do you associate with this approach, such as experimentation, risk taking, interaction with the external environment, dialogue, and participative decision making? Do you believe that the application of this approach has improved the innovation processes of the Research and Technology Organisation? Have you encountered any resistance during the implementation of Lean Startup principles? Do you believe that resistances have diluted the impact of Lean Startup adoption?

Two pilot interviews were conducted to confirm that the questions were clear to informants and could lead to in-depth discussions (Majid et al., 2017). Following the pilot interviews, the lead researcher conducted a total of 15 individual interviews

between March 2022 and November 2022, adhering to ethical behaviour without interfering or guiding the responses to avoid bias (Kvale, 1983). Interviews were conducted until the responses no longer provided new insights (Glaser et al., 1968).

All interviews were recorded and transcribed immediately to ensure data quality (Gibbert et al., 2008). The transcriptions were combined with notes taken during the interviews, and if any information remained unclear or further data was needed, informants were contacted for clarification. Various roles were interviewed to include different perspectives. Exhibit 3 provides an overview of interviews information.

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The 15 individual interviews had an average duration of 83.5 minutes, ranging from 109 to 53 minutes, resulting in a total of 1,253 minutes of recorded data. Overall, the interviews yielded a single document containing all the interviews transcripts, amounting to 110,818 words.

Strategy and Retrospective Meetings

Notes from strategic meetings that led to the implementation of Lean Startup principles and retrospective meetings related to specific initiatives and projects involving Lean Startup were utilised as primary information sources. A total of 18 strategic and retrospectives meetings were held between 2018 and 2022, but detailed descriptions are not provided to maintain confidentiality.

Direct observation

The third method of information collection involved direct observation by the lead

researcher, who recorded progress, learnings, milestones, obstacles, improvements, and decisions made throughout the Lean Startup adoption process from 2018 to 2022. This included participation in over 220 meetings. The notes taken during this period extend to 193 handwritten pages.

Secondary sources of information

Secondary sources of information consisted of both internal sources accessible to the lead researcher as part of the organisation (e.g. business plans, technical reports, meeting minutes, strategic plans) and external sources (e.g. sectoral reports, journal articles, websites, event attendance). This set of sources led to data triangulation (Jick, 1979) which is crucial for ensuring the reliability and persuasiveness of qualitative research (Bonoma, 1985; Siggelkow, 2007), thereby enhancing the credibility and reliability of the findings (Yin, 2017).

Interviews analysis and data coding

The interviews data was analysed iteratively until saturation was reached, employing the coding processes of open, axial and selective coding (Moghaddam, 2006; Saldaña, 2021).

The first step involved manual transcription of the interviews using the recorded materials. All transcripts were then read in their entirety to enable coding of the full corpus of data, following the techniques described by Corbin and Strauss (2015) for developing Grounded Theory. Inductive data reduction (Eisenhardt, 1989) was employed to construct a coding tree, capturing the exact wording used by the informants to describe the process under investigation, as well as the constructed wording induced by the researchers.

All empirical data was open coded at the smallest independent units of meaning (Corbin & Strauss, 2015), resulting in a list of first-level codes that used labels or descriptive phrase closely aligned with the language used by the informants. After this initial open coding phase, the codes associated with each interview were compared iteratively to identify similarities, patterns, and second-order concepts, facilitating code creation and the analysis of connections between them (Saldaña, 2021). The axial coding phase involved filtering the initial codes, establishing new relationships between concepts, and selecting the most relevant ones to address the research objectives. Quotes and passages from the text were used to support the coding paradigm, elucidating the relationships between phenomena, their causes, and consequences (Hernández Carrera, 2014).

Finally, in the third and last step, the second-order codes were grouped into general dimensions that encompassed the overall elements. Through selective coding, a central code was selected to organise and integrate the remaining codes, employing the parts and relationships of the coding (Flick, 2009). This process transformed the codes into aggregated concepts, allowing for the abstraction and construction of theory based on the real-world content derived from qualitative interviews (Saldaña, 2021).

To ensure rigor, the coding process considered not only interviews transcripts but also information from strategic and retrospective meetings, direct observation notes, and secondary sources (Gioia et al., 2013) to include all empirical materials collected.

Results and Discussion

Impact on organisational learning capability

The application of Lean Startup principles promotes organisational learning in RTOs, following the work linking both constructs by Contigiani and Levinthal (2019).

Consequently, Lean Startup has increased the organisational learning capability through direct experience and trial-and-error experimentation. This, in turn, has led to the modification of existing routines and beliefs (Levitt & March, 1988), increasing the likelihood of using successful routines and discarding those that were previously established. In this regard, participant #02 notes, “As we include new methodologies and adopt more agile ways of working, we are all learning. At the strategic level, you can see how people in [...] continuously change their behaviour. I see it with the [product ---] team”. A similar perspective is shared by participant #04, who states “[...] in general, individuals who have participated in the internal challenges have had a positive learning experience, and they now perceive things differently. In some cases, they approach their activities in projects or developments in a different way”.

The outcomes of the process of Lean Startup adoption have consolidated the results, and individuals involved in the process have permanently modified their routines, as indicated by Dodgson (1993). In this sense, participant #11 explains “I believe it is important to achieve results, regardless of whether they were successful or not. It is about the 'things have happened,' different things have occurred, and I have noticed that by doing things differently, I reach positive or negative conclusions sooner. This has motivated many people to want to learn, as nobody likes to spend 2,000 hours on something that does not work well. I think this mindset has become contagious. [...] It is important not to do it in isolation but rather maintain continuity so that it becomes part of the culture. It must be systematic, and we have to keep doing it continuously”. This change has been observed in all roles participating in processes that involve the adoption of Lean Startup principles, including both technical and marketing-related tasks, as highlighted by participant #14 “[...] right now, I do not consider working in any other way. I expect an early adopter to strongly commit to a solution like the one we are

proposing to ensure a good product-market fit. Just like what we are doing with [value proposition ---], which we are currently exploring and seeking someone to invest in prior to its development".

These perceived improvements enhance the capabilities of the organisation, as pointed out by participant #10: "This creates a kind of virtuous circle, meaning that the positive returns from the Lean Startup initiatives that are already working and opening new markets drive us to become better. This means our organisational capacity is increasing. It is more difficult to assess this at the individual learning level, but when you consider the organisation as a whole, its capacity is growing".

Key learnings from participation in the process

Through participation in the development of new products and services using a Lean Startup-guided process, several important lessons were learned. These lessons, ranked by their degree of importance, include the significance of the practical application of new methods or tools, the value of validation with external stakeholders, the acquisition of market knowledge, the elimination of biases in building the value propositions, and the courage to make decisions.

Regarding the practical application of new methods and tools, it is essential to go beyond theory and find a balance between the value delivered to customers and the resources invested. As participant #05 explains "[...] what I have learned the most is balancing value and effort. In other words, when we prioritised functionalities [of a product] in the past, we used to implement everything a client requested. Now I evaluate the cost of implementing it and consider the actual value it provides".

This direct contact with customers through interviews to confirm hypotheses also allows for deeper learning in relation to different markets and professional profiles, which is difficult to achieve in any other way, as participant #03 stated "Because you

address very different profiles of professionals [...], and not only what you learn from that person's work or the needs they have, but also from other ways of thinking [...]. It helps you focus better on what they are interested in, what is a real need for them, or what is a problem and what is not. You can put more things into perspective". This learning also serves to eliminate biases through a process of building the value proposition, as participant #01 argued, "[some time ago] it was very easy to go into 'no, no, I know what customers want, because I have been working in this sector for several years, and I know this is so' [...]. Now we always are going to test it. They can say 'no, no, but I already know it'. OK, but we must test it".

The last learning is having more courage to perform certain tasks or make decisions. For example, selling a product vision to an early adopter, as participant #06 notes, "For me, the most important learning has been the courage to propose a client to buy a product before we have something".

Dimensions of organisational learning capability and their relationship to the adoption of the Lean Startup approach

The research suggests that the implementation of Lean Startup principles in the products and services development processes improves the organisational learning capability in RTOs, considering the facilitating dimensions developed by Chiva et al. (2007). Three of these dimensions, experimentation, interaction with the external environment, and risk taking are directly linked to the adoption of Lean Startup principles, while dialogue and participative decision making are related to the way in which principles have been adapted to the context and mode of operation of the organisation under study.

Experimentation

The relationship between experimentation and the Lean Startup approach is strong and

positive, as it connects with the fourth principle related to the use of the BML iterative cycle, that describes the process of continuous experimentation of value propositions through the definition of MVPs to verify whether an idea has achieved the product-market fit, as participant #13 points out "[...] the process allows you to experiment both at a technical level and at a market level". In this sense, participant #08 notes "[The] Lean Startup approach, from the methodological point of view, allows creating a kind of 'sandbox', controlled spaces for experimentation. All the internal challenges that have been done, all the ones we are working on, for me, are controlled spaces for experimentation". The importance of experimentation has been welcomed by the organisation, which is looking for new ways to test value propositions and evolve them at a low cost in terms of resources and time.

Interaction with the external environment

The relationship with the Lean Startup approach is strong and positive, as the interaction with the external environment is intrinsic in the formulation and validation of new products and services proposals. Similar to experimentation, it is connected with the principle of validated learning in Lean Startup, which proposes a process of searching for evidence that helps an organisation discover its business model by understanding what customers want (Batova et al., 2016). This involves understanding and evolving towards more favourable positions for understanding the value proposition and the needs or issues of potential customers. Regarding the relationship with the environment, participant #08 indicates, "[...] for me, the external environment is synonymous with market. It is clear when we are going out to validate the desirability of our value propositions, we are talking about this […]. We are talking to a changing external environment with high uncertainty: what is happening, how stakeholders make decisions, and what they want". This search for knowledge to validate value

propositions leads to going beyond the boundaries of the known markets for the organisation, opening up to new agents and unexplored sectors, as pointed out by participant #05 “[...] there is greater interaction with the environment, [...] even with sectors where we had no contact, or because we always asked the same clients, and so here we are trying to cover other types of sectors, other types of clients”.

Dialogue

The creation of multidisciplinary teams for the validation of value propositions, diverse in profiles and skills, as well as different in terms of belonging to different functional areas of the organisation, has led to greater internal dialogue and discussion, as well as more knowledge transfer. Thus, the use of the Lean Startup approach in the RTO has had a strong and positive relationship with the analysed construct. As pointed out by participant #10, “[internal dialogue] is a necessary condition, or at least, in a model where what happens is that the culture of the organisation changes. If there is no internal dialogue, you can have pools of innovation separated from the rest of the organisation, but I believe that the organisation is more interested in having internal dialogue. Although innovation falls to defined teams of people who have a specific task, the rest of the organisation is at the service, supporting and learning from them. If you look at day-to-day management, internal dialogue is essential because some people, for example, have a dual role: one in an innovation project of this kind using Lean Startup, and another in portfolio projects with clients. To whom do they report? If there is no internal dialogue, it is very difficult”.

Likewise, the teams share an understanding of the problems analysed from multiple perspectives that provide a common vision and objectives. The close work in all the phases proposed in the Lean Startup process, from the conceptualisation to the launch of a new product or service, fosters greater communication between team

members, with autonomy to decide the role that each person assumes in the team, as noted by participant #11, “Self-organised teams in charge of validating value propositions had to decide among themselves who was the CEO, who assumed the role of CTO, and who talks to the client, and all apart from the structure of the organisation. So that a CEO could be someone who is hierarchically below in the organisation of a person who also participates in that team”.

Participative decision making

The use of methodologies and tools promoted in the RTO, along with the adoption of Lean Startup principles, aims to improve this dimension. In so doing, there is a strong relationship between them, as the process supports the decision making of teams working on validating value propositions through the Lean Startup approach. This decision making is based on data collected from market interactions and benchmarking analysis, leading to conclusions that are not based on hierarchy but rather on the experience or role of individuals within the team.

In addition, delegating decision-making authority to people beyond their defined responsibilities within the organisation fosters motivation, as participant #03 points out, “[...] I believe that the confidence in the team is the key to motivation. Trust, given by the management team and the freedom to work on something one believes in is very beneficial, even if it is not directly related to one's assigned job functions. It allows for the development of ideas and progress with value propositions that would otherwise be difficult to achieve without a specific organisational forum”.

However, while the relationship between this dimension and the application of Lean Startup principles in the RTO is strong and positive, the freedom of decision making by the teams formed to validate value propositions is influenced by how the

principles have been adapted in the RTO. It is not a defined and embedded aspect of the Lean Startup framework, as *Dialogue* dimension.

Risk taking

The application of Lean Startup principles in the RTO makes the explicit recognition of assuming errors as an implicit aspect of innovation. Errors are understood as negative responses from the market that may require the discarding of a proposal or pivoting. However, mechanisms are put in place to ensure the organisation's viability: this involves taking small steps where errors are tolerable but managed in a controlled manner, as continuous evaluation allows decisions to be made based on objective information without jeopardising significant personal and economic resources or damaging the RTO's reputation. As participant #03 highlights, "[…] I believe we have taken risks in a controlled manner. When presenting new ideas to the market, including our current clients, there exists a specific perception they hold of the organisation. Introducing new concepts may even challenge their existing perception of us".

In addition, to be better prepared for risk taking, the organisation is clearly aware of the protection provided by the institution itself, which offers a stable environment for workers applying Lean Startup principles. Individual responsibility is dissociated and transferred to the work team, as pointed out by participant #13, "[…] when people see that it is a group vision, not something that their manager has to assess, they are more prepared to assume risks. It is not a risk that you take alone, so it is easier […] as long as the management team is perceived to be supportive". Additionally, close contact between the teams working on Lean Startup principles for the development of new products and services, and all market stakeholders, improves the understanding of risks among team members. This enables them to feel comfortable experimenting, as explained participant #02, "[...] I believe that the concept of risk taking is better

understood internally. It is not about taking more risks, but understanding them better, allowing for better decision making". This suggests a strong and positive relationship between Lean Startup principles and this dimension as part of the BML cycle.

Conclusions and future research directions

The application of Lean Startup principles in an RTO has led to organisational learning through direct experience by means of trial-and-error experimentation. This has resulted in the modification of existing routines and beliefs (Levitt & March, 1988), increasing the likelihood of using routines associated with successful goal achievement while leaving behind previously established ones. Our findings suggest and provide evidence that the use of the Lean Startup approach has positively impacted all the facilitating dimensions of organisational learning capability as developed by Chiva et al. (2007).

These findings have significant academic implications. While learning is already recognised as a crucial element within the Lean Startup process, our research suggests that adopting Lean Startup in a research-oriented organisation boosts its organisational learning capability. This creates a virtuous cycle, wherein Lean Startup adoption further enhances organisational learning capability, thereby benefiting subsequent Lean Startup projects. These findings contribute to the existing knowledge about Lean Startup and advance the field towards a consensus on its usefulness and limitations.

From a managerial perspective, this paper provides a comprehensive description of the strategic decision implementation in a research-oriented organisation. So, this research highlights the benefits of Lean Startup adoption, which can be valuable for other research-oriented or high-tech organisations.

However, this research is not without limitations, which opens opportunities for future research directions. The research relies on a single case study, which often limits the generalizability of the results (Creswell & Creswell, 2017; Yin, 2013b), despite

following the procedures and techniques defined by Corbin and Strauss (2015) during its execution. To enhance the external validity of the results, the sample analysed should be extended and multiple case studies should be conducted involving other RTOs in which the Lean Startup approach is adopted. The extension of the research context from the Region of Valencia to other regions or countries with different models of innovation support would also increase the robustness of the findings. Additionally, it would be beneficial analyse the applicability of the keys and procedures described for efficiently applying Lean Startup principles and its relation to organisational learning in other R&D environments, such as universities or public research institutions, while also comparing the results with R&D departments of companies.

Exhibits

Exhibit 1. Lean Startup Build-Measure-Learn cycle. Source: own elaboration based on Ries (2011).

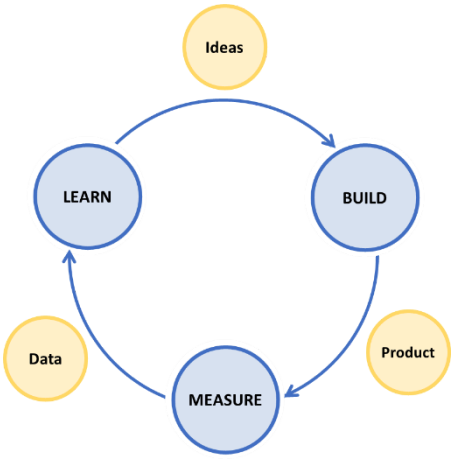

Exhibit 2. Methods used to collect data and time periods in which they were used.

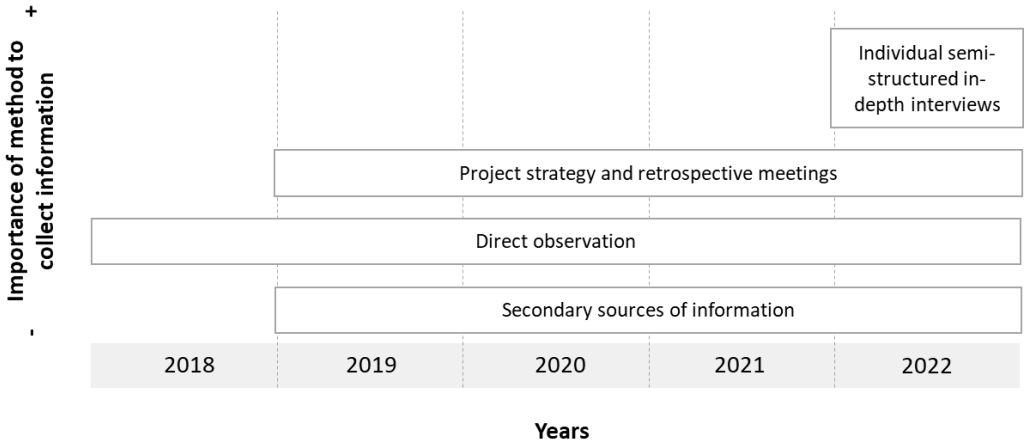

Exhibit 3. Interviews information organised by roles.

Role	People interviewed	Date of the interviews	Duration of interviews (sum)	Number of words (sum)
Top Management Team	3	27/07/2022 01/09/2022 29/09/2022	298 minutes	22,527
External consultant	1	25/07/2022	92 minutes	7,926
Validation team of new business ideas	3	02/03/2022 09/03/2022 07/04/2022	252 minutes	21,930
People involved in new products and services	6	05/04/2022 06/04/2022	467 minutes	46,960

Role	People interviewed	Date of the interviews	Duration of interviews (sum)	Number of words (sum)
development processes using Lean Startup		09/09/2022 03/10/2022 07/10/2022 14/11/2022		
Non-participants in the products and services development processes using Lean Startup	2	27/07/2022 10/11/2022	144 minutes	11,475

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