Lean Startup and Learning Loops in Entrepreneurial Ventures: A Systematic Review

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The lean startup embraces experimentation and validated learning as part of the entrepreneurial search effort. Scholars situate it within the Learning School of Strategy (Bortolini et al., 2018; Mintzberg, 1978) and report that it intersects with multiple organizational learning areas (York, 2022). Of interest is the relationship of lean startup, its iterating and pivoting actions, and continuous experimentation with learning loops (single-, double-, and triple-loop) in the entrepreneurial setting. This systematic review, with guidance from Tranfield et al. (2003), Preferred Reporting Items for Systematic and Meta-Analyses (Moher et al., 2010), and the International Journal of Management Reviews, identified evidence around these relationships. This effort used preset criteria to screen citations from three portals (ABI/Inform, EBSCO, and SCOPUS) and Snowball collection per Wohin (2014). This effort identified 41 publications (19 systematic, 22 snowball). This review finds direct and suggestive evidence concerning the interrelationships of lean startup, its actions, and processes with the learning loops. Also, it posits a model involving lean startup and the three learning loops and offers questions for further exploration.

Keywords: lean startup, learning loops, new venture, organizational learning, systematic literature review, triple-loop learning

INTRODUCTION

Learning offers an essential basis for scholars to examine the entrepreneurial process (Corbett, 2008; Minniti & Bygrave, 2001; Politis, 2005; Shepherd et al., 2000; Wang & Chugh, 2014). Entrepreneurial learning represents an integral bridge between entrepreneurship and organizational learning (Wang & Chugh, 2014). Experimentation, a form of exploratory learning (Huber, 1991), is particularly interesting due to the popularity of the lean startup, a hypothesis-driven approach for testing assumptions (Ries, 2011) that situates within the Learning School of Strategy (Bortoini et al., 2018).

Organizational learning reflects a firm's embedded knowledge change from acquired experiences (Argote, 2011; Fiol & Lyles, 1985; Huber, 1991). It intersects with the lean startup in multiple areas (Aminoff and Pihlajamaa, 2020; Bocken et al., 2018; Bortolini et al., 2018; Contigiani and Levinthal, 2018; De Cock, Bruneel and Bobelyn, 2020; Leatherbee and Katila, 2020; Mansoori, 2016, 2017; York, 2022).

There is a need to extend these prior works. Such an effort can occur by focusing on the behaviors, actions, and processes involved with the lean startup. The organizational learning concept of learning loops (Bateson, 1972; Tosey et al., 2012), tying in with behavioral psychology (Argyris and Schon, 1974, 1978), provides a valuable lens. This area covers single-, double-, and triple-loop learning (Argyris and Schon, 1974, 1978; Bateson, 1972; Tosey et al., 2012). Several lean startup-related works (Aminoff & Pihlajamaa, 2020; Bocken et al., 2018; Furr & Dyer, 2014; Ganguly & Euchner, 2018; Hwang and Shin, 2019; Mansoori, 2016, 2017) discuss aspects of learning loops. None directly or indirectly maps the method, its actions, and/or processes with these loops within the entrepreneurship setting.

This observation offers an opportunity to examine the relationship between lean startup and learning loops in this setting. It leads to research questions relevant to the methodology, actions, and/or processes' engagement with these learning loops. Most specifically, what direct and suggestive evidence exists concerning this relationship? Accordingly, this paper's contributions include a map of the current evidence and a proposed model describing interrelationships.

Hence, this paper charts the following course. It starts with a literature framework and study methods. Next are two literature streams and a discussion of relevant insights, limits, and emerging outputs for exploration.

LITERATURE FRAMEWORK

Lean Startup

The lean startup refers to a popular practitioner-driven, hypothesis-based approach Eric Ries (2011) developed to identify scalable products and business models. The method begins with an entrepreneurial vision to define the new venture's focus and ideas, which the entrepreneur translates into falsifiable hypotheses (Eisenmann et al., 2011; Ries, 2011) for experimentation and exploratory learning (Eisenmann et al., 2011; Huber, 1991). This effort embraces a "build-measure-learn" (BML) cycle to test these hypotheses (Eisenmann et al., 2011; Ries, 2011). Testing involves a minimum viable product (MVP), a "bare-bones" set of features to evaluate early customer engagement (Moogk, 2012), and driving one BML cycle with minimal time and effort (Ries, 2011). This effort engages metrics (Croll & Yoskovitz, 2013; Eisenmann et al., 2011; Ries, 2011).

Learning is core to the methodology. Critical is the entrepreneur's reflection on the experiment's results (hypothesis dis/proof) (Eisenmann et al., 2011; Ries, 2011). This effort leads to pivoting, iterating, persevering, or exiting actions (Camuffo et al., 2020; Eisenmann et al., 2011; Ries, 2011). Two critical actions—iterating (minor) and pivoting (major) (Bortolini et al., 2018; Ries, 2011) - reflect learning when outcome and expectation mismatches occur (Argyris & Schon, 1978). This process continues until the entrepreneur validates product and/or business model traction, leading to product/market fit (P/MF) (Blank, 2005; Kerr et al., 2014; Leatherbee and Katila, 2020).

Scholars situate the lean startup within organizational learning (Bortolini et al., 2018; Contigiani & Levinthal, 2019; Mansoori, 2016, 2017). York (2022) maps out eight areas of intersection. Bortolini and colleagues (2018) connect it with Mintzberg's (1978) Learning School of Strategy. Contigiani and Levinthal (2019) tie in the exploration-exploitation trade-off, experimentation, search, and feedback dynamics. Others discuss search (exploration) and execution (exploitation) (Blank, 2005, 2013; Leatherbee & Katila, 2020; Shepherd & Gruber, 2021; Yang et al., 2019). Eisenmann et al. (2011) and Ries' (2011) descriptions (BLM) reflect Huber's (1991) and Argote's (2011) acquisition-interpreting-distribution-embedding process. Mansoori and colleagues (2016, 2017) utilize Argyris and Schon's (1978) theory-in-action to explore how entrepreneurs internalize the methodology. McDonald and Eisenhardt (2020) observe the engagement of experimentation and then reflection. Others highlight absorptive capacity's influence on

lean startup use to coalesce around new business ideas (Leatherbee & Katila, 2020) and obtain funding (De Cock et al., 2020). Ghezzi (2020) ties experimentation as part of a sensemaking process.

Levels and Loops in Organizational Learning

An integral piece of organizational learning involves learning levels and loops. Bateson (1972) provides the foundation for these concepts via his hierarchical framework for analysing the structure of learning. In this model, each level embraces greater complexity (Romme and Van Witteloostuijn, 1999), with each level looping back to enhance the previous level (Tosey and Mathison, 2008; Tosey, Visser and Saunders, 2012).

Argyris and Schon (1978, 1974) apply Bateson's (1972) concepts to organizational learning. Their behavioral theory work lays the foundation for single- and double-loop learning. Single-loop learning refers to behavior specific to action and involves error detection and correction, where the firm stays within accepted routines (Argyris and Schon, 1978). Double-loop learning describes the behavior in which the correction requires the firm (and its actors) to re-evaluate and address the underlying values, mental models, and aspects of the status quo (e.g., policies, procedures, goals, and assumptions) governing its behavior (Argyris and Schon, 1978). Such behavior ties into the feedback process, allowing for realignment when set activities miss aspirations, leading to new routines based on a new perspective (Argyris and Schon, 1978).

Triple-loop (Tosey, Visser, and Saunders, 2012; Visser, 2007; Wijnhoven, 2001), having multiple characterizations, reflects a higher-level process focused on transforming organizations and their employees into "learning how to learn" and implementing (and learning from) single- and double-loop processes more effectively (Fahrenbach and Kragulj, 2019). Visser (2007) refers to this process as adapting behavior to conditioned patterns at the level of relationships within an organization. Accordingly, it challenges an organization's learning frameworks, mental models, and assumptions (Fahrenbach and Kragulj, 2019; Tosey, Visser, and Saunders, 2012). This process links a firm's horizontal and vertical levels into a unified learning organization where members tap into the embedded collective knowledge (Cecez-Kecmanovic, Janson, and Zupancic, 2010), characterizing a learning organization (Jensen, 2005; McClory, Read and Labib, 2017; Snell and Chak, 1998). Within it, firm members identify promoting or inhibiting factors, leading to new approaches to developing knowledge (Cecez-Kecmanovic, Janson, and Zupancic, 2010; Flood and Romm, 1996, 2018; Snell and Chak, 1998). Also, they can engage external stakeholders and communities of practice (Ameli and Kayes, 2011; McLoughlin et al., 2021).

METHODS

This review drew on Tranfield et al. (2003) to address two overarching research questions:

1) What evidence exists concerning the lean startup and learning loops (single, double, and triple)?;
2) What support exists regarding the connection between the lean startup's validated learning actions (pivoting and iterating) and learning loops?

The process engaged (Figure 1) three relevant portals (ProQuest's ABI/Inform Collection, Business Source Complete (EBSCO), and Elsevier's SCOPUS) to capture citations. The systematic search focused on titles, abstracts, and keywords, which utilized the search string: (("lean start*up" OR "experimentation" OR "customer discovery") AND ("entre*" OR "start*up" OR "new venture")) AND (("learn*" OR "org* learn*") OR ("iterat*" OR "single*loop" OR "learning 1" OR "learning I") OR ("pivot" OR "double*loop" OR "learning 2" OR "learning II") OR reflect OR ("deutero" OR "triple*loop" OR "learning 3" OR "learning III")).

FIGURE 1
COLLECTION, ASSESSMENT, AND DISPOSITION OF SCHOLARLY PEER REVIEW CITATIONS FROM THE SYSTEMATIC REVIEW AND SNOWBALL REVIEW PER PRISMA (MOHER ET AL., 2010)

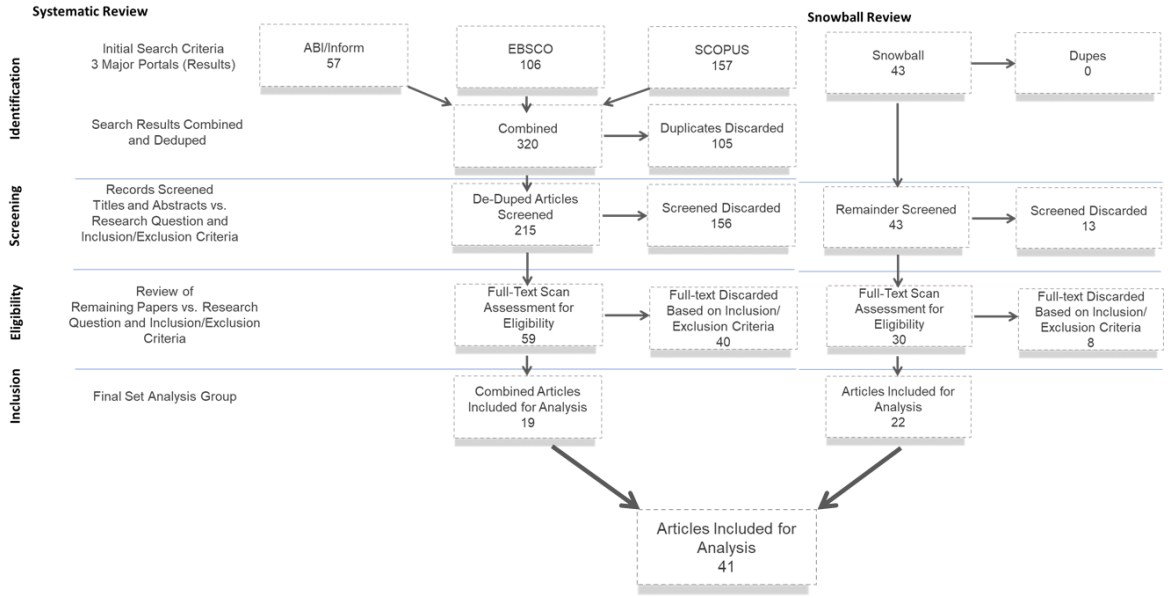


Table 1 provides pre-defined screening criteria used for screening and reviewing titles, abstracts, and papers. Drawing on Preferred Reporting Items for Systematic and Meta-Analyses (PRISMA) guidelines (Moher et al., 2010), this effort resulted in 19 citations for analysis: Bajwa et al., 2017; Balocco et al., 2019; Björklund et al, 2020; Bocken and Snihur, 2020; Bocken et al., 2018; Bohn and Kundisch, 2020; Bortolini et. al., 2018; Brecht et al., 2021; Fagerholm et al., 2017; Ghezzi, 2020; König et al., 2018; Leatherbee and Katila, 2020; Mansoori, 2017; Peralta et al., 2020; Reis et al., 2021; Shepherd and Gruber, 2021; Sull, 2004; Wijaya and Dhewanto, 2019; and Yoo et al., 2021.

The review engaged a snowball sample of 43 articles per Wohlin (2014), drawing on references from the systematic review inclusion set of citations. Screening these citations followed the same process and selection criteria for the systematic phase. This effort contributed 22 articles for analysis: Aminoff and Pihlajamaa (2020); Andries et al. (2013); Blank (2013); Camuffo et al. (2020); Contigiani and Levinthal (2019); Felin et al. (2020); Flechas et al. (2021); Frederiksen and Brem (2017); Ghezzi (2018); Ghezzi and Cavallo (2020); Grimes (2018); Kaffka et al. (2021); Kirtley and O'Mahony (2020); Marvel et al. (2020); McDonald and Gao (2019); McDonald and Eisenhardt (2020); Melegati et al. (2020); Nambisan (2017); Peralta et al. (2020); Sadeghiani et al. (2021); Sarasini and Linder (2018); and Wood et al. (2019). The final analysis set (systematic and snowball) comprised 41 publications.

Quality assessment drew on PRISMA (Moher et al., 2010) and reviewers' guidelines from the International Journal of Management Reviews. Such considerations included 1) the soundness of the citation's arguments, 2) the robustness of the study's methods, and 3) the validity of the paper's conclusions. 4) the provenance of the source, and 5) the journal's quality for the citation.

The analysis was consistent with the two research questions and evaluated citations to provide evidence that:

1) Directly connected lean startup (business experimentation or business model innovation) or the methodology's actions (iterating, pivoting) or processes with specific learning loops based on the textual content, specifically around the results and data;
2) Suggesting a relationship due to inferences or indirect support gleaned from the material within the paper, such as in the introduction, literature frame, results, and discussion sections.

TABLE 1
PRESET SELECTION CRITERIA FOR SYSTEMATIC AND SNOWBALL PHASES

Inclusion	Exclusion
1. Language: English 2. Period: Open 3. Document type: Peer review and high-level practitioner journals. 4. Focus: 1) Business or venture experimentation, business model innovation, or the lean startup; AND 2) entrepreneurship, new venture, or startup setting; AND 3) iteration, reflection, or pivot; OR 4) learning levels (0-IV), single-, double-, or triple-loop or deutero learning, 5. Type: Empiric, review, or theoretical contribution.	1. Document types: Newspapers, magazines, educational editorial pieces, supplement introductions, book reviews, conference papers, class notes, teaching case studies, OR where full text was not available 2. Focus 1) Entrepreneurship training in academia or accelerator that does not show learning in the startup or refers to the teaching of the "lean startup" or part of researching entrepreneurship (not lean startup with real startups); 2) artistic, financial, farming, or management consulting application without using lean startup or business experimentation; 3) learning or Organizational learning but does not consider lean startup or business experimentation; 4) non-business experimentation processes; 5) non-levels (or loops) of learning Organizational learning or learning; effectuation or causation; 3. Setting: 1) Institutional (academic, accelerator, government, corporate, defense, franchise, legal, regulatory, political, established small-to-medium enterprise, manufacturing, political, public sector, health care, public health, academic, non-governmental organization); OR 2) entrepreneurship development settings (e.g., accelerators, incubators, academic, living labs, and other habitats); OR 3) non-entrepreneurial startups. 4. Search considerations: 1) Use of the words "lean" and "startup", but not sequentially, to refer to the "lean startup"; OR 2) inclusion focuses criteria 1 and 2 do not consider criteria 3 OR 4.

THEMATIC ANALYSIS

Lean Startup and Learning Loops

Table 2 outlines current direct and suggestive evidence concerning the relationship between the lean startup and learning loops (single, double, triple) within the entrepreneurial setting.

TABLE 2
MAPPING THE LEAN STARTUP LITERATURE RELATIVE TO LEARNING LOOPS WITHIN THE ENTREPRENEURIAL SETTING BASED ON THE DEGREE OF EVIDENCE FOUND WITHIN PEER-REVIEW PUBLICATIONS

	S	D	T	Evidence
Aminoff & Pihlajamaa (2020)	√	*	√	Circular business models and experimentation study identifies direct evidence of multiple forms of SL and discuss TL as a resolving approach.
Autio (2017)			*	Business experimentation in online user communities fosters collective experimentation and exploration, leading to positive relationships in evaluating specific technologies and opportunities and triggering entrepreneurial action.
Balocco et al. (2019)		*		Lean startup activities identify the strategic change needed and those for executing such changes.
Bocken & Snihur (2020)			*	Lean startup facilitates a continuous effort and experimentation as a strategic organizational process to aid ventures in addressing environmental and societal grand challenges.
Bocken et al. (2018)			*	Ongoing experimentation (with learning loops) involving a circular business model innovation provides internal and external traction that facilitates sustainability transitions. Also, it accentuates the need for sustainable business model innovation as a continuous process and for such efforts to become an internal capability.
Bohn & Kundisch (2020)		*		Digital startups abandon their initial strategies for new courses, some of which involve more radical change.
Fagerholm et al., (2017)			√	RIGHT (Rapid Iterative value creation Gained through High-frequency Testing) model for continuous experimentation in the software setting.
Ghezzi (2018)	*	*	*	The study found Incremental delivery of features as a concept drawn from the qualitative portion of his mixed methods investigation of digital startups. It saw pivoting all business model parameters as a primary advantage of the lean startup activities in over 50% of the survey respondents. No one ever stops pivoting and iterating in digital. Discussion recommends continuous implementation of lean startup activities whenever the context is uncertain.
Ghezzi (2020)		*		The research uses the business model as a cognitive lens of the innovation process. Highlights pivot with experimenting and market feedback. Both are part of the sensemaking cycle.
Grimes (2018)		*		The paper finds sensemaking and creative revision in response to customer and other actor feedback in an accelerator.
Kaffka et al. (2021)		*	*	Find support for continuous hypothesis testing and validating assumptions underlying the methodology. Ties in sensemaking/sense breaking

	S	D	T	Evidence
Leatherbee & Katila (2020)		√		Found that the new information gained from customers made the teams revisit the original cause-and-effect relationship
Mansoori (2017)	√	√	*	Founders use and embed single-loop learning at the individual and team levels to handle frequent minor and significant changes based on close customer interactions. Observe that modifying the governing variable (allowing for frequent changes if necessary) influenced using and internalizing the corresponding action strategy (rigorously evaluating and communicating customer engagement feedback). Reports that a learning-oriented mindset and embracing the experimental nature of the process suggest higher-order learning.
McDonald & Eisenhardt (2019)		*		The "parallel play" framework includes experimentation followed by a reflection, leading to business model innovation and strategic pivots.
Nambisan (2017)			*	Digital entrepreneurs can form, enact, expand, and re-enact through repeated experimentation cycles, thus blurring the lines between the start and completion of testing phases.
Peralta et al., (2020)		*		Entrepreneur farmers modify their business model and pivot to an alternative to the initial product, broadening its scope to a product-service system.
Reis et al. (2021)		*		Highlights the need for pivoting and restarting context research.
(Sarasini & Linder, 2018)		*		"Strategic" activities involve adaptable, long-term visions considering societal complexities and the role of niches as sites within a firm for experimentation with new regulatory structures.
Silva et al. (2020)			*	This work reinforces Bocken and Snihur's (2020) observations when discussing experimentation's ability to facilitate transitions and an entrepreneurial atmosphere due to these efforts' low-resource, small-scale nature.
Trimi & Berbegal-Mirabent (2012)			*	Explain that the next step involves optimizing the process once the testing of hypotheses occurs and then incorporates learning into an actual product—multiple tech startup examples from Ries' (2011) book.

D- Double loop, S- Single loop, T- Triple loop. √ Direct Evidence. *Suggestive Support.

Single-Loop

The review finds two direct and one suggestive contribution. Focusing on vicarious and experiential learning in an accelerator using the method, Mansoori (2017) highlights how founders use and embed single-loop learning at individual and team levels to handle minor and significant changes from customer interactions. Aminoff and Pihlajamaaa (2020), investigating a recycling startup case, identify four single-loop learning forms: confirming, developing, prioritizing, and exclusion. Ghezzi's (2018) mixed-methods qualitative data offers suggestive evidence noting the incremental delivery of features.

Double-Loop

Similarly, limited direct evidence exists. Mansoori (2017) finds that customer interactions and analysis tools to evaluate feedback led to insights translating essential modifications of the governing variables, influencing the use and internalization of the corresponding action strategy. Leatherbee and Katila (2020) find that the new customer information aids in revisiting the original cause-and-effect relationship, leading to the questioning of prior beliefs, generating a more robust analysis, and establishing new hypotheses. Aminoff and Pihlajamaa (2020) observe that the recycling startup's members embrace new perspectives and question the venture's governing variables. While these authors identify three forms of double-loop learning (out-of-the-box ideas, mental model changes, and widespread change), they find limited support (one testing a new idea in Experiment B and one involving out-of-the-box ideas in Experiment C) (Aminoff and Pihlajamaa, 2020).

Several contributions offer suggestive evidence. Reis et al. (2021) highlight the need to pivot and restart context research at the end of the idea generation phase. Bohn and Kundisch (2020) observe that digital startups abandon their initial strategies for new directions, some involving more radical changes. Balocco (2019) finds that lean startup activities identify the strategic changes needed and are requisite for executing such modifications. Ghezzi (2018) reports that pivoting all business model parameters is a primary advantage of the lean startup in over half the respondents. Sarasini and Linder (2018) observe that "strategic" activities involve adaptable, long-term visions and consider societal complexities and the role of niches as sites within a firm for experimentation with new regulatory structures. Finally, Peralta et al. (2020) find that entrepreneurial farmers modify their business models and pivot to an alternative product, broadening their scope to a product-service system.

Sensemaking and reflection works are suggestive. Ghezzi (2020), when examining the business model as a cognitive lens part of the innovation process, finds that pivots with experimenting and market feedback are part of sensemaking. Grimes (2018) and Kaffka et al. (2021) focus on sensemaking in response to feedback from team members and other program participants. McDonald and Eisenhardt (2020) observed that experimentation followed by a reflection leads to business model innovation and strategic pivots.

Triple-loop

Limited evidence exists concerning triple-loop learning. Aminoff and Pihlajamaa (2021) find that it emerges as a significant learning area based on the participants' reflections on the experiments and results, generating methods and process insights for future endeavors. This work identifies four triple-loop forms: challenge design, participant selection, participant motivation, and resources and tools (Aminoff and Pihlajamaa, 2020). This process could empower firms to overcome challenges in building a sustainable, circular economy and business model innovation process (Aminoff and Pihlajamaa, 2020). In describing the RIGHT (Rapid Iterative value creation Gained through High-frequency Testing) model for continuous experimentation in the software setting, Fagerholm et al. (2017) provide additional evidence by identifying conditions for its effective use and challenges around experimentation in product and process development efforts.

Others provide suggestive evidence. Autio et al. (2013) find that business experimentation in online user communities fosters collective experimentation and exploration. This effort leads to positive relationships by evaluating specific technologies and opportunities and triggering entrepreneurial action from these interactions. Trimi and Berbegal-Mirabent (2012), citing multiple examples of successful technology firms embracing this approach, explain that the next step is optimizing the process once the hypotheses are tested and incorporated into an actual product. Ghezzi (2018) highlights that no one stops pivoting and iterating in digital. He also recommends continuously implementing lean startup activities whenever the context is uncertain (Ghezzi, 2018). However, this scholar highlights in his opportunity space figure a transition point from iteration to planning once the firm reaches P/MF (Ghezzi, 2018). Nambisan (2017) explains how digital entrepreneurs can form, enact, expand, and re-enact through repeated experimentation cycles, thus blurring the lines between the start and completion of testing phases. Silva et al. (2020) add that experimentation's organizational effects facilitate a transitional and entrepreneurial atmosphere due to its low resources and small-scale characteristics.

Concerning circular business modeling, Bocken et al. (2018) find that ongoing experimentation provides internal and external traction to facilitate sustainability transitions. They accentuate the need for sustainable business model innovation as a continuous process and for such an effort to become an internal capability (Bocken et al., 2018). Bocken and Snihur (2020) advocate the lean startup as a facilitator of continuous effort and experimentation as a strategic organizational process to aid ventures in addressing environmental and societal grand challenges.

Two final contributions add insight. Mansoori (2017) suggests triple-loop learning by including observations around learning orientation and embedding the experimental nature of the process. Kaffka and colleagues (2021) find support from entrepreneur diary notations documenting continuous hypothesis testing and validation assumptions over a year.

Pivoting, Iterating, and Learning Loops

Table 3 outlines direct and suggestive supports involving pivoting and iterating, as well as the three learning loops.

TABLE 2
MAPPING, ITERATING, AND PIVOTING WITH LEARNING LOOPS

	Iteration		**Pivoting**	
	Direct	**Suggestive**	**Direct**	**Suggestive**
Single-loop	NA	Bortolini et al. (2018) Blank (2013), Brecht et al., (2021),Fangerholm et al. (2017), Felin et al. (2019), Konig et al. (2019), Shepherd & Gruber (2020), Sull (2004), Yoo et al., (2021)	NA	Andries et al. (2013), Felin et al. (2020), Ghezzi & Cavallo (2020), Kirtley & O'Mahony (2020), Wood et al. (2019)
Double-loop	NA		Flechas Chaparro & de Vasconcelos Gomes (2021), Kirtley & O'Mahony (2020), Leatherbee & Katila (2020)	Blank (2013), Bocken et al. (2018), Bortolini et al. (2018), Fagerholm et al. (2017), Felin et al. (2019), Ghezzi (2018), Ghezzi & Cavallo (2020), McDonald & Gao (2019), Wood et al. (2019)
Triple-loop	NA	Blank (2013), Björklund et al. (2020), Björklund et al. (2020) Brecht et al. (2021), Fangerholm et al. (2017), Felin et al. (2019), (Ghezzi &	Bocken et al. (2018) Fagerholm et al. (2017), Chaparro & de Vasconcelos Gomes (2021),	Trimi & Berbegal-Mirabent (2012)

	Iteration		Pivoting	
	Direct	**Suggestive**	**Direct**	**Suggestive**
		Cavallo, 2020), Shepherd & Gruber (2020), Sull (2004), Wijaya & Dhewanto (2019), Yoo et al. (2021)		

Pivoting

The evidence appears limited. Leatherbee and Katila (2020) note that pivoting can occur as new information facilitates the founding team to revisit its initial assumptions, conduct a more robust analysis, question prior assumptions, and develop new hypotheses. Chaparro and de Vasconcelos Gomes (2021) propose a theoretical framework with recursive loops entailing failure, failure recognition, generating options, testing, reconfiguration, and an updated business model. Ghezzi (2018) reports that half of his study respondents indicated pivoting business model parameters as a primary lean startup advantage.

Most support is suggestive. McDonald and Gao's (2021) work involving strategic reorientation exemplifies indirect connections between business experimenting and pivoting. Other scholars connect their works involving pivoting with continuous experimentation, suggesting triple-loop learning. Bocken and colleagues (2018) describe a continuous approach to circular business models, experimenting and pivoting in their case study series involving startups in sustainability. Fangerholm et al. (2016) emphasize software product development when discussing continuous experimenting and pivoting using the RIGHT model. Trimi and Berbegal-Mirabent (2012) accentuate the value of pivot experiments involving the business model and product as a continuous development process. These authors also note that successful tech firms (e.g., software) embrace this approach (Trimi and Bergegal-Mirabent, 2012). Andries et al. (2013) highlight that pivoting can occur as part of a series of deliberate, simultaneous, inexpensive experiments to enhance the search process.

Iterating

The iterating literature covers iterating but is not as extensive as pivoting. Like pivoting, limited direct evidence exists, and most provide suggestive support.

The definition of iterating involves multiple testing cycles, which suggests numerous individual events or experiments linked in continuous experiments, such as triple-loop learning efforts. Brecht et al. (2021) state that the next iteration of their Smart Platform Experiment Cycle (SPEC), situating the lean startup methodology, is the next testing cycle. Björklund and colleagues (2020) reinforce this view by referring to multiple iterations and repetitions. Konig et al. (2019) refer to iteration cycles describing digital startups trying to solidify their products and business models. Wijaya and Dhewanto's (2019) enterprise resource planning case involves multiple iterations of hypotheses around customer/product/solution and P/MF using the Javelin Validation Board. Finally, Ghezzi and Cavallo's (2020) study refers to iterating (a second-order theme) as the testing cycles of a modified product.

The characterization of a minor, iterative change suggests that of a single-loop process. Bortolini et al. (2018) refer to iteration as a less radical change in either the business model or product to test further. Felin and colleagues (2020) refer to it as a short-sighted, incremental change and note the complete movement relative to their comment on foreclosing on other options.

Some contributions use both definitions, suggesting both single- and triple-loop learning. Multiple scholars (Blank, 2013; Fangerholm et al., 2017; Felin et al., 2020; Ghezzi and Cavallo, 2020; Shepherd and Gruber, 2020; Sull, 2004; Yoo et al., 2021) refer to iterating using both - as running multiple testing cycles or series of experiments involving incremental change (i.e., iterative) per Ries (2011). Bortolini et al. (2018) note how a venture approaches a viable, sustainable state, tying in the cycles of testing meaning.

DISCUSSION

Contributions and Literature Considerations

This work extends the lean startup and organizational learning literature, which has multiple intersection points (York, 2022), and situates the methodology within the Learning School of Strategy (Bortolini et al., 2018; Mintzberg, 1978). It explores the evidence around the relationship of the lean startup (and its actions) with learning loops within the entrepreneurial setting.

This paper's first contribution involves mapping the evidence and determining whether it is direct or suggestive regarding the lean startup literature in the entrepreneurship space with learning loops. This effort delineates the method's relationships with learning loops in the entrepreneurship (not institutional) space. It charts the lean startup literature specific to pivoting, iterating, and continuous experimentation. This work finds both direct and suggestive evidence.

A distinctive finding involves that direct evidence relative to the influence of lean startup methodology and the relationship between validated learning actions (iterating, pivoting) and continuous experimentation to learning loops in the new venture setting appears to be limited. The most notable works are Leatherbee and Katia (2020), Mansoori (2016), and Aminoff and Pihlajamaa (2020). Still, there are limitations. Leatherbee and Katia (2020) link double-loop learning and tie it to pivoting but fail to delve into triple-loop processes. Mansoori (2016) finds that single- and double-loop learning occurs and potential triple-loop application; however, it is unclear whether it is due to the methodology or the setting. Aminoff and Pihlajamaa (2020) find that the case study company embraces single-loop learning but is not as enthusiastic about its use of double-loop learning. These authors propose that triple-loop learning offers a strategy to address some learning issues (Aminoff and Pihlajamaa, 2020).

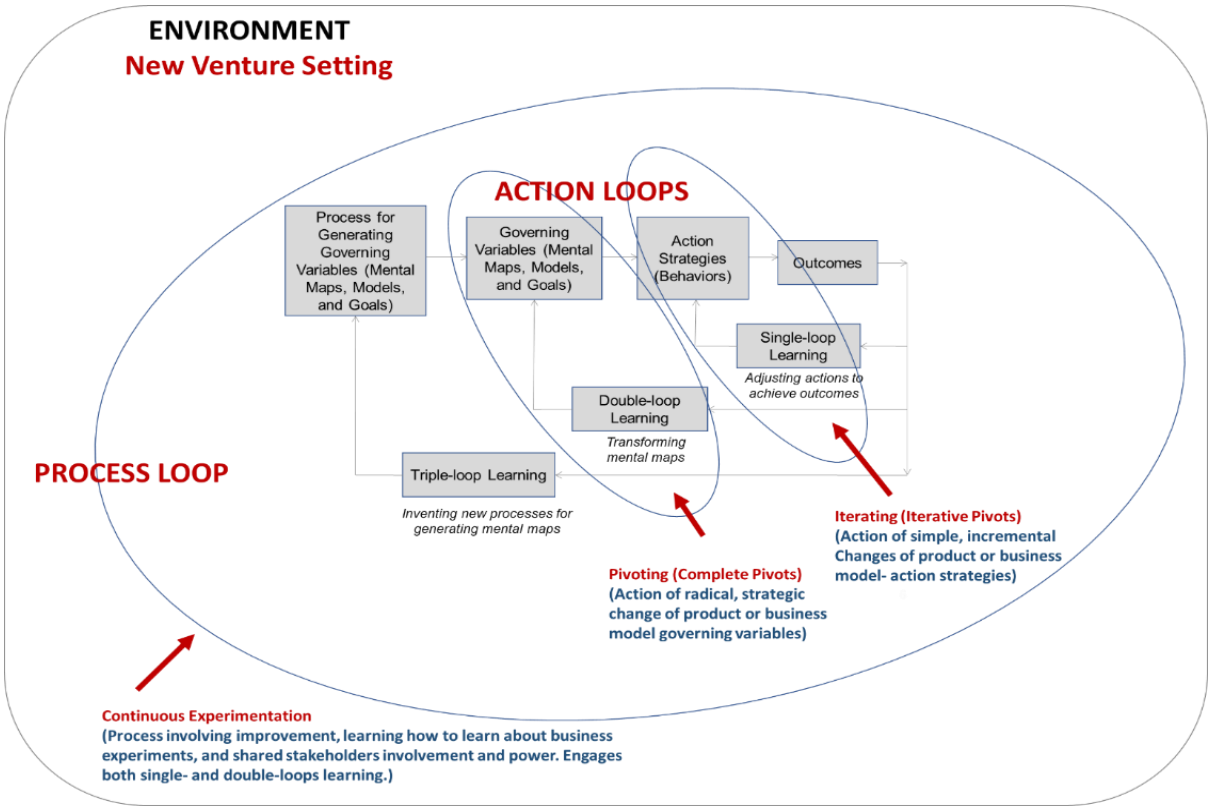
Another observation is that multiple citations suggest support for continuous experimentation, particularly in software and sustainability (Bocken, Schuit, and Kraaijenhagen, 2018; Fagerholm et al., 2017; Fitzgerald and Stol, 2017; Trimi and Berbegal-Mirabent, 2012). This observation is critical since continuous experimentation epitomizes triple-loop learning. Such findings offer an opportunity to investigate the learning process specific to new ventures in these areas related to changes in action strategies, reassessment of governing variables, and developing a 'learning how to learn' culture (Nicoletti, 2015; Thomke, 2020).

An important insight is that the observations involving the entrepreneurship space from this review are not as equivocal as those from the industrial or institutional space. Peer and non-peer-reviewed contributions highlight established firms using the methodology provide a more definitive link to higher-level learning processes: software (Bohnsack and Liesner, 2019; Ellis and Brown, 2017; Fitzgerald and Stol, 2017; Furr and Dyer, 2014; Nicoletti, 2015; Trimi and Berbegal-Mirabent, 2012; Yamin and colleagues, 2017), sustainability (Baldassarre et al., 2017; Bocken et al., 2017; Weissbrod and Bocken, 2017), manufacturing (Supriyanto and Prasetyawan, 2019), and in multinational firms (Frederiksen and Brem, 2017; Ganguly and Euchner, 2018; Hwang and Shin, 2019; Power, 2014; Ries, 2011). This observation offers an opportunity to explore the differences between startups and mature organizations related to these learning processes.

Proposed Model and Research Questions

This paper's second contribution involves a proposed model engaging the validated learning actions (iterating and pivoting) and the process (continuous experimentation) with the three learning loops (Figure 2), along with associated research questions.

FIGURE 2
MODEL CHARACTERIZING THE INTERRELATIONSHIP BETWEEN LEAN STARTUP AND LEARNING LOOPS (ADPTED, SNELL & CHAK [1998])



The first consideration is the setting within the entrepreneurial new venture environment. Second, the model's core involves the three learning loops—single, double, and triple—adapted from Snell and Chak (1998).

The third piece introduces the lean startup methodology's interaction with three learning loops. The first action involves iterating (Bortolini et al., 2018) or iterative pivots (Wood et al., 2019). These represent changes from insights gained through the experiments leading to action strategy revisions—specifically, minor, iterative changes of the product or the business model—reflecting single-loop learning action (Argyris and Schon, 1974, 1978). The second action involves complete pivots (Wood et al., 2019) or radical changes (Bajwa et al., 2017; Bortolini et al., 2018; Ries, 2011) involving product, service, or business model assumptions. Such actions reflect significant changes in governing variables (Argyris and Schon, 1974, 1978).

The final piece involves the process loop, engaging continuous experimentation (Blank, 2013; Bocken et al., 2018; Chaparro & Gomes. 2021; Fagerholm et al., 2017; Trimi & Berbegal-Mirabent, 2012). This element involves 'learning how to learn' about business experiments (Fahrenbach and Kragulj, 2019), democratization (Flood & Room, 1996, 2018; Snell & Chak, 1998), and single- and double-loop learning (Tosey et al., 2012).

This model's relationships prompt questions for future investigation:

1) How do the entrepreneurs' use of the lean startup's validated learning actions (iteration, complete pivots) and the continuous experimentation process tie in with the three loops of learning?
2) How do these learning loop elements interrelate when new entrepreneurial ventures utilize the lean startup?

3) How do internal and external factors influence the progression from lower- to higher-learning loops in entrepreneurial new ventures using the lean startup?

Limitations

Some limits do exist within this analysis. The research strategy could have limited potential contributions. The addition of another portal (e.g., Web of Science) or a broader search strategy could have captured more citations. Nonetheless, this effort drew on a snowball strategy to add literature.

Some concerns might exist about snowballing. These citations emerge from the systematic papers and textual points relevant to the research questions. To assure quality, the examination of these papers follows Wohlin's (2014) guidance and utilizes the same systematic review process using pre-defined selection criteria to examine these additional citations. Such efforts have led to 17 high-quality peer-reviewed (CABS 3 and 4-star) publications and 18 within the last five years.

Finally, mapping might be considered an interpretive effort. While this process employed pre-defined definitions, perhaps a more stringent coding of such data would have helped. Still, the coding process can involve a certain degree of subjectivity. Also, the broad diversity of language relevant to iteration and pivoting in the literature exists and reflects the need for individual interpretation. As literature may not map neatly, this consideration presents an opportunity for future refinement.

CONCLUSION

The lean startup pervades multiple contexts (Contigiani and Leventhal, 2018) and research streams (Bortoini et al., 2018; Silva et al., 2020). Of particular interest is the intersection of lean startup and organizational learning (York et al., 2022). Such led to pursuing this effort, focusing on a particular area that proposes relationships between core lean startup actions and processes and the three learning loops. This work addresses the two core research questions. It finds direct and suggestive supportive evidence, though the literature does not map neatly. This effort also posits a model that overlaps the essential actions of iteration, pivoting, and continuous experimentation with the three learning loops. Associated research questions set the foundation for further investigation into the behaviors, actions, and processes underlying this methodology.

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