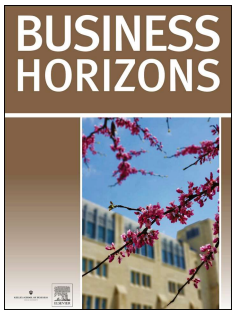

Design-led innovation as a generative source of competitive advantage

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Abstract

Firms need to reliably identify new sources of competitive advantage *ex ante* to mitigate the risk of obsolescence in response to changing environments. One approach to addressing this issue is design-led innovation (DLI), which integrates design thinking with strategic management. DLI offers a flexible framework to identify and exploit new opportunities for competitive differentiation. Identifying, formulating, and framing strategic problems drive the DLI process by acting as the catalyst to create awareness and knowledge of value creation opportunities. This study offers a strategic problem classification matrix based on a portfolio approach to identifying value creation opportunities. Two practices are presented: (1) engaging in progressive-problem-solving; and (2) employing DLI catalysts. These practices could potentially strengthen DLI's application and transform it into a generative source of competitive advantage.

KEYWORDS: Design-led innovation; Problem identification; Problem solving; Competitive advantage

1. Mitigating the risk of obsolescence

The COVID-19 pandemic, Black Lives Matter movement, rapid transition to Industry 4.0, and Russia's invasion of Ukraine are salient examples of disruptive economic, social, technological, and political events that increase environmental turbulence across all industries. These events drive unexpected shifts in customer needs, accelerate competition, and increase product and firm obsolescence (Dugan et al., 2020). Between 1965 and 2020, the average life of an S&P company declined from 32 to 21 years, despite collectively spending billions of dollars to uncover new opportunities to create and capture value (Dawar, 2013; Statista, 2022; Weber, Weggeman, & Van Aken, 2012). Clayton Christensen succinctly sums up the paradox firms face as they strive to mitigate the risk of obsolescence: *"…. the factors that helped the best companies to success – listening responsively to customers, investing aggressively in technology products that satisfied customers' next generation needs – are the same reasons companies fail"* (Rifkin, 2020).

Explaining the drivers of competitive advantage for successful firms *ex-post* is relatively straightforward after the firm has navigated through the fog of uncertainty, when it controls unique resources (Barney, 1991) or leverages market power (Porter, 1985). However, looking backwards into the drivers of market leaders' success does not provide sufficient guidance for practicing managers who must strategize about the future moves of their companies. Instead, firms need to reliably identify opportunities to create sources of competitive advantage (*ex ante*) by navigating through the uncertainty of turbulent business environments. The process involves discovering, targeting, and crafting market positions to generate sustainable profitability and protect the new product from imitation or appropriation (Zenger, 2016). Firms need to maintain a delicate balance between growing the existing business while uncovering new opportunities to create and capture value (O'Reilly & Tushman, 2004).

During periods of higher levels of market ambiguity, design-led innovation (DLI) becomes an effective approach to identifying and capturing new sources of competitive advantage from both incremental and radical innovation (Verganti, 2009; Talke et al., 2009; Dell'Era et al., 2010; Bucolo et al., 2012; Radnejad et al., 2022). DLI is defined as the "union of design and strategy" (Wrigley, 2017, p.235) in which the key principles of design thinking are incorporated into the firm's strategic processes to generate innovation-driven competitive advantage (Wrigley et al., 2020; De Goey et al., 2019; Bucolo et al., 2012; Verganti, 2003). However, organizational contexts tend to undermine the effective problem identification, formulation, and prioritization process. Typically, there is a poor fit between innovative products/services and the firm's existing resources, processes, systems, and culture (Garvin & Levesque, 2006). Many firms fall into the trap of perfecting existing processes and products to satisfy existing customer needs rather than innovating to capture new markets (Cai, Wu, & Gu, 2020; Jaworski & Kohli, 1993; Jayram, Oke, & Prajogo, 2014). 80% of S&P 500 companies tend to over-invest in refining existing products (Uotila, Maula, & Zahara, 2008). To overcome these challenges, the current study offers a strategic problem classification matrix. Then, we propose two evidence-based practices are proposed to transform DLI into a generative source of competitive advantage: (1) *progressive-problem-solving,* or the process whereby expert managers continuously extend their knowledge and capabilities by tackling increasingly complex problems; and (2) *employing DLI catalysts* who adapt and apply DLI best practices and methodologies within an organization to embed change and enhance competitive advantage through context-specific strategies and educational interventions.

2. Creating competitive advantage: The journey

The multi-stage process of responding to environmental turbulence through innovation is presented in Figure 1. Strategically, firms attempt to defend against environmental turbulence by stretching to peek over the time horizon and anticipate how accelerating market competition, economic and social disruptions, technological discontinuities, and/or geopolitical disruptions will impact future demand for their products and services.

[Insert Figure 1 About Here]

Managers try to anticipate how unfolding environmental turbulence will impact customers' emerging needs as they optimize scarce resources to capture new opportunities. However, reaching consensus on the best path forward is challenging. Employees, customers, end-users and other stakeholders often lack the knowledge to evaluate future opportunities and plausible solutions. Customers struggle to articulate what they will need (Tuli, Kohli, & Bharadwaj, 2007). Internally, organizational and cognitive filters undermine the identification, formulation, and prioritization of novel strategic problems. Managers ignore novel strategic problems assuming nothing can be done (Bennett & Lemoine, 2014). They work with mental models of real-world problems framed in the context of managers' existing knowledge, skills, and expertise which causes them to over-simplify or misrepresent the situation (Garbuio & Lin, 2021; Nickerson et al, 2007). As a result, managers misread the environment and prepare to address the wrong challenge (Bennett & Lemoine, 2014), make good enough rather than optimal choices (i.e., satisficing), and fail to uncover the breadth of customer selection criteria upon which their products compete (Danneels, 2004). These factors lead to managers not identifying or giving appropriate weight to the "right" voice at the "right" time, investing in low-risk incremental innovation, and blinding them to radical innovations that could transform their industry. The current study argues incorporating design thinking principles into a firm's strategic processes to generate innovation-driven competitive advantage, or DLI, is a viable mechanism to respond to environmental turbulence.

To illustrate the value of DLI, Dawar (2013) shares the story of how Hyundai developed an uncommon solution to an uncommon problem in response to a 37% collapse in its USA car sales following the Great Financial Crisis (GFC), in 2008 and 2009. Hyundai's target market was lower-income customers who were deferring car purchases due to low job prospects and a faltering U.S. economy. Competitors slashed prices and offered cash-back and other dealer incentives to stimulate demand. However, Hyundai probed, sensed, and discovered the uncommon problem customers were wrestling with. Customers were saying, "The risk of buying during the financial crisis – when I could lose my job at any time – is simply too high" (Dawar, 2013). Instead of offering a price reduction guarantee to address the concern directly, Hyundai offered a return policy: "If you lose your job or income within a year of buying the car, you can return it with no penalty to your credit rating" (Dawar, 2013). Called the Hyundai Assurance, the guarantee acted like a put option, addressing buyers' primary concern for holding back on purchasing a new vehicle. When the program was launched in January 2009, Hyundai's sales that month nearly doubled. Hyundai sold more vehicles than Chrysler, which had four times as

many dealerships. While its competitors could have easily matched Hyundai's guarantee, they did not, instead, continuing to slash prices and offer incentives (Dawar, 2013).

The Hyundai response showcases the effective application of DLI principles to transform business challenges into opportunities.It demonstrates how a deep understanding of customer needs and fears, rather than traditional competitive strategies like price cuts, can drive product and service innovation. By introducing the Hyundai Assurance program, Hyundai innovatively addressed the primary barrier to purchasing during an economic downturn—job insecurity and financial instability. This approach not only differentiated Hyundai from its competitors, but it significantly boosted the company's market share by aligning its business strategy with the real, immediate needs of its customers.

3. Creating knowledge of new sources of competitive advantage

3.1. Design-led innovation

Managers use DLI to facilitate a balanced approach to creating knowledge of new sources of competitive advantage (Wrigley, 2017; De Goey et al., 2019; Verganti, 2009). It utilizes design thinking in an innovation process framework and shifts the focus from the development of individual products and services to identifying and creating new sources of competitive advantage, e.g., new business models (Bucolo, Wrigley, & Matthews, 2012). Identifying, formulating, and framing customer problems act as the catalyst to generate new knowledge of opportunities to create value (Wrigley, 2017). The DLI process integrates design tools and theories into a business context into one framework that highlights the typical tensions within firms that managers must manage as they chart the best path forward (e.g., the operational-strategic, external-internal, CEO-frontline employees). It aligns the organizational dimensions of people, process, technology, and culture with the firm's strategic direction and core capabilities (Bucolo et al., 2012). DLI frameworks facilitate an iterative learning process to identify and formulate opportunities in different ways and prototype and manage a portfolio approach to innovation (Knight, Daymond, & Paroutis, 2020). Through this process, managers produce a set of tested options for prioritized managerial problems and monitor the status of innovation.

As shown in Table 1, DLI frameworks consist of three integrated stages and ten substages. Each stage consists of a series of questions, activities, and tools to help practitioners lead DLI in their organizations (Wrigley, 2017):

- Stage 1: Dissect (understand, reveal, and ask);
- Stage 2: Learn (propose, prototype, provoke, and reframe); and
- Stage 3: Integrate (design, share, and transform).

The story of Orica, an Australian explosives company, illustrates the effectiveness of leveraging DLI to transform the conventional approach. Traditionally, the explosives industry was a commodity market where business was won or lost on price (Dawar, 2013). However, Orica discovered that although quarries were focused on minimizing costs, quarry managers held

significant, unspoken concerns about the complexities and risks associated with blasting, such as safety issues and the unpredictability of outcomes (Stage 1: Dissect). Instead of competing solely on price, Orica's engineers gathered extensive data and conducted experiments to better understand the factors influencing blast performance (Stage 2: Learn). This shifted managerial focus from merely providing explosives to offering precise, predictable blast outcomes through empirical models. By reframing their approach and integrating these insights into a new business model, Orica began guaranteeing blast results within specified tolerances, setting them apart from competitors (Stage 3: Integrate). This strategic shift not only redefined Orica's value proposition but also transformed their role from a commodity supplier to a trusted partner, creating a sustainable competitive advantage that grew stronger as they accumulated more data and further refined their predictive capabilities. This example highlights how DLI empowers companies to move beyond price-based competition, leading to differentiated and enduring advantages in the market.

In combination, these DLI stages create organizational focus around transforming strategic problem insights into opportunities through customer and internal stakeholder engagement and then map them to all aspects of the business (Bucolo et al., 2012). These opportunities act as the catalyst to mobilize the firm's strategy towards capturing the most promising new sources of competitive advantage (Knight et al., 2020).

[Insert Table 1 About Here]

3.2. DLI and the problem-solving perspective

The problem-solving perspective (PSP) assumes the knowledge-based objective of managers is to sustain above-normal profits by continually discovering new knowledge and solutions to create and capture new sources of competitive advantage (Nickerson & Zenger, 2004). However, managers cannot choose *a priori* which new knowledge to acquire because the knowledge does not exist (Nickerson & Zenger, 2004). As a result, firms often follow an abductive reasoning process focusing less on analyzing "what is" and more on "what might be" (Martin, 2009, as cited in Garbuio & Lin, 2021). Rather than resorting to existing playbooks, firms experiment their way forward to create more reliable knowledge regarding emerging opportunities (*probing, sensing, and responding*) (Snowden & Boone, 2007). Identifying, formulating, and prioritizing strategic problems acts as the catalyst to probe, sense, and respond by breaking the value-creation and value-capture process into four activities: (1) problem, finding, and formulating, (2) problem-solving, (3) solution implementation, and (4) operating the implemented solution (Nickerson et al., 2007). Strategic problems are defined as "a deviation from a desired set of specific or range of acceptable conditions resulting in a symptom or web of symptoms recognized as needing to be addressed" (Baer et al., 2013, p. 199).

Once problems are identified, managers prioritize which problems to frame and formulate and then organize a search that optimizes the likelihood of discovery speed, cost, and success of the solution (Nickerson et al., 2007). The quality of problem formulation is judged by "comprehensiveness" or the "extent to which alternative and relevant problem formulations are identified with respect to the initial symptom or web of symptoms" (Baer et al., 2013, p. 200). Problem-finding ideally seeks a reasonable number of "good enough" (i.e., relevant and plausible) abductive hypotheses to depict a desirable future (Garbuio & Lin, 2021). The

problem-finding, and framing, and formulating activity is critical to firm performance because the results of these activities influence whether, in what direction, and for whom the firm creates value (Nickerson Yen, & Mahoney, 2012). Some solutions are better than others. The difference determines how much value is created and captured and ultimately what firms survive (Nickerson et al., 2012). The objective is to find uncommon solutions to those uncommon problems the firm is uniquely positioned to address given its resources and capabilities (Felin & Zenger, 2016).

3.3. Problem-centric DLI and innovation types

DLI provides a framework to create awareness and knowledge about new sources of competitive advantage by breaking the process down into problem identification (observation) and problem solution (solutions) with problem exploration (frameworks) and problem reframing (imperatives) (Wrigley, 2017). Identifying, formulating, and prioritizing strategic problems acts as the catalyst to drive the DLI process of creating awareness and knowledge of new opportunities to create value *ex ante* (Garbuio & Lin, 2021; Nickerson et al., 2007). However, not all problems are equal as a catalyst to creating knowledge of unique sources of competitive advantage *ex ante* (Ward & Osiyevskyy, 2023). One set of strategic problems may be operational in nature relating to the firm's existing products, customers, and processes. These problems may be well-understood and clearly defined with observable performance metrics such as reducing defects, cost, or production time (Nickerson et al., 2007). Resolving well-understood problems is handled by strengthening "ordinary capabilities" to generate incremental innovation of existing processes and products e.g. standard operating procedures (Nickerson et al., 2012; Schoemaker et al., 2018).

In contrast, resolving novel problems is more likely to uncover opportunities to create new sources of competitive advantage the firm is uniquely positioned to address. The strategic problems offering the most potential as source of competitive advantage, if successfully resolved, are complex and ill-structured (novel) (Baer et al., 2013). Solving these types of problems is a creative process that involves a special class of problem solving characterized by novelty, unconventionality, risk, and difficulty in problem formulation (Nickerson et al., 2007). The symptoms of complex and ill-structured problems may be observable, yet the underlying root causes and interdependencies between variables may not be directly observable and are less likely to be understood (Baer et al., 2013). The customers' solution requirements are also less likely to be understood. Managers need to identify and formulate customers' strategic problems through abduction, then deduce and follow these ideas to their logical consequences and predict their outcomes, test the ideas in practice, and use induction to generalize results (Garbuio & Lin, 2021). Transforming DLI into a generative source of competitive advantage requires practices to identify, formulate, and prioritize more novel problems that can act as the catalyst to create awareness and knowledge of novel solutions that create and capture value (Nickerson, Silverman, & Zenger, 2007; Garbuio & Lin, 2021).

3.4. Transforming DLI into a generative source of competitive advantage: Practical recommendations

We propose a strategic problem classification matrix and two evidence-based practices to transform DLI into a strategic capability and overcome the organizational barriers and cognitive filters of identifying novel opportunities *ex ante*,. These practices will help managers avoid

falling into the trap of over-investing in existing sources of competitive advantage at the expense of identifying and capturing new markets.

3.4.1. Recommendation 1: Adopt a strategic problem portfolio approach to create different types of innovation opportunities

DLI helps firms generate innovation to incrementally strengthen the competitive advantage of the existing business and identify new market opportunities. However, to deter managers from over-investing in the existing business at the expense of new market opportunities, we recommend firms adopt a portfolio approach to the strategic problems managers identify, formulate, and prioritize. The objective is to balance innovation investment in the current business and uncover new sources of competitive advantage in response to: (a) product progression through aging industry-life cycles (Adner, 2002); (b) market competition, emerging technologies, and political/ economic disruption; (c) the changing nature of the problem; and (d) shifts in stakeholders' strategic priorities (Nickerson & Zenger, 2004). To facilitate this process, we offer a Strategic Problem Classification Matrix (See Figure 2).

[Insert Figure 2 About Here]

The matrix's categories are defined along two dimensions: problem novelty, and resources and capabilities. The problem novelty dimension ranges from well-understood problems to novel problems. The resources and capability dimension ranges from the firm's existing resources and capabilities to new resources and capabilities required to resolve the strategic problems. Combining the dimensions into a two-by-two matrix results in four distinct ways to think about the drivers of DLI.

To exemplify this recommendation of adopting a strategic problem portfolio approach, Ward & Osiyevskyy (2023) discuss the successful case of CSL (Australia), a global biotechnology company that strategically tackled different types of problems to innovate and expand its market presence.

- Quadrant 1: *Reinvesting in learning utilizing existing resources & capabilities to resolve well-understood problems*. CSL dominated the Australian influenza vaccine market. However, demand was seasonal resulting in under-utilization of its manufacturing capacity. It addressed this issue by expanding vaccine sales into the Northern Hemisphere so that its manufacturing resources and capabilities were utilized year-round. CSL leveraged existing resources and capabilities to enhance operational efficiency and expand its market reach.

- Quadrant 2: *Advancing learning by investing in new resources and capabilities to resolve well-understood problems.* In response to growing market competition (the problem), CSL maintained its position as a world leader in plasma fractionation by creating new resources and capabilities through the construction of a new nucleic amplification testing for blood-borne diseases.

- Quadrant 3: *Reimagining possibilities by tackling more novel representations of recurrent problems* to enhance the efficacy of influenza vaccines. CSL applied existing resources

and capabilities to develop proprietary ISCOM adjuvant technology to boost the immune response elicited by its vaccines. This strategy indicated CSL's focus on refining existing products to deliver improved health outcomes.

- Quadrant 4: *Exploring new frontiers by tackling new and more novel problems.* When CSL began life as a public company its business was limited to processing all the blood plasma collected by the Australian Red Cross and supplying Australia with childhood vaccines. CSL also had a contract with the University of Queensland to develop a body of intellectual property for the treatment of the human papillomavirus, a known cause of genital warts and cervical cancer. However, it lacked the resources and capabilities to run the massive clinical trials. CSL overcame these constraints by partnering with Merck to commercialize, what would become, the highly successful, Gardasil vaccine, generating $1 billion in its first year. Over the next 25 years, as CSL expanded globally it shifted its strategic focus to product development and brought more R&D activities in-house.

3.4.2. Recommendation 2: Facilitate progressive problem-solving

For the problem-centric DLI capability to be a source of competitive advantage, it needs to help firms reliably identify and prioritize the most promising opportunities. This can be difficult in the early stages as decision-makers may not understand how to evaluate the opportunities. For example, Hyundai's managers needed expertise to break down the high-level goal of resurrecting slumping sales, into a series of definite problems, that – if successfully resolved – would increase sales.

Increasing the economic value of the DLI capability requires management expertise to evaluate the promisingness of the strategic problemto act as a catalyst to create knowledge of new sources of competitive advantage (Bereiter & Scardamalia, 1993). Judgments of promisingness are predictions about the firm's ability to successfully resolve the problem and its economic potential. Promisingness is evaluated along three dimensions: (a) Will resolving the problem help achieve the intended goal; (b) Do we have the capabilities to solve this problem and (c) Could solving this problem help resolve a more complex problem that aligns with a larger goal? (Bereiter & Scardamalia, 1993).

Expert managers deepen their expertise of evaluating the promisingness of opportunities through progressive problem-solving and stretching to tackle problems beyond those they have successfully tackled before. Through the process of stretching, managers develop new knowledge, skills, and capabilities, enabling them to tackle increasingly complex problems (Bereiter & Scardamalia, 1993). When comparing the mental models developed through real-life product development exercises, experts' mental models had superior extent, depth, and detail compared to those models prepared by novices (Bjorklund, 2013, as cited in Garbuio & Lin, 2021). Progressive problem-solving always involves some risk, some venture beyond what one already knows how to handle. What distinguishes creativity experts is that they also succeed some of the time, and through this experience, they develop a kind of knowledge that increases their likelihood of future success. They gain a deeper understanding of the connections between variables (Garbuio & Lin, 2021). The more developed mental models of expert innovators trigger more "dot-joining" between unrelated events and trends and so facilitate abductive hypothesis generation. This is called the knowledge of promisingness. The Progressive Problem-

Solving Framework (Figure 3) promotes a culture of progressive problem-solving. The framework encourages firms to evaluate and tackle increasingly novel problems. By tackling increasing novel problems firms develop new capabilities, strengthen their ability to evaluate the promisingness of resolving problems to generate new sources of competitive advantage, and strengthen DLI as a source competitive advantage.

[Insert Figure 3 About Here]

The case of Salesforce Inc. (Salesforce) illustrates this recommendation: the company engaged in progressive problem-solving to develop the skills, expertise and capabilities to tackle increasing challenging problems and uncover new sources of competitive advantage. In 1999, Salesforce disrupted the software industry by delivering its customer relationship products via the cloud and a software-as-a-service (SaaS) business model (Benioff & Langley, 2019). Customers paid monthly licensing fees per user, instead of the more conventional high up-front costs and ongoing maintenance fees. The SaaS model attracted customers but exposed Salesforce to higher levels of customer attrition as customers could cancel the service at any time. This problem was addressed by creating a team of customer success managers whose job was to listen and understand how customers were using the product.

The customer success team model worked well until 2013 when Merrill Lynch, SalesForce's largest customer, threatened to leave unless Salesforce could make its product faster and more intuitive. As Benioff & Langley (2019) describe, Salesforce managers crossed the country interviewing Merrill's advisers to uncover the problems that need to be addressed. Salesforce's managers evaluated the promisingness of these problems, but they all seemed too minor and simple to fix, e.g. address book navigation. Underdeterred, they stepped back to look at the bigger picture and realized Merrill's advisers were not talking about the bigger questions - "what was required to transform their jobs". Salesforce managers shifted gears and asked the advisers to talk about the larger challenges of their jobs. They discovered when advisers asked for faster navigation, what they really wanted was smarter functionality, e.g. triggering proactive client alerts. This "aha" moment made Salesforce realize that to move past marginal innovation, they needed to identify and resolve the problems behind the problems.

According to Benioff & Langley (2019), digital disruption and ambitious growth plans introduced more challenging problems as Salesforce scaled its expertise, capabilities and capacity. The more Salesforce listened to customers, the more customers wanted; this eventually led to its the engineers running out of productivity capacity. In response, Salesforce built a digital eco-system platform (AppExchange) to tap into the world's most innovative developers at scale. When Apple launched the iPhone in 2007, Salesforce founder, Marc Benioff, was convinced they needed to move the product from the desktop to the smartphone. After repeated failed attempts, the company recruited human-expertise to develop an in-house mobile development capability. When artificial intelligence (AI) emerged, it created a tremendous Salesforce opportunity to analyze enormous amount of data and uncover customer insights unobservable to the human eye. Salesforce stretched again because Benioff "did not want to be late to the revolution" (Benioff & Langley, 2019, p. 82) and there was no blueprint on how to proceed. First, AI was used to solve a problem their own sales people were complaining about – "how could they stop wasting time on the least promising accounts?". The solution, an

"opportunity scoring" algorithm to examine variables such as the length of time a sales opportunity had been in play, the dollar value of the account. Then, AI was applied to strengthen the reliability of corporate sales forecasts a significant executive management problem.

3.4.3. Recommendation 3: Engage DLI catalysts

Humans are pre-wired to reduce unpredictability and maintain a state of equilibrium (Quinn & Spreitzer, 2006). When given a choice "change or die" eight out of nine people cling to the way things have always been done (Deutshchman, 2005). Consequently, business leaders need more than just knowledge if they are to implement new business practices to transform an organization and deliver above-normal returns. They need to unlock employees' intrinsic motivation to move beyond the comfort of the status quo and lead them through change (Quinn, 2012). They achieve this by building trust and scaling and consolidating knowledge, so that adoption of new business practices is sustained (Price, Wrigley, & Matthews, 2021).

Generating knowledge of opportunities for new sources of competitive advantage *ex ante* requires an 'outside-in' exploratory approach. Managers need to integrate the perspectives of multiple stakeholders, prototype and experiment with possible future constructs (Wrigley, 2017). The process challenges the way things have been done and leads to thinking in unaccustomed ways, which can be uncomfortable and difficult. One approach to getting organizations to take ownership of new DLI practices is to involve all affected parties in developing firm-specific strategies, tools, and methods to: a) move the organization past the way things have been done; b) define how things will be done; and c) lock-in new ways of doing and prevent firms from reverting to old practices (Gardner, 1974). Firms engage DLI catalysts to facilitate this process.

DLI catalysts are practitioner-scholars that adapt DLI best practices and training to the organization based upon its specific context, goals, and constraints. A leading Australian airport corporation ("The Airport") engaged a DLI catalyst to integrate DLI as a strategic capability (Price et al., 2013). In the early 2010s, airport business models were evolving away from the core business of passenger services related to the departure and arrival of flights to economic hubs involving people, cities, industries and businesses (Price et al., 2013). Integrating DLI into its digital strategy was the first step to engaging more deeply with customers and stakeholders and realizing the vision.

DLI catalysts are often external advisors who bring a fresh perspective to the organization, free from internal biases and resistance that hinder innovation within established systems. A DLI catalyst was positioned in The Airport's strategic planning and development group and reported to the business performance manager, who acted as its design champion, supporting and supervising the project from the airport's perspective. The DLI catalyst adopted a qualitative action-research approach over a 12-month period to teach, test, document, and overcome organizational barriers within a dynamic organizational context (Price et al., 2013).

The DLI process engages customers and stakeholders in iterative dialogue loops to build a service portfolio of new opportunities and deeper understanding of future needs (Price et al., 2013) The DLI workshops brought together representatives from all levels of the airport organization from senior management to the front-line staff. As an external advisor, the DLI catalyst raised awareness of how a safety-first culture emanating from heavy industry regulation

fostered a negative attitude towards innovation and risk. The DLI catalyst drew on existing theory to create new context-specific knowledge, strategies, and tools to overcome these barriers and shift The Airport strategically from a smart-follower to an industry leader (Price et al., 2013). A conceptual innovation funnel was developed to provide greater transparency and project accountability within The Airport's innovation pipeline. The innovation funnel acted as the catalyst for business leaders to challenge the 'business-as-usual-mindset' by testing ideas in the proof-of-concept stage through prototypes and fostering a culture of innovation adoption.

4. Conclusions

The primary purpose of this study is to equip managers with practical DLI tools to "see over the horizon" before their competitors. Applying these tools holds the promise of creating real, meaningful competitive advantages to fuel organizatioal growth and prosperity. We offer three recommendations to transform DLI tools and practices into a strategic capability. First, a Strategic Problem Classification matrix to spur managers to balance innovation investment in the current business as well pushing the firm to uncover new sources of competitive advantage. Second, a Progressive Problem-Solving Framework to encourage managers to stretch to tackle strategic problems beyond which they have successfully resolved before. Through this process new knowledge and capabilities are created which provides a DLI platform to tackle increasingly novel problems and a new source of competitive advantage. Finally, despite managers saying they are open to DLI, organizational culture can bias decisions towards a "business-as-usual" mindset at the expense of becoming an innovation leader. Therefore, it is recommended firms engage DLI catalysts to lead the DLI integration and cultural transformation process, to lock-in DLI best practices (the new ways of doing things).

The strategic problem classification matrix and supporting DLI recommendations are general in nature. Therefore, our study is not without limitations. First, DLI facilitates an iterative learning process to identify and capture new sources of competitive advantage. However, to our knowledge few studies empirically examine the linkage between problem novelty and the type of innovation generated (incremental versus radical). Second, to our knowledge, few studies examine the role of progressive problem-solving whereby firms tackle increasingly difficult problems to uncover unique opportunities to create value and transform DLI into a source of competitive advantage. Further studies could yield deeper contextual insights into these questions (e.g. size and age of the enterprise, industry structure) and the conditions under which the focal relationships are strongest. Further research could also field-test the solutions to generate managerial insights of what works best and why, and provide managers with specific knowledge how best to adapt the recommendations to their specific context.

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Figure 1. Responding to environmental turbulence through innovation: A multi-stage process

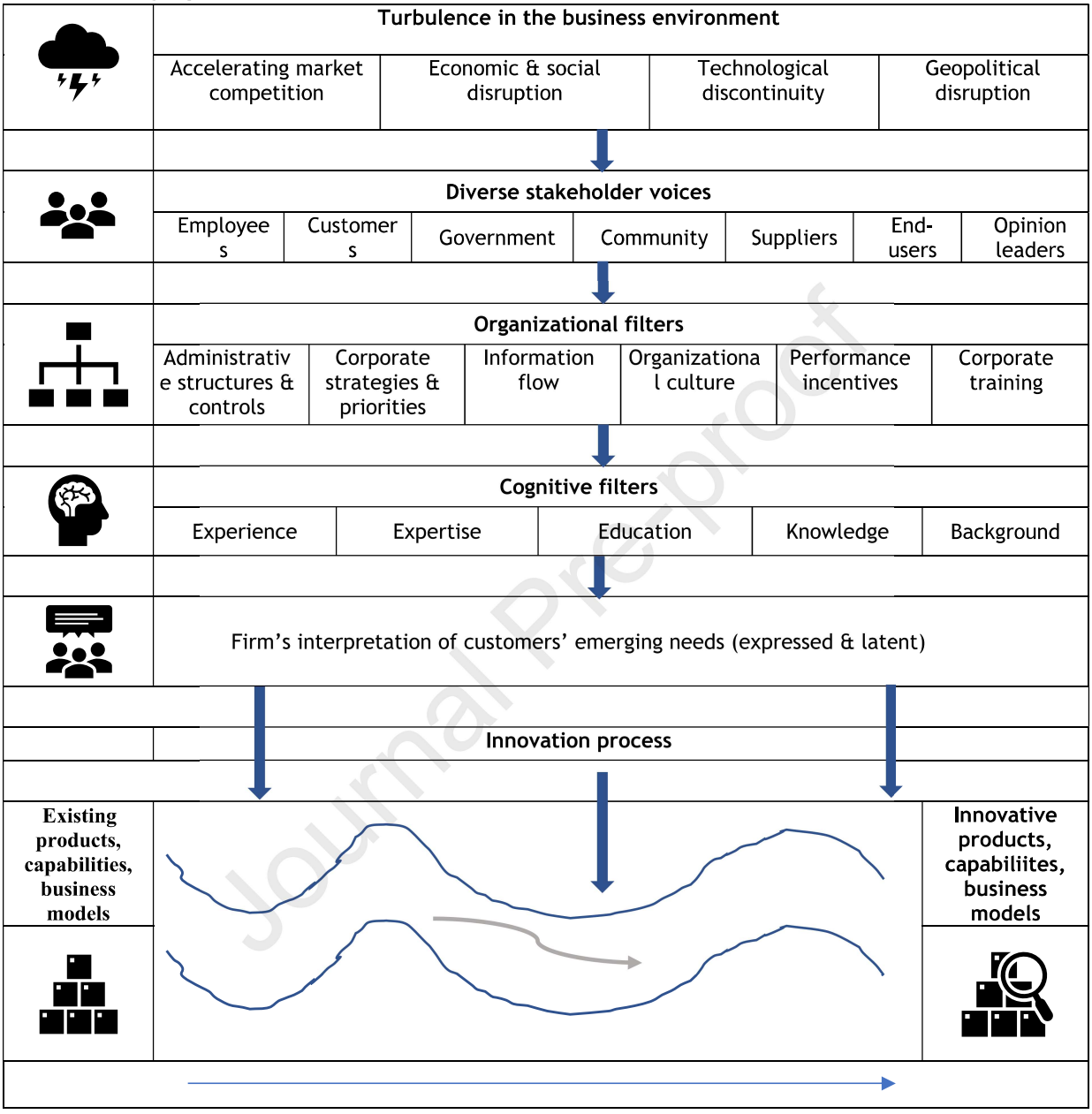

Figure 2. Strategic problem classification matrix

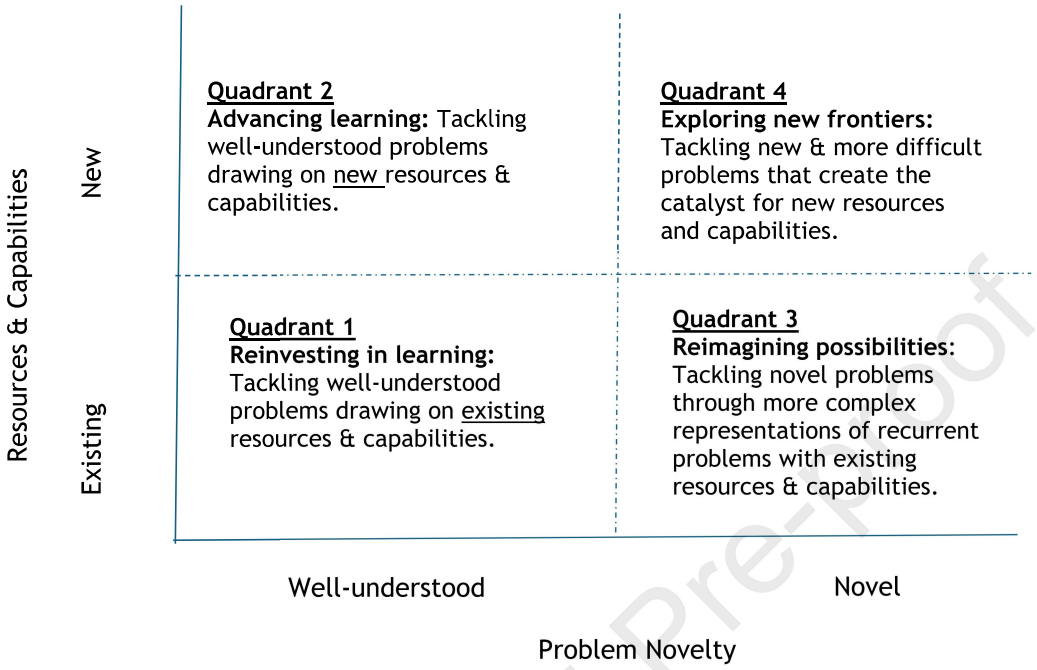

Figure 3. Progressive problem-solving framework

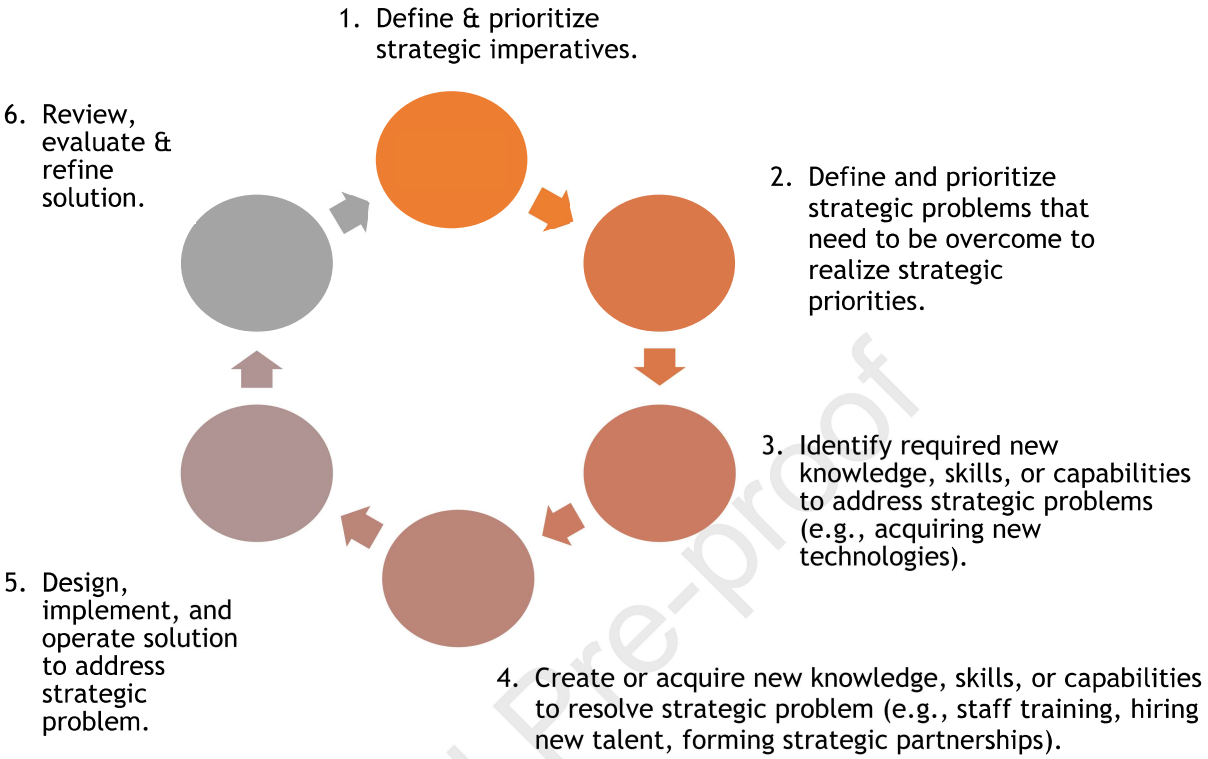

Table 1. Strategic problem-centric DLI: The three stages

DLI stage	Sub-stage	Driving question	Description
Dissect	**Understand**	- What customer problems do you solve?	- The purpose of your company is to solve what problem? - What is the biggest problem your market is facing? - What differentiates the customer problems you solve?
	Reveal	- Who are your stakeholders?	- Describe your customer and/or its stakeholders' problems. - What are your customers' most important problems in your product solves? - How do you engage with customers to identify, frame, and formulate their problems?
	Ask	- Do you have a matching strategy?	- Do the internal stakeholders know and share the same vision of the strategic problems that need to be resolved? - How does your strategy align to addressing your customers strategic priorities/problems?
Learn	**Propose**	What are the proposed assumptions?	- Identify, frame, formulate and prioritize your customers' strategic problems.
	Prototype	What are the value of the insights?	- Prototype your strategic problem formulation with your stakeholders to gather deeper insights e.g. storytelling/narrative technique followed by thematic analyses. - Build upon your assumptions to formulate the customers' problem more comprehensively.
	Provoke	What new meanings have you created?	- Iterate through the propose, prototype, provoke process to identify new patterns e.g. uncover the root causes of the strategic problem and identify variable interdependencies. - How can you use these new insights to more comprehensively formulate prioritize strategic problems?
	Re-frame	What new problems can you provide value to?	- What are some solutions to address the identified strategic problem? - Apply the Strategic Problem Classification framework to challenge drive both incremental and radical innovation? - What are the alternate product and service offerings that incorporate the required features to address the customer solution criteria?
Integrate	**Design**	What are the new product and service offerings?	- Design new solutions to address the strategic problem and maximize your capabilities. - What is the revised business model for this new value proposition to address the problem?
	Share	How do you collectively execute on this?	- How do you share the problem and corresponding solution with the customer?
	Transform	How do you execute and integrate these new learnings across the firm?	- Engage DLI catalysts to lock-in new ways of doing and prevent the organization reverting to "business-as-usual".

Source: Adapted from Wrigley (2017)