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Exploring Problem Finding and Formulation in Innovation Strategy: A Qualitative Study

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Abstract

This study explores problem finding and formulation skills in the innovation process in organizations in the current context. Although it is crucial to find the problem before the solution, this stage is still little investigated in the literature and in the practice of innovation strategy. We used a qualitative methodology, with an exploratory approach, through semi-structured interviews with business managers. The results show that the problems are explored based on design thinking approaches. However, the absence of a scientific method compromises the precise identification of the real problem. There was a belief in knowing the root cause, which is not always resolved by cost-benefit take-offs, or the problem always being formally formulated. The impediments to exploring problems with a scientific method and due rigor are the result of the status quo, limited time, and resources. These challenges encourage a hasty bias. There was awareness of the impact of solving the wrong problem, resulting in a high opportunity cost. Limitations include the focus on a group of service companies and the size of the sample, making further empirical research necessary to validate and extend the findings. This research contributes to the literature on strategy and innovation, emphasizing the importance of finding and formulating the problem with a scientific method before solving it, as a crucial element in innovating and creating value. We highlight the relevance of this study to the practice of innovation strategy and well-informed decision-making, directly impacting the creation of value and the sustainability of organizations.

Keywords Strategy · Innovation · Problem finding · Problem formulation · Problem solving · Design thinking · Bounded rationality · Attention · Value creation

Introduction

An organization's survival depends on its ability to undertake continuous innovation in order to gain a sustainable competitive advantage and create value. Staying relevant means converting adversity into opportunity, responding to the basic changes

Extended author information available on the last page of the article

taking place in the short and medium term in society, business and technology, as the life cycle of organizations has never been shorter (Pereira et al., 2021).

The complexity, uncertainty and ambiguity of the context and problems make it necessary to use non-linear strategies to identify real problems before designing solutions. This is driving an evolution in approaches based on design thinking, by incorporating scientific method, making the process more reflective and integrated, because problem solving is only effective if the problem to be solved is clearly identified (Beckman, 2020; Johansson-Sköldberg et al., 2013; Liedkta, 2018).

The beginning of the process comprises the problem finding and formulation stages, uncovering hidden and valuable problems that allow innovation to create real value (Hurmelinna-Laukkanen & Heiman, 2012). This is the essence of creating and capturing value (Nickerson et al., 2007) that delivers the returns from innovation (Spradlin, 2016).

Exploring the problem implies understanding its scope and dimension, and creating mechanisms to delimit its boundaries, considering that individuals have limited rationality and attention, as well as being susceptible to bias and heuristics. Mitigating these challenges requires the adoption of a structured and systematic method, because a strategic problem is usually complex and poorly structured, without the correct identification and definition it will lead to a wrong solution, which corresponds to type III error, and consequently will impact the performance and value created (Nickerson & Argyres, 2018).

The manager plays a decisive role in the ability to identify and define problems with precision, using methods and rigor to deeply understand problems of strategic relevance, aiming at effective decision making. This is one of the key strategic skills to promote innovation (Pereira et al., 2021).

Despite the wide-ranging literature on innovation and problem solving, there is a significant gap when it comes to the phase of identifying and defining problems, starting from assumptions that have already been recognized, without critically examining how these problems were found and formulated. This approach compromises the effectiveness of the solutions and the impact on value creation.

There is a scarcity of research exploring the importance of systematic analytical frameworks and methods for finding real and strategic problems before solving them (Hurmelinna-Laukkanen & Heiman, 2012; Nickerson et al., 2007, 2012; Nickerson et al. 2018; Pereira et al., 2021; Spradlin, 2016), thus allowing us to frame this gap in scientific knowledge as the research problem.

These shortcomings highlight the need to further study the strategies used in the phase of finding and formulating the problem, as well as the method and rigor in identifying, defining and analyzing the causes, to overcome biases and heuristics, and mitigate type III errors, in an environment of innovation and organizational transformation (Baer et al., 2013; Bhardwaj et al., 2018; Nickerson & Argyres, 2018; Pereira et al., 2021; Ananth et al., 2024), influencing the success of innovation and value creation strategies.

Due to the relevance of the topic in a real context of uncertainty and innovation, the sample was selected from a group of companies in the service sector that are going through a huge innovation and transformation challenge, to answer the research problem. Fifteen (15) managers were invited to participate in the research.

The interviews focused on the challenges of finding and formulating real problems, how these challenges affect innovation strategy and management, and the impacts on value creation.

The study comprised several stages to answer the main research question:

How does finding and formulating problems impact the success of innovation in organizations to create value?

In the first phase, relevant issues were identified in the literature review that led to the formulation of the questions, which were carried out in semi-structured interviews with open questions for the issues identified. Subsequently, using the Khcoder software, an in-depth analysis was made of the data obtained, identifying patterns and extracting relevant insights to answer the objectives under study.

The first objective aims to identify how managers exploit problems of strategic importance in order to innovate. The second objective is to identify whether managers adopt a scientific method to identify, formulate, and analyze the root causes of the problem. The third objective aims to identify the challenges that managers face when searching for strategic problems and the reasons that may limit this action. The fourth objective of the research aims to identify the impact that managers attribute to poorly identified and defined problems, recognized as type III errors in value creation.

This allows us to identify how the exploration, identification, definition and rigorous analysis of strategic problems impact innovation and the creation of value in organizations.

Literature Review

Exploring Problems

Volatility and continuous evolution in a globalized world impose on organizations the need for systematic reinvention in order to maintain relevance, foster innovation and create sustainable value (Pereira et al., 2021). The current economic and social paradigm makes it imperative for organizations to uncover still latent opportunities to guarantee more robust sources of competitive advantage (Ward & Osiyevskyy, 2022).

This scenario implies that the real driver of value-oriented innovation lies in the ability to explore new possibilities and discover questions not yet formulated (Drucker, 1985; Ven, 1986). Recognizing the strategic value of finding real problems to drive innovation and generating new opportunities to create value (Dougherty, 2017; Satell, 2018).

It is then crucial to develop innovation potential, which means analytically resolving what the innovation must be to satisfy an opportunity (Drucker, 1985). This must be aligned with the business strategy and objectives (Wedell-Wedellsborg, 2017), which requires a balance between imagination and analytical rigor (Beckman, 2020; Pereira et al., 2021).

This is the real starting point for strategic innovation, although it is often neglected (Spradlin, 2016). The process involves dealing with uncertainty, interpreting ambiguous and complex signals, and considering multiple variables and interconnections

(Camillus, 2008; Rittel & Webber, 1973). This challenges traditional approaches and requires non-linear strategies that provide structure, objectivity and analytical rigor, prior to designing solutions (Pereira et al., 2021; Simon, 1973).

Innovation is, by nature, conceptual and perceptual, so it is essential to contextualize, observe, ask questions and listen to the multiple elements in its construction (Drucker, 1985). However, these essential elements are rarely integrated with a structured and systematic method in traditional problem-solving approaches, which tend to focus on problems that have already been identified and clearly defined (Getzels, 1975).

In this context, problem solving offers the necessary process, although it is often poorly understood and executed (Pereira et al., 2021; Spradlin, 2016). The literature highlights four stages, finding and identifying the problem, formulating and analyzing the causes, selecting and prioritizing solutions and implementing and monitoring the solutions, but the initial stages of problem finding and problem formulation are often neglected, despite their importance being critical (Nickerson et al., 2012; Pereira et al., 2021).

The creative process is centered on problem exploration, where problem finding is the initial and fundamental step towards effective innovation problem solving (Abdulla & Cramond, 2018).

The essence of problem finding lies in the ability to identify relevant problems, often hidden or poorly understood, by integrating multiple perspectives, both internal and external, to explore the problem space widely. This process makes it possible to infer real needs that are unexpressed, hidden, unexplained and recognized as problems, becoming actionable knowledge and the driving force for innovative solutions that create value (Beckman, 2020; De Vos et al., 2021; Dougherty, 2004; Liedkta, 2018; Murray et al., 2019).

This stage is complemented by problem formulation, which consists of the systematic structuring of the problem, transforming a vague perception into a clear, researchable definition aligned with the strategic objectives, converting ambiguity into clarity (Baer et al., 2013; Nickerson et al., 2012; Pereira et al., 2021; Spradlin, 2016).

However, for this process to be effective and reliable, its stages must be conducted with scientific rigor, using structured and systematic methods in the approaches used, enriching knowledge and evidence (Beckman, 2020), complemented and promoting a more reflective, structured and integrated evolution of approaches widely adopted in innovation processes, such as design thinking (Johansson-Sköldberg et al., 2013).

This approach aims for a more robust and analytical creative process of interaction with the client in the discovery of the problem, allowing innovation with better solutions, lower costs, and greater stakeholder engagement (Liedkta, 2018). Ensuring a focus on data and evidence (Ocasio, 1997; Simon, 1972, 1973), studying stakeholders' unmet expectations, values and real needs before developing strategic innovation solutions (Drucker, 1985).

Scientific Approach and The Root Cause of Problems

Addressing complex challenges requires a systematic research method, a structured process, with rigorous data collection and validation, critical analysis and continuous verification, to identify and understand complex phenomena, and without a clear definition (Pereria et al., 2021).

This process creates direction in organizational attention, which acts as a selective mechanism, based on social, cultural, cognitive and contextual structures, influencing how the problem is perceived, and conditioning what is relevant and what remains invisible (Ocasio, 1997), promoting objective decisions, reducing bias and strengthening critical judgment in problem solving (Simon, 1955).

Because finding and formulating complex and relevant problems can be confusing, it is necessary to focus on these steps in a structured way, using approaches that enable a deeper understanding of the problem (De Vos et al., 2021). This rigor and objectivity avoid the errors of traditional methods based on trial and error, which compromise effectiveness and efficiency in identifying and defining (Broadbent et al., 1990; Pereira et al., 2021; Simon, 1947).

The existence of a process that applies the principles of scientific management in the analysis of the problem from the initial stages is essential to discover relevant and valuable problems, with rigor in the collection and analysis of data (Beckman, 2020; Pereira et al., 2021). One of the most important exercises is the process of searching for the causes of the problem, based on facts from multiple sources, connecting dots and perspectives, in a constant interrogation of the origin of the problem (Pereira et al., 2021).

Understanding the real causes is fundamental, as failure to identify them means only treating the symptoms, and the real problem will persist (Pereira & Santos, 2020). It is crucial to break down the problem and sub-problems and analyze them in multiple ways, ensuring a clear definition based on facts that reflect reality (Pereira et al., 2021; Spradlin, 2016).

Only after this in-depth analysis of the causes does the process of proposing solutions begin, basing the proposals on the causes, denying them, contradicting them, mitigating them, transferring them, or accepting them. Each strategy generates a single or multiple action plan, depending on whether the causes are interdependent or independent and whether they are feasible from the point of view of the resources or time required, as well as the expected effectiveness (Pereira et al., 2021).

There are multiple techniques for analyzing causes, most of them originating in quality management, such as the Ishikawa technique, the five whys, problem decomposition, and the Pareto method (Pereira & Santos, 2020; Pereira et al., 2021).

Success lies in the effort to deeply understand the problem by expanding the knowledge gained in identifying and defining the problem, integrating multiple perspectives (Choo, 2014). Asking, what is the cause, the opportunity, the new value created, who is it for, the segment, and what are the risks involved (De Vos et al., 2021).

This requires a comprehensive and detailed view, to deal with the complexity of the problem (Markovitz, 2020; Wahl et al., 2022; Reeves & O'Dea, 2022), making it essential to integrate method and structure in the discovery and formulation of problems, and thus guarantee rigor in the investigation of causes, creating a solid and rich base of knowledge (Simon, 1973; Pereira et al., 2021).

The method influences the attention of decision-makers, determining the focus, priorities and actions to respond to the context, impacting the effectiveness of processes (Ocasio, 1997). Essential for better identifying the real problems that need to be tackled, increasing the likelihood of finding problems that generate value (Beckman, 2020; Liedkta, 2018; Wahl & Hutter, 2022; Wedell-Wedellsborg, 2017).

Challenging Problems

The challenges related to the complexity of the problems and the environment, the noise in the information and the various limitations in identifying and defining the problem manifest themselves in various cognitive phenomena, reflected in patterns of distorted judgment, and processes of simplification of reality (Acciarini et al., 2021).

Managers are human beings with limited rationality and attention (Ocasio, 1997; Simon, 1972). These limitations imply that decisions are rarely fully rational, due to incomplete or diffuse information about the present and uncertainty about the future, restricting the ability to solve complex problems (Simon, 1955). In addition, the fact that attention is scarce and selective affects how strategic problems are discovered and validated (Ocasio, 1997).

These conditions facilitate the emergence of cognitive biases, characterized by systematic patterns of distorted judgment (Heiman & Hurmelinna-Laukkanen, 2023), making it difficult to gain an accurate understanding of the problem, since the principles of science and the scientific method are inhibited (Pereira et al., 2021). One of the main challenges is the precipitation bias, which leads managers to prioritize the action of the solution over understanding its causes (Bhardwaj et al., 2018; Pereira & Santos, 2020).

Proposing a solution is usually a quicker exercise than diagnosing the problem, because the novelty and unfamiliarity of the situation outweigh factors such as the time horizon, which is a determining element in knowing the cause of the problem, and not paying attention to who is affected by the problem (Bhardwaj et al., 2018).

Having a more emotional and less rational focus, or looking for a responsible person, are also limiting factors in understanding the problem in depth (Pereira et al., 2021). Another factor is the tendency for the problem to be considered known, investing immediately in the presumed correct solution, opting for methods with which they are familiar and neglecting to analyze the cause and properly define the problem (Bhardwaj et al., 2018).

There may also be a tendency towards more classical and conventional management that limits their horizons in developing new skills that allow them to adjust strategy to the context in which organizations are embedded (Nickerson et al., 2012). It is important to circumvent prejudices rooted in the status quo and links to behavioral norms (Liedtka, 2018).

Problems are often approached inadequately because they involve knowledge that is not immediately available, the nature of the problem to be solved is unclear, the information available is insufficient, diffuse and complex (Beckman, 2020; Hurmelinna-Laukkanen & Heiman, 2012; Reeves & O'Dea, 2022; Ward & Osiyevskyy, 2022; Simon, 1973). Analyzing data without knowing the facts generates a superficial view and limits the correct identification of problems, diverting attention and impairing strategic perception and interpretation (Markovitz, 2020; Ocasio & Joseph, 2005, 2018).

Strategy Problems

The importance of the process lies in understanding the scope that managers have to discover problems of strategic relevance (Park & Baer, 2022). When the problem analysis lacks method and structure, the lack of rigor in its identification and definition prevents the desired objectives and results from being achieved, generating lost opportunities in innovation projects that are not aligned with the strategy and increasing the opportunity costs (Baer et al., 2013; Nickerson et al., 2007; Pereira et al., 2021).

This scenario poses a critical risk to strategy and sustainable innovation by directing resources and efforts towards solutions that are well executed but have no real value, resulting in inefficiencies, waste and a negative impact on strategic return, the market and competitive advantage (Cummings & Nickerson, 2021; Spradlin, 2016). Often, the failure of innovation strategy in organizations stems precisely from the fact that its essence is focused on solving problems, and to innovate, it is essential to know the problem (Satell, 2013).

It is crucial to understand that quickly identifying the problem does not mean efficiency and savings, and can lead to an incorrect and ill-defined problem, with wasted resources and time and high consequences for the organization (Hurmelinna-Laukkanen & Heiman, 2012). This mistake is called a type III error, which means solving the wrong problem correctly because the real problem remains untouched (Mitroff & Featheringham, 1974). It is an error that usually stems from a faulty diagnosis at the problem finding stage, influenced by cognitive biases, pressure for quick solutions and the absence of a structured and reflective approach, resulting in inefficiency and wasted resources (Cummings & Nickerson, 2021).

Without adequate rigor in understanding, identifying and defining the problem, the focus of attention is dispersed, results are not achieved, and strategic opportunities are missed (Spradlin, 2016). Because the focus is often on an ineffective innovation strategy, which falls not on careful problem identification, but on rapid solution, underpinned by a culture of putting out fires and acting with urgency (Beckman, 2020; Spradlin, 2016).

This search for quick fixes often produces superficial creative insights that do not lead to real innovation (Björkdahl et al., 2022; Markovitz, 2020). This is why many innovation strategies fail, because they are based on solving ill-defined problems and confusing symptoms with real causes (Spradlin, 2016).

The power of strategy lies in the method, increasing the probability of discovering the right problem, in the strategic decision premise that knows what problem to

solve (Pereira et al., 2021; Spradlin, 2016), instead of making a quick decision based on heuristics or a decision premise derived from superficial questions (Cummings & Nickerson, 2021).

Organizational strategy must promote the identification of new value opportunities, as well as the development of competencies to exploit them, ensuring a continuous flow of knowledge of strategic problems that deliver tangible and intangible benefits, generating new opportunities, rather than solving problems and evaluating already perceived or pre-existing solutions to generate competitive advantage (Baer et al., 2013; Nickerson & Zenger, 2004; Nickerson et al., 2007; Nickerson & Argyres, 2018) (Fig. 1).

Research Methodology

Framing the research context and selecting the appropriate methodology is essential to investigate the importance of problem finding in organizational strategies. In this sense, a qualitative and exploratory approach was adopted, appropriate for identifying emerging patterns, perceptions and significant relationships, providing valuable insights for innovation management, strategic formulation and the creation of value (Eisenhardt et al., 2016).

The study focused on a group of service companies in Portugal currently involved in relevant innovation and transformation processes. Fifteen (15) business managers with a university degree and significant experience in strategy, innovation and management contexts were invited to take part in the research.

Participants were selected for convenience, based on accessibility and direct involvement with the phenomenon under investigation. This criterion is in line with the purpose of qualitative research, which prioritizes analytical relevance over statistical representativeness (Miles et al., 2014).

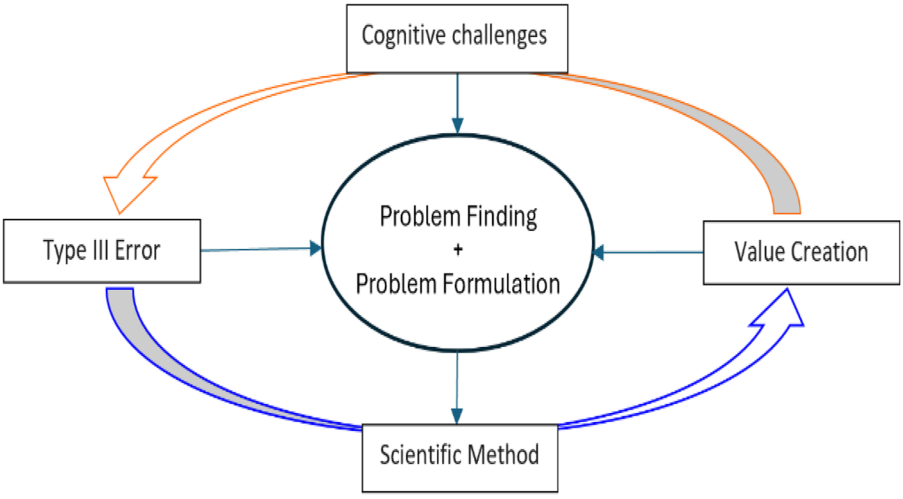


Fig. 1 Conceptual model - Source: Prepared by the author

The interviews focused on the challenges faced in identifying and formulating strategic problems, the approaches and methods used, and the impact on innovation and value creation. Based on the literature review, relevant issues were identified, which led to the formulation of questions, carried out in semi-structured interviews with open-ended questions for the issues identified. Data collection took place between September 2022 and December 2022. Each interview lasted an average of 40 min and was audio-recorded with consent. The recordings were transcribed in full for later analysis.

Khcoder software was used to analyze the data, allowing text mining techniques to be applied. Graphs and word frequency tables were generated, focusing on nouns, adjectives, and verbs. This was followed by a process of structured analysis, which made it possible to identify correlations, connections, and thematic clusters, providing an in-depth and relevant interpretation of the data obtained. This approach made it possible to identify patterns and extract insights into the challenges faced by managers in discovering problems of strategic importance for sustainable innovation. In the twelfth (12th) interview, saturation was considered to have been reached, once the data had converged and no new relevant information emerged, according to the methodological criterion of data saturation in qualitative research, which can occur at different levels such as data, codes or meaning (Naeem et al., 2024; Rahimi & Khatooni, 2024). This dynamic made it possible to capture the real experiences of managers in a complex innovation context.

Key Question, Research Questions and Research Objectives

Understanding that the phenomenon under study is complex and comprehensive, Leedy and Ormord (2019), point out that the main research question serves as the objective for the research effort and the secondary questions help to identify specific topics for the research, which in this case consists of four subjectives, to answer there is main research question:

How does finding and formulating problems impact the success of innovation in organizations to create value?

1. Liedkta (2018); Beckman (2020) - It's important to immerse yourself in stakeholders' problems, as this produces data that can be converted into insights in strategy development. a successful innovation process must deliver three things: superior solutions, lower risks and costs, and engagement. Which approaches are most useful?

   I. Research question: How are problems explored?
   II. Research objective: To identify how problems are encountered to innovate.
   III. What approaches are used to find problems?
   IV. Research objective: To identify the role of the approaches used in problem finding.

2. Pereira et al. (2021) - Problems must be tackled objectively, with methodology, intellectual integrity and modesty, understanding the problem and its causes is a

critical step, it must be done in depth, on a scientific basis, in which the decision is based on facts and methodologies that on the one hand allow rigor, on the other avoid cognitive biases.

I. Research question: What is your knowledge of the root cause of the problem?
II. Research question: How important is the scientific approach to finding, formulating, and analyzing the root cause?
III. Research question: What methods and approaches were used to formulate and analyze the problem?
IV. Research objective: To identify the importance managers attach to knowing the cause of the problem, the scientific method and the approach used to analyze the problem and avoid bias.

3. Bhardwaj et al. (2018) - Instead of generalizing the results on cognitive biases in decision making to problem solving, it would be useful to study them directly in problem formulation.

I. Research question: What are the main challenges that condition the discovery and formulation of the problem, and lead to the solution being worked on before the cause?
II. Research objective: To identify the main challenges that limit the discovery and formulation of problems and to understand the bias that leads to the search for a solution rather than a problem.

4. Nickerson et al. (2012) - Problem formulation is fundamental in value creation because solving strategic problems, which are generally complex and poorly structured, without proper formulation, can easily lead to the wrong problem being solved, which can damage the company's performance.

I. Research question: What impact does the wrong problem have on value creation?
II. Research objective: To identify managers' perceptions of the importance of discovering and formulating the right problem to solve when creating value.
III. Research question: How does the wrong problem affect value creation?
IV. Research objective: To identify the perceived importance and impact of the wrong problem, type III error, on the creation and capture of value in the organization.

Characterization of the Sample

The sample for this study is made up of 15 (fifteen) interviewees, business managers belonging to a group of service companies involved in innovation and transformation dynamics. They comprise 3 (three) segmentation variables: area of function in which they work, length of experience in business, and type of problems the managers face in carrying out their duties. The managers interviewed work in areas of strategic importance within the companies where they work. The diversity of areas of activity

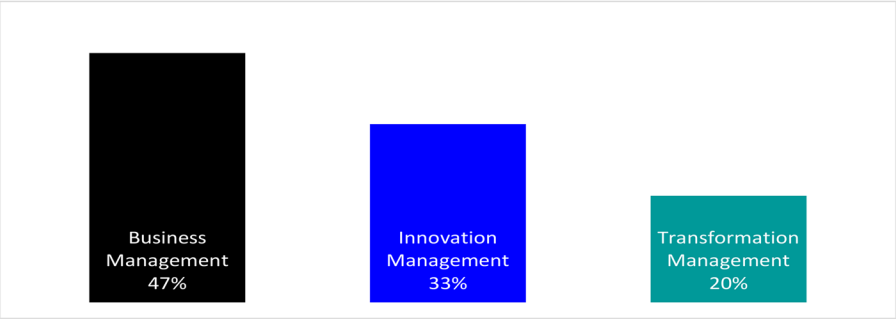


Fig. 2 Function area - Source: Prepared by the author

allows us to capture multiple perspectives on how strategic problems are identified, understood, and addressed in the business context (Fig. 2).

The areas of activity are divided into three (3) areas of activity, 47% in business management, 33% in innovation management, and 20% in transformation management. The interviewees in their roles manage various types of strategic challenges, including business expansion and development (Fig. 3).

The problem clusters are new products or services 53%, business efficiency 27%, business insertion in new markets 13% and market share 7% (Fig. 4).

47% have up to five (5) years' experience in management and strategy, 33% between five (5) and ten (10) years, 13% between ten (10) and twenty (20) years, and 7% over twenty (20) years.

Results and Discussion

The data collected sought to answer all the research objectives. The main aim of this study is to understand how business managers explore and tackle strategic challenges, with a particular focus on how they find and formulate problems before proposing solutions. The aim is to analyze the methods and approaches used in this process, the

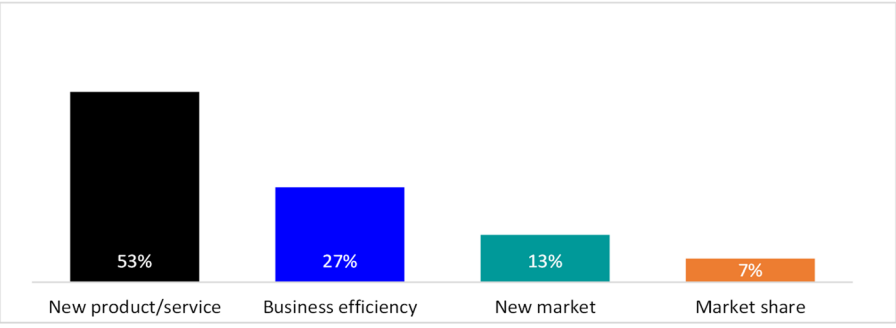


Fig. 3 Type of problems - Source: Prepared by the author

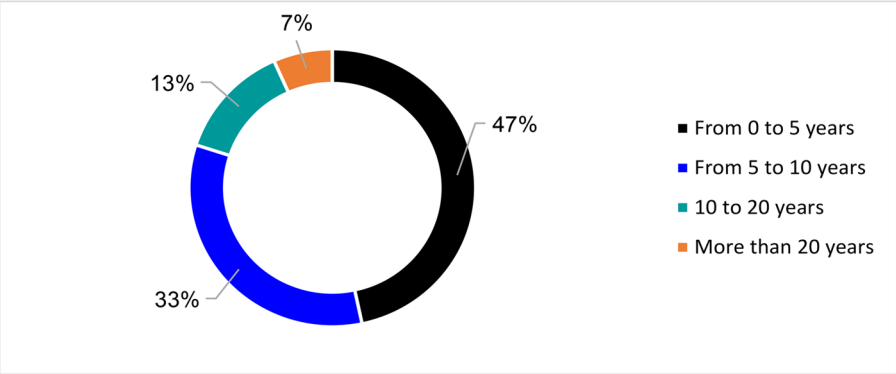


Fig. 4 Length of experience in business - Source: Author's elaboration

challenges faced in identifying and defining problems, as well as the impact these practices have on innovation and value creation.

Objective

The first objective aims to understand how managers explore problems to innovate, investigating which approaches they use and how effectively they contribute to finding and formulating these problems. According to Liedkta (2018), a successful innovation process must bring together three elements: superior solutions, risk and cost reduction, and active stakeholder involvement. In order to assess whether there are any problems that are unknown or not fully understood, we sought to understand the degree of knowledge of these problems (Fig. 5).

When asked about organizational knowledge of existing problems, 47% of managers said that the organization knows its problems, 40% acknowledge this knowledge, but point out that it is not a linear process, given the constant evolution of the context and the problems, and 13% indicated that the problems are not known by the organization. The results show that although there is a dominant degree of knowledge of the problems, there is still a significant proportion that remains hidden due to the complexity and changeability of the environment. This confirms the importance of the problem finding stage as a critical component of strategic innovation.

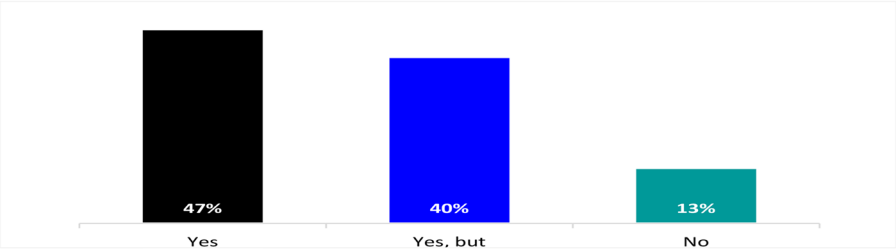


Fig. 5 Unknown Problems - Source: author's elaboration

Regarding the role of stakeholders in identifying problems, the response was unanimous, in identifying existing or new problems, highlighting their contribution as the basis for identifying relevant problems (Liedkta, 2018; Dougherty, 2004).

In order to understand the strategies adopted, the interviewees were asked about the actions implemented to deal with problems (Fig. 6).

The actions observed focus on constantly evaluating the customer experience and collecting relevant data. Analysis of the word cloud resulting from the interviews shows a strong focus on the customer, with emphasis on words such as customer, experience, channels, and feedback, demonstrating customer centricity. The centrality of feedback is evident, functioning as an essential element in identifying problems through the multiple channels available. However, the data indicate that the focus is mainly on problems that have already been identified and clearly defined, which reflects a conventional approach to identifying, formulating, and solving problems (Getzels, 1975; Ocasio, 1997).

This traditional approach tends to limit innovative potential, leading to predictable solutions.

> "We map the pain points, or as we call the problems identified by customers, the idea is to address these problems that have already been identified and have not yet been solved for various reasons, as the basis for new innovation projects", E5.

This indicates a customer-centered process but still lacks a structured and reflective effort to discover more complex strategic problems, limiting the innovation potential. They also show a reductionist view in considering only the customer's perspective as a source of knowledge; it is essential, but it is only one of the multiple stakeholders involved in the innovation process (Dougherty, 2004).

As Drucker (1985) points out, the source of innovation that creates value lies in the ability to explore new possibilities and discover questions that have not yet been formulated. It consists of the activity of finding relevant problems, often hidden or poorly understood, by obtaining multiple perspectives, both internal and external (Beckman, 2020; De Vos et al., 2021; Dougherty, 2004). In this sense, incorporating the scientific method into the process of discovering and formulating problems



Fig. 6 Customer experience - Source: author's elaboration

becomes crucial, because a structured, evidence-based process makes it possible to gather, cross-check and interpret data from multiple stakeholders, ensuring depth, analytical rigor and validity in decisions (Pereira et al., 2021).

The interviewees reveal that the main organizational strategy for identifying relevant problems involves collecting data on customer experience, often operationalized through the design thinking approach.

"Pain points are fundamental, and we even use them in design thinking", E7.

Despite its value, the design thinking approach often lacks rigorous methods for discovering and formulating problems, which compromises its strategic impact on value-oriented value generation (Fig. 7).

Figure 7 shows the benefits of problem finding with a scientific method in design thinking. The word frequency table highlights the most recurrent nouns: problem, design, thinking, idea, methodology, location, and process. The action of the verbs manifests the action of thinking, doing, having, knowing, using, complementing, and identifying. The data shows the importance of problem finding and formulation in the design thinking approach Table 1.

Design thinking involves stakeholders in understanding the problem in the empathy phase, which makes it essential that the problem finding and formulation stages are carried out systematically and methodically before ideation. This makes it possible to identify real, hidden, and strategic problems. It offers a more structured view of

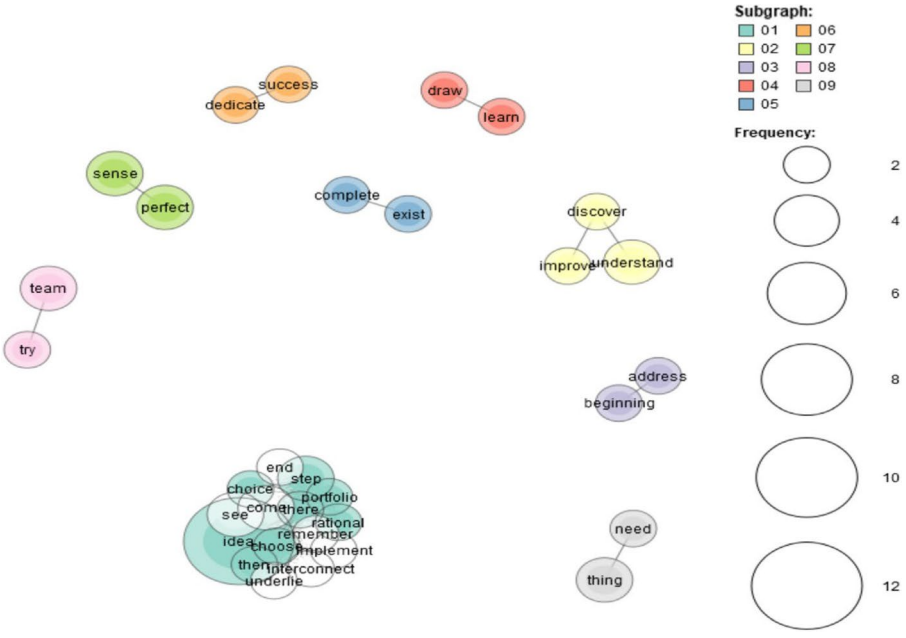


Fig. 7 Scientific problem finding in design thinking- Source: prepared by the author

Table 1 Frequency of scientific problem finding words in design thinking- Source: Author's elaboration

Nouns	Frequency	Adjectives	Frequency	Verbs	Frequency
Problem	33	Other	8	Think	25
Design	19	Important	7	Do	13
Thinking	15	First	5	Have	12
Idea	12	Funda-mental	5	Know	7
Methodol-ogy	12	Good	5	Use	6
Finding	10	Whole	4	Com-ple-ment	4
Process	10	Perfect	3	Iden-tify	4

the problem, broadening the understanding of issues that have not yet been perceived. It is a crucial approach if properly applied, with a systematic structure and method for thinking about the problem differently, analytically and designing effective solutions, ensuring that the right problem is identified before innovations are developed (Beckman, 2020).

"The design thinking methodology is the framework we use to analyze problems. But we don't have anything structured for that, the way we do it to identify problems is a process that starts with the collection of feedback that we do, after collecting feedback we identify pain points and then we measure which ones are the most critical and from there we develop actions according to their prioritization", E5.

This statement reveals a common practice in organizations. Although design thinking is recognized as a framework for tackling problems, the process is often conducted in a superficial, slightly empirical and unstructured way. The cycle starts with gathering feedback, mapping pain points and then prioritizing, but lacks a systematic approach to in-depth root cause analysis.

This reinforces the importance of integrating the scientific method into design thinking at the problem finding stage, to identify ambiguous signals, find more than symptoms, and understand the challenges in depth before formulating problems. As Beckman (2020) and Liedkta (2018) point out, the difficulty in knowing the root cause is linked to the lack of rigorous methods that break down and assign meaning to the data collected. It therefore requires a structured process that offers clarity, analytical depth, and avoids superficial or biased interpretations. (Simon, 1973; Pereira et al., 2021).

Beckman (2020) argues that this knowledge requires active involvement in making sense of it, something that is often avoided due to its complexity. Thus, the lack of structure hinders the discovery of non-obvious problems, limiting the potential for innovation and the creation of truly relevant solutions. It is the essence of superior solutions by identifying and defining problems in non-obvious and conventional ways that is crucial to obtaining better solutions, reducing costs and strengthening engagement by identifying real problems (Beckman, 2020; De vos et al., 2021; Dougherty, 2004; Liedtka, 2018; Murray et al., 2019).

Objective

The second objective is to identify whether managers use the scientific method to discover, formulate and analyze the causes of the problem. This was done by investigating the methods and approaches used to identify, define, and analyze the problems faced. The respondents were then asked about the degree of knowledge they have regarding the root cause of the problems they face (Fig. 8).

Analysis of the data shows that 80% of managers believe they know the root cause. Of these, 47% consider that the cause of the problem is known, but admit to having limited strategies to act on it, often due to the trade-off between cost and benefit.

The result suggests that the majority of managers can understand the problem but find it difficult to deepen their knowledge; there are challenges in fully defining the problem and the factors that influence it. Yes, 33% indicate that the cause is identified and analyzed without reservation. No, 20% represents the difficulty in discovering the cause. There is no full understanding of the problem.

The results show that although the majority believe they have a grasp of the root cause of the problem, around half of those surveyed feel it is a challenge to isolate the true origin of the problems, which can lead to superficial solutions being adopted, with less strategic impact or being ineffective.

The difficulties in analyzing root causes are also a reflection of the uncertainty and inconstancy of the current strategic problems they face. Pereira et al. (2021) refers to the importance of understanding the problem and its causes, and establishing a vision of the whole is a critical step that must be carried out in depth.

> "I think we're too inward-looking, but deep down I think we know what the root cause is", E4.

It is essential to identify the causes, as this allows us to answer why the problem occurs, and to ensure that the information makes sense, thus contributing assertively to the formulation of the problem. Solutions should only be proposed after a clear and objective understanding of the problem, systematized, with structure, method, and rigor (Spradlin, 2016).

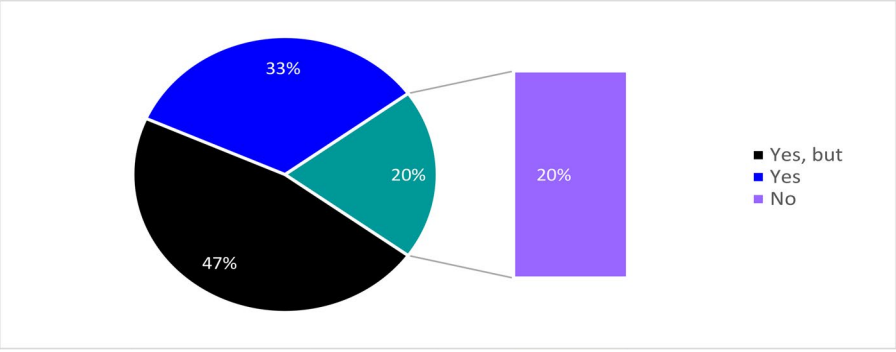


Fig. 8 Knowledge of the root cause - Source: Prepared by the author

> "Not using methodologies to find that root is not something we practice in a systematic, logical way", E8.

Regarding the importance of using a structure that allows the problem to be formulated and the analysis process to be visualized, the response was unanimous, all this fundamental structure, which suggests a general awareness of the need for scientific and structured methods to identify, understand and solve problems.

According to Pereira et al. (2021), responsible management and strategy must be based on evidence and conducted with method and analytical rigor, since this is the only way to reduce the influence of bias and ensure more informed decisions (Fig. 9).

Despite the unanimous recognition of the importance of a scientific approach, the data shows that adoption is still partial. Around 40% said they did not use a specific scientific tool, justified by the urgency of the problem to be solved. On the other hand, 60% use a specific scientific tool in their analysis process. This scenario highlights the significant impact of time pressure for simpler and more intuitive options.

Although most recognize the importance of the method and its use, there is still a gap in the systematic implementation of structured tools and scientific approaches, which can compromise the depth and effectiveness of problem definition.

> "I think there's too much of a tendency to rush into things, where it's easier to do that than to look at the root of the problem - it's more work and takes longer, and the results are less immediate", E11.

According to Pereira et al. (2021), the absence of a structured method for observing problems can compromise the ability to identify which problem really needs to be solved. Scientific management principles are fundamental to understanding the root cause of the problem. The process of analysis begins with a deep and rigorous appreciation of the problem so that it is perfectly understood, defined, situated, and objectified based on concrete facts. Most of the interviewees expressed the need for scientific approaches and methods, referring to the approaches used in the figure below (Fig. 10).

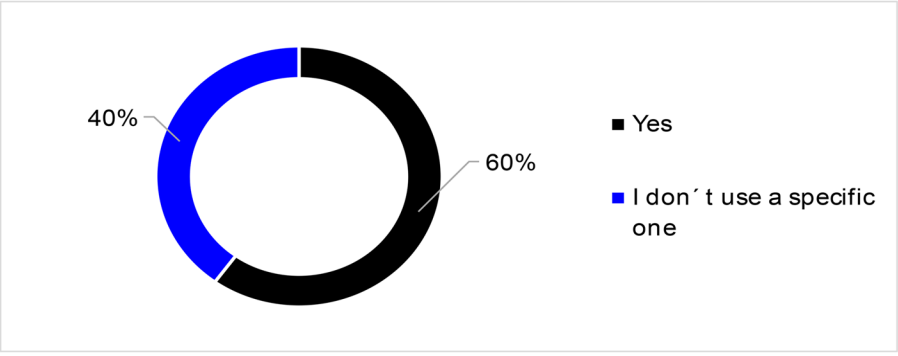


Fig. 9 Use of approach in problem analysis - Source: Author's elaboration

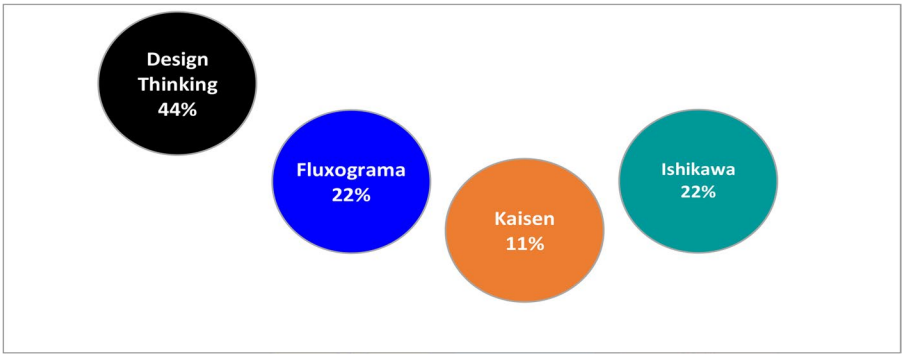


Fig. 10 Approaches and methods used to identify the problem - Source: Prepared by the author

In the approaches used, design thinking dominates with 44%, Ishikawa and flowcharting with 22% respectively, and the kaiser methodology with 11%. Although the most widely used approach is design thinking, perhaps because it is a more collaborative and user-centered method, it does not allow factual knowledge of the cause of the problem, with a method and structure for the identification and definition of the problem.

The data shows that there is a smaller scale in the use of more structured methods, which may indicate that a more technical root cause analysis is not yet prioritized, perhaps due to a lack of awareness of its importance. However, other relevant approaches are used, focusing on cause and effect analysis, helping to identify the origins of problems that arise.

The 22% Ishikawa represents, according to Pereira et al. (2021), one of the best-known techniques, which makes it possible to know the principle of causes and get to the root cause, identifying in detail the problem and all the stakeholders involved in it. The interviewees pointed out that the business context in which they operate, marked by the urgency and immediate impact of problems, limits the use of a methodical approach to identifying the cause of the problem.

> "The speed of action means that we often don't look at problems in a methodological way and we think we have a very quick way of solving the problem, but it may only be the symptom and sometimes we don't realize that a symptom is the result of a bigger disease, a pathology that was further back in the upstream process", E8.

Although the need to know the root cause is widely recognized, the pressure to solve problems quickly often leads to a lack of proper methodological analysis, focusing only on the supposed symptoms, as Pereira et al. (2021) point out .

Figure 11 shows the benefits associated with a scientific approach to problem analysis. The co-occurrence of words generated 9 clusters, with 49 nodes and 65 links Table 2.

The word frequency table highlights the nouns: problem, framework, methodology, process and design. The verbs express the action of using, having, doing,

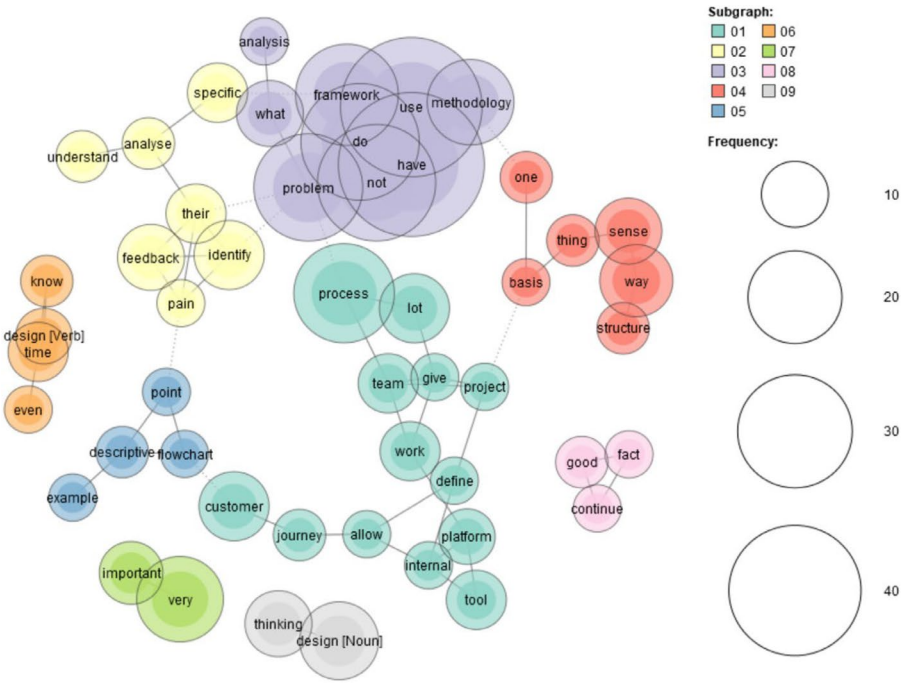


Fig. 11 The benefits of using a scientific approach - Source: Author's elaboration

Table 2 Frequency of words on the benefits of using a scientific approach - Source: Self-preparation

Nouns	Frequency	Adjectives	Frequency	Verbs	Frequency
Problem	12	Specific	4	Use	22
Framework	11	Descriptive	3	Have	21
Methodology	8	Continuous	2	Do	14
Process	7	Fundamental	2	Identify	5
Design	6	Internal	2	Analyse	3

identifying, and analyzing. The data allows us to identify the importance of using a scientific approach to analyzing the problem, which can use a specific framework or several frameworks that complement each other.

The focus of the analysis is the use of a specific method to identify the problem. It reflects the need for an analysis of structure that allows for a descriptive and methodical framework. Showing the importance of the structured, systematic and continuous process to identify the problem and the root cause (Simon, 1973; Pereira et al., 2021). Design is the key to making the problem easier to understand, and structure is crucial in its analysis (Beckman, 2020; Simon, 1973, 1996).

> "Sometimes decisions are effectively made, even because of the pressure of time, without a very systematized process, of course, the method matters, but there are no perfect companies where the process is completely oiled, I would say, and therefore I think this risk exists", E10.

The scientific process is fundamental to identifying the correct problem, because only with the use of a framework is it possible to analyze the problem descriptively, and this is an elementary process in carrying out the analysis and design of the problem, the scientific method must be carried out continuously throughout the strategy of the problem (Simon, 1973; Pereira et al., 2021).

According to Pereira et al. (2021), management must be based on cause-effect analysis and the study of the relationship between variables, so that decision-making becomes scientific, with standardized processes, thus obtaining more predictable and transparent results and the efficiency and effectiveness of resources. The importance of the scientific method in the strategic approach to problems is understood.

The data allows us to infer that the use of the scientific method translates into greater clarity in the identification of the problem, allowing for a more precise and defined assessment, and facilitating the decision-making process (Simon, 1973; Pereira et al., 2021). It also produces a more interactive and continuous process, increasing efficiency in problem-solving (Beckman, 2020).

Objective

The third objective aims to understand the impediments and challenges that managers face in identifying and defining strategic problems. In this way, managers were asked about the influence of certain challenges and impediments to finding and formulating problems, before looking for a solution (Fig. 12).

The data obtained shows that the phenomenon is recognized. This implies a comprehensive and detailed view in order to understand and develop solutions to the complexity of the problem (Markovitz, 2020; Wahl & Hutter, 2022).

The results indicate that the majority of managers (80%) recognize, to varying degrees, the challenges that lead to a solution, to the detriment of analyzing the cause of the problem. 60% of managers acknowledge that this can happen, pointing out that

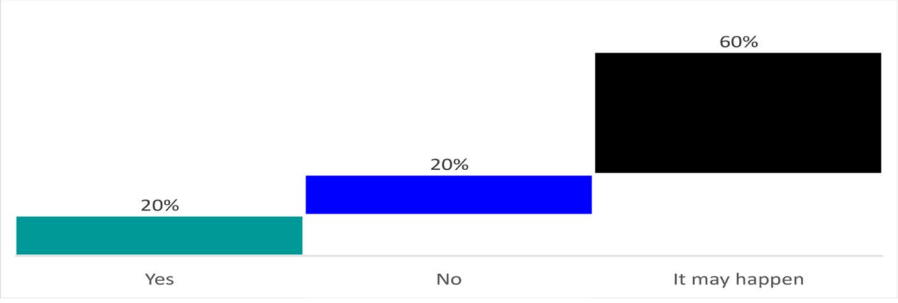


Fig. 12 Tendency to solve before knowing the problem - Source: Prepared by the author

several variables can influence and condition this situation, namely, the complexity and dependence of the organizational context.

The tendency exists for 20%, recognizing the limitations in analyzing problems before proposing solutions, while another 20% responded that this tendency does not exist, perhaps because there is another perception of the phenomenon or because they have developed knowledge that allows them to have a methodological approach more focused on analyzing the root cause of the problem before proposing solutions.

The phenomenon highlights the possibility that strategic solutions can be formulated without properly knowing and addressing the cause of the problem, leading to short-term solutions (Pereira et al., 2021).

However, it may reflect that often in organizations, the focus is not on careful consideration of the cause of the problem, because the structure is based on firefighting and quick resolution of the problem (Beckman, 2020; Spradlin, 2016).

To identify and understand the challenges and constraints faced by managers in discovering and formulating problems, interviewees were asked about the main reasons for developing a strategy based on the solution rather than the cause of problems. The word co-occurrence analysis in Fig. 13 consists of seven (7) clusters, forty-seven (47) nodes, and sixty (60) links (Fig. 13).

The data obtained identifies various reasons and challenges in knowing the cause of the problem, and can determine the course of action and the proposed solution. It can be seen that the main challenges faced by managers in formulating strategies that focus on the solution rather than the cause of the problem are culture and time, financial resources, thinking that the problem is known, lack of knowledge and awareness

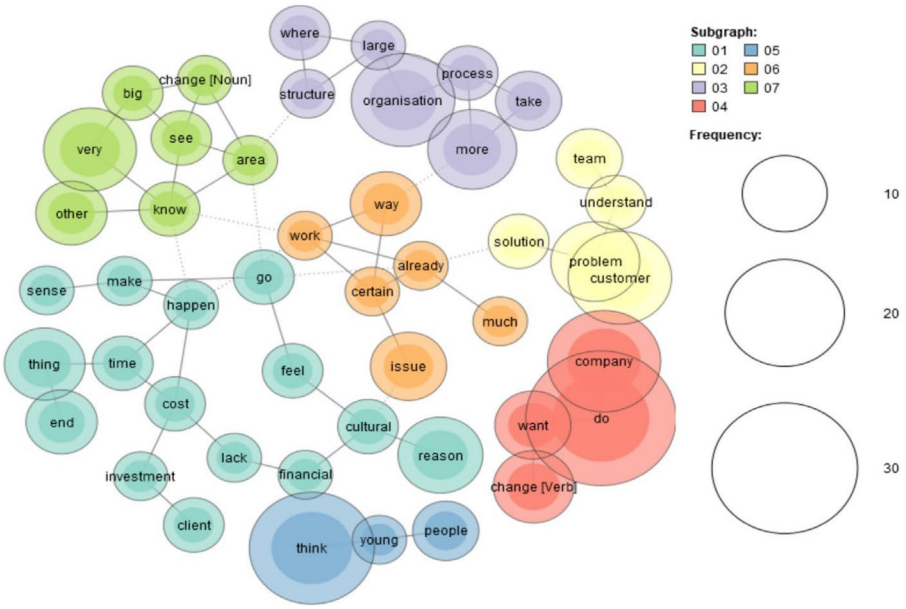


Fig. 13 Tendency to solve before knowing the problem - Source: Prepared by the author

of problem discovery and formulation practices. The graph shows the dominance of words that expose challenges Table 3.

In the frequency of words, the nouns, company, customer, organization, problem, reason, justification, thing, question and path show that the reason for the problem is still difficult, but the path is being made. The verbs in the table show the need for quick action, the focus is on quick results, to have, to do, to think, to change, to want, to finish, to take and to feel. According to Ocasio (1997), managers take action according to their focus on their attention. The graph and frequency table show that the focus is on short-term objectives and quick results.

The graph shows that words like culture, financial and time are related and manifest the challenges of organizational culture, time and investment in exploring, identifying and defining the problem. Bhardwaj et al. (2018) mention that managers tend not to think too much when defining and formulating problems, they usually assume they know what the problem is and start solving it.

> "I don't think this is the wrong way to look at it, because if we have a growing problem, we have to try to solve it first", E15.

This behavior occurs due to the consequences of multiple biases, which condition knowledge of the problem, attention is shaped by formal and informal channels (Ocasio & Joseph, 2018), routines and agendas (Ocasio & Joseph, 2005), which selectively guide the problems to be retained.

The data shows a confirmation bias the company has other ways of thinking, focusing the evidence only on the customer, identifying that many managers "think" (22) that they already know the problem, suggesting that managers assume they know the cause before investigating.

The emphasis on the precipitation bias by moving quickly to the solution without questioning the underlying causes of the problems, because the problems are changeable and are difficult to find and justify the resources (Bhardwaj et al., 2018). Or the status quo bias when identifying the path taken by younger people, associated with the tendency to follow traditional strategies, with preferences for classic, linear and known methods, which can result in the wrong solution and reflect resistance to change (Liedkta, 2018).

Table 3 Word frequency of the challenges to the cause of the problem - Source: Prepared by the author

Nouns	Frequency	Adjectives	Frequency	Verbs	Frequency
Company	18	Other	7	Have	35
Customer	15	Big	5	Do	32
Organization	15	Culture	5	Think	22
Problem	11	Certain	4	Alter	9
Justification	10	Difficult	4	Want	8
Thing	9	Financial	4	End	7
Question	8	Big	4	Take	6
Path	7	Young	4	Feel	5

> "People have been used to doing the same things for many years, and it's hard to change, so I think that too, and I don't want to generalize because I think there are older people with a younger mentality than younger people", E12.

The status quo can be limiting in developing skills and generating new knowledge (Liedkta, 2018). Awareness of the problem can be compromised by a number of factors, be it personal preference for a more conventional strategy, time pressure or lack of knowledge of good practice in cause awareness (Bhardwaj et al., 2018). A lack of focus on who is affected by the problem can limit awareness of the cause of the problem.

> "In an efficient and functional organization, those moments will certainly exist, they won't be due to incompetence, they'll just be due to human limitations because there will be moments when you don't even think you understand the problem, there are classic examples in the history of management", E13.

According to Bhardwaj (2018), a large proportion of companies consider that problems are misdiagnosed and that this imposes a significant cost. According to Simon (1972), not only is it possible to solve the wrong problem, but you may also be solving it badly due to the poor formulation of the problem, leading to the resources allocated being more than a financial cost, it produces an opportunity cost, for the satisfactory and not optimal option. But also, in the competitiveness and sustainability of the organization, because the focus of attention is on the solution and not on the problem to be solved (Ocasio, 1997). Awareness of the problem can be compromised by various factors, be it personal preference for a more conventional strategy, time pressure or lack of knowledge of good practices in root cause analysis (Bhardwaj et al., 2018; Pereira et al., 2021).

Objective

The fourth research objective aims to analyze managers' perceptions of the importance of correctly identifying and defining problems before solving them, and the impact on value creation. Managers were then asked to identify the impact of an incorrectly defined problem on value creation. The respondents were unanimous in stating that the impact of a poorly defined problem is high on the organization's value creation, which can compromise its sustainability.

The results obtained from the co-occurrence of words make it possible to observe the relationship between the correct definition of a problem and the impact on value creation. Text mining generated seven (7) clusters made up of forty-nine (49) nodes and sixty-one (61) links (Fig. 14).

The graph and word frequency table show that the impact of a poorly defined problem directly affects the creation of value, both for the customer and for the organization. The word frequency table highlights nouns such as customer, impact, problem, value, solution and company. The verbs presuppose action in the importance of discovering problems, having, doing, delivering, thinking, knowing and using Table 4.

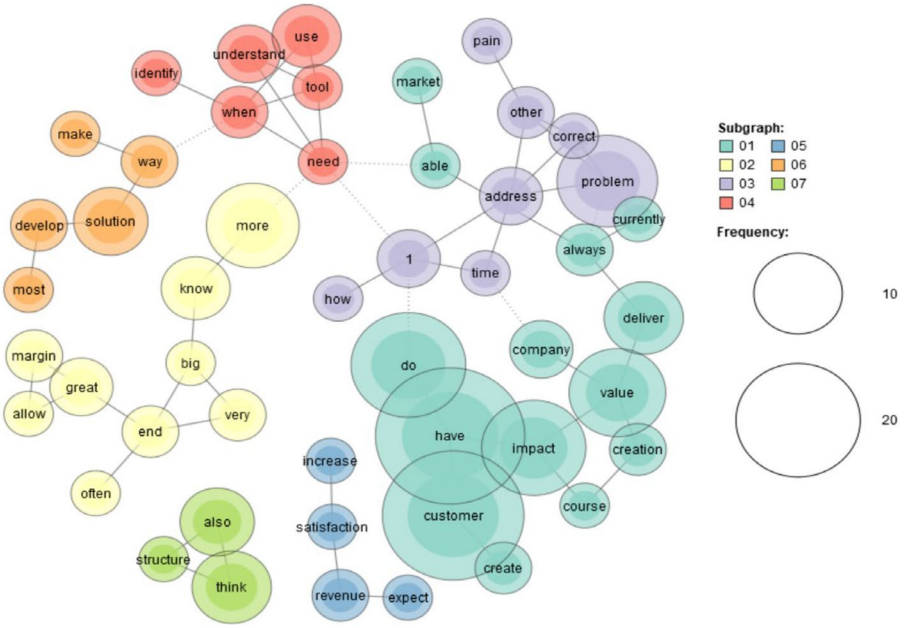


Fig. 14 Word groupings of the impact of an ill-defined problem - Author's elaboration

Table 4 Frequency of impact words for an ill-defined problem - Source: Author's elaboration

Nouns	Frequency	Adjectives	Frequency	Verbs	Frequency
Customer	26	First	5	Use	29
Impact	14	Great	5	Do	17
Problem	13	Other	4	Delivery	8
Value	12	Able	3	Think	8
Solution	7	Big	3	Know	6
Company	5	Correct	3	Use	6

The customer is the first to be impacted when the solution does not deliver the expected value, compromising expected return and value creation (Nickerson et al., 2007). This mismatch results in high opportunity costs and the loss of competitive advantage resulting from not exploring more effective approaches to identifying and defining problems (Nickerson et al., 2007).

> "This is decisive in defining the strategy, because if we don't solve a problem well and if we don't look at the problem as it is, we can get to the end and have big surprises", E6.

Solving strategic problems, which are usually complex and poorly structured, without a rigorous definition can easily lead to the solution of "wrong" problems, resulting in type III errors, with high impacts, waste of resources and destruction of value (Baer et al., 2013; Cummings & Nickerson, 2021; Nickerson & Argyres, 2018).

> "The impacts are immense because if I don't have that attention, I could be developing something where I'm investing, and then it doesn't have the expected results", E2.

The data obtained shows that type III errors have a strong impact on value creation, affecting expectations, the value delivered to the customer, satisfaction and, consequently, the brand, resources and value creation (Cummings & Nickerson, 2021; Spradlin, 2016).

> "It has a negative impact, because we are working on something that is not what we should be working on, we are addressing and finding solutions and answers to an ill-defined problem, so the solutions are wrong, we are not generating value, but wasting value", E11.

The essence lies in the need for strategic managers to invest in an in-depth understanding of problems, as a fundamental condition for developing innovation potential that creates value (Dougherty, 2017; Nickerson & Zenger, 2004; Nickerson et al., 2007, 2012).

> "It's almost a basic necessity that companies have to do it, if they don't, they run the risk of building solutions that don't make sense, which is obviously a big risk", E10.

Correctly defining the problem is crucial to the organization's performance and strategic position, requiring a rigorous analysis that avoids hasty decisions and ineffective solutions that could seriously compromise its competitive advantage and sustainability.

> "Often we define the strategy, but we don't look at it, we don't define it, and we don't list any problems", E4.

Finding and formulating problems is crucial in strategic management, guiding value creation and innovation. With an impact on the vision of the strategy and for whom the new value created is intended (Nickerson et al., 2007, 2012). In this process, knowing what the problem is the first step (Cummings & Nickerson, 2021). A scientific approach transforms a focus on real and relevant problems (Ocasio & Joseph, 2005; Ocasio & Joseph, 2018) into innovative solutions with a high impact on performance and the ability to generate and maintain value (Pereira et al., 2021) Table 5.

Conclusions

This study aimed to identify how exploring problems in the problem finding and formulation stages with method and rigor is fundamental to identifying and defining the problem before generating the solution, contributing directly to innovation strategy and value creation in organizations.

Table 5 Table of contributions - Source: Prepared by the author

Topic	Author/Year	Theoretical Contributions	Practical Contributions
Exploring Problem, Problem Finding, Problem Formulation, Design Thinking	Beckman (2020); Liedkta (2018);	• Exploring problems requires practices that go beyond looking for immediate solutions, • The beginning of the process is problem finding and problem formulation. • The importance of scientific approaches to finding hidden or poorly understood problems • Before a solution can be found, the problem must be identified and defined • Method and rigour generate relevant strategic insights, • The depth of approaches used in a subtle way, such as design thinking, is increased. • Design thinking can neglect the cause of the problem if it is not explored in depth with a scientific method • Obtaining better solutions, lower costs and stakeholder engagement in innovation projects.	• Need for scientific tools and approaches to explore problems, find and formulate relevant and real strategic problems. • Avoid premature solutions, reduce costs, mitigate risks and increase stakeholder engagement • Increase the rigor of approaches such as Design Thinking to increase the impact on value creation.
Scientific method, root cause of problems	Pereira, et al . (2021); Spradlin (2016); Beckman (2020)	• A scientific approach allows for rigour in identifying and defining problems, • It allows for understanding causal relationships • It promotes decisions based on evidence and not on symptoms • The critical and reflective analysis obtained from problem situations • Contributes to the construction of solutions aligned with strategic objectives, • It allows for a greater focus of attention on relevant strategic problems • Reduces bias, increases the quality of innovation decisions • Making informed decisions • Organizational attention is conditioned by cognitive biases	• It guides managers to base their decisions on data and structured methods • Use of a scientific approach and thinking, with collaborative processes • Tools that promote critical reflection • Empowering and facilitating the focus of attention on real problems of strategic importance to innovate • Reducing errors and optimizing resources.
Rationality, Limited attention, Bias and heuristics	Bhardwaj, et al (2018).; Liedkta (2018); Simon (1947); Ocasio (1997)	• Cognitive limitations, such as limited rationality and selective focus of attention, translate into biases and heuristics • Organizational challenges, which are fueled by a lack of structure • Method and scientific approach, crucial for a • Critical and reflective analysis that directs • Focus of attention on real and strategic problems	• Points out the need to use scientific approaches • Mitigate cognitive and attention limitations • Eliminate biases and heuristics • Identify and define problems before rushing into solutions,
Type III error, Value creation	Nickerson,(2012). Cummings & Nickerson (2021).	• Identifying and defining problems with a scientific approach mitigates type III errors and reduces the opportunity costs of hasty decisions. • It favors a more precise and grounded analysis of strategic challenges, by understanding causes and contexts in depth.	• The use of scientific approaches allows managers to identify previously overlooked strategic opportunities, • Opting for the optimum solution rather than satisfying, • Preventing resources from being allocated to irrelevant solutions • Reducing costs and risks • Mitigating opportunity costs • Boosting the ability to maintain a continuous flow of learning and discovery • Raising maturity in innovation strategy and value creation.

The first objective identified the importance of exploring problems in order to innovate. The identification still focuses heavily on known problems, with a focus on customer feedback. There is recognition of the importance of stakeholders in the process. There is a growing understanding of the importance of exploring hidden problems to innovate.

The study shows that although design thinking is widely adopted as an approach to driving innovation, the initial problem finding and formulation stage is not always conducted with the necessary rigor. Incorporating the scientific method into these phases is an essential contribution to strengthening the effectiveness of the process.

Scientific thinking makes it possible to explore unknown problems, identifying them rigorously and objectively before solving them, which is fundamental in obtaining superior solutions, with fewer risks and costs and greater stakeholder buy-in, for sustainable innovation and value creation.

The second objective identified the importance of problem formulation, scientific method, and root cause analysis. Most managers consider that they know the root cause of the problem, but there may be strategic restrictions on working on certain problems due to the trade-off between cost and benefit.

The results suggest that the majority of managers can understand the problem but may find it difficult to deepen their knowledge; there are challenges in fully defining the problem and the factors that influence it. There is partial adherence to the use of scientific methods, specially design thinking and the Ishikawa diagram.

However, the pressure for quick results compromises the systematic application of methods. Most people know the cause, but find it difficult to analyze it in depth, showing a lack of structure and rigor in defining problems. The inconsistent use of the scientific method can lead to decisions based on symptoms rather than the real causes.

The third objective made it possible to identify the challenges and limitations that managers face in finding and formulating problems. The results indicate that the majority of managers recognize, to varying degrees, the challenges that lead to solutions, to the detriment of analyzing the cause of the problem. This phenomenon highlights the possibility that strategic solutions can be formulated without adequately knowing and addressing the cause of the problem, leading to short-term solutions.

The precipitation bias quickly moves on to solutions without questioning the underlying causes of problems. Or confirmation bias, thinking that the problem is already known, and status quo bias when identifying concepts as the right way, associated with the tendency to follow traditional strategies, with preferences for classic, linear and known methods, which can result in the wrong solution and reflect resistance to change.

The fourth objective highlighted the importance of correctly identifying and defining the problem, highlighting the type III error, which is a critical factor and compromises the company's performance, directly impacting the creation of value for the client and the organization. When the solution is not based on a precise diagnosis, there is a waste of resources, an increase in costs and a loss of opportunity, with a detriment to the intended strategic result.

This study shows that although managers recognize the strategic importance of correctly finding, identifying, defining and analyzing problems, in practice, the approach still lacks structure, depth, and systematization. There is a mismatch between intention and execution, driven by organizational pressures and cognitive biases.

Limitations of the study

The research focused on service companies, limiting generalizations to other sectors; future studies should include organizations from different sectors to identify whether the challenges and strategies identified apply to different contexts.

The limitations of the empirical approach in the intentional sample of 15 business managers make it necessary to carry out new studies in the future with a larger population sample and greater statistical relevance.

Implications

The findings reinforce the importance of identifying and defining problems as a starting point for sustainable innovation, suggesting that scientific approaches and careful analysis of strategic challenges can promote the creation and capture of sustainable value.

The findings contribute to the theory, highlighting the importance of finding and formulating problems before solving them, and the relevant role of scientific approaches in promoting innovation. And for the practice of innovation management and strategy, the adoption of approaches that prioritize the identification and careful definition of real and relevant problems increasing the value of innovation.

Author Contribution Conceptualization: Leandro F. Pereira, Álvaro L. Dias; Methodology: Carla Fonseca, Leandro F. Pereira; Formal analysis and investigation: Carla Fonseca; Writing – original draft preparation: Carla Fonseca; Writing – review and editing: Leandro F. Pereira, Álvaro L. Dias, Rui Vinhas da Silva; Funding acquisition: Rui Vinhas da Silva; Resources: Leandro F. Pereira, Rui Vinhas da Silva; Supervision: Leandro F. Pereira, Álvaro L. Dias.

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Data Availability The data that support the findings of this research are available on request from the corresponding author

Declarations

Human Ethics and Consent Human Ethics and Consent to Participate declarations: not applicable.

Conflict of interest There's no conflict of interest of any kind in this research

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