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Phases, metrics, and techniques of product discovery

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Abstract

This paper aims to explore, synthesize, and analyze gray literature on the product discovery process, focusing on its key metrics, phases, and techniques to offer valuable insights into effective product management practices. A comprehensive review and analysis of gray literature sources, including online articles, blog posts, reports, and books, was undertaken to construct a thorough perspective on the product discovery process. The review categorizes the main themes of product discovery into phases, metrics, and techniques, providing a holistic summary of the methods and best practices for successful product discovery. The review is based on gray literature, which lacks the academic rigor of peer-reviewed sources despite providing valuable industry insights. Hence, it is recommended that future research incorporate more peer-reviewed academic literature to supplement these findings for a more comprehensive understanding of the product discovery process. This review synthesizes the existing gray literature on product discovery, offering an informative overview of the field's current practices, methods, and strategies. It highlights key insights that could help organizations and practitioners better understand the product discovery landscape, potentially informing the enhancement of their product development practices to align with market opportunities and user needs. Improved understanding and application of product discovery could lead to more user-centric products, positively impacting user satisfaction and engagement. Additionally, it could influence the competitiveness and success of product companies in the market, influencing employment and economic growth. This review synthesizes the existing gray literature on product discovery, offering an informative overview of the field's current practices, methods, and strategies. It highlights key insights that could help organizations and practitioners better understand the product discovery landscape. Thus, it serves as a unique, timely resource for companies across industries, aiming to understand better and potentially optimize their product management strategies.

Keywords: Product discovery, Phases, Metrics, Techniques, Product management

Introduction

The ever-changing landscape of the technology sector has led to a growing focus on product discovery and its critical role in product management. As organizations strive to keep up with market demands and remain competitive, they continuously search for efficient processes and strategies for product development (Gnanasambandam et al.,

2023). In this environment, product discovery has become more than a simple stage in product development; it is a continuous process of learning, adapting, and improving (Torres, 2018). Product discovery has emerged as an essential approach for organizations to effectively develop successful products that address user needs and market opportunities (Goetzen, 2023).

Creating a product involves consuming significant resources (Casarotto, 2021). An organization may have the best engineering team capable of building a product, but it is crucial to ensure that they are developing the right product – one that is valuable for customers and not merely a product that nobody wants to use (Lanyon, 2018; Münch et al., 2020).

With the increasing interest in product discovery, there is still a need for a more comprehensive understanding of the metrics, phases, and techniques involved (Münch et al., 2020). This research explores the relationships between these concepts and provides a consolidated view of the methods and best practices adopted by organizations and practitioners in product discovery.

The structure of the paper is divided into seven sections. The current section serves as the introduction, presenting the objectives of this research and providing an overview of the paper's structure. Section 2 delves into the research motivation, while Sect. 3 delves into the research methodology, detailing the gray literature review. Sections 4, 5, and 6 represent the planning, conducting, and reporting phases of the multivocal literature review, respectively. Section 6 also discusses the interrelationships between research questions and their derived insights. The paper concludes with Sect. 7, summarizing the conclusions and potential threats to the study's validity.

Research motivation

Developing new products, features, or services is risky and difficult. There is no "magic bullet" process for discovering new product opportunities (Melanie & Mayfield, 2009).

This leads to the key question of what should be developed (Münch et al., 2019). The challenge for companies is no longer identifying and solving technical problems but rather which products, features, or services solve relevant customer problems and deliver value to the customer and the business (Fagerholm et al., 2017).

Some challenges concerning conducting product discovery experiments were identified by Gutbrod et al. (2017). Based on the conduction of semi-structured expert interviews with start-ups, the authors obtained the following challenges: (1) getting enough subjects for experiments, (2) fear of contacting customers and cold calls, (3) technical issues regarding the setup of infrastructure for experimentation, (4) lack of skills for conducting customer interviews, (5) lack of resources and employees for experimentation, (6) lack of motivation to conducting experiments and finally (7) the fear that people steal the idea of the start-up.

Other authors emphasize the role of prototyping in experimenting with business ideas. In a study, they identified factors influencing a prototype-centric learning loop (Nguyen-Duc et al., 2017). One important finding from their study is that it is necessary to align the prototyping approach with the learning goals (Nguyen-Duc et al., 2017).

Another study by Nguyen-Duc and Abrahamsson (2016) explored the role of minimum viable products (MVPs) in early-stage startups. They found that MVPs are

important in bridging knowledge gaps between the entrepreneur team and stakeholders (Nguyen-Duc & Abrahamsson, 2016).

Lindgren and Münch (2016) conducted semi-structured interviews to explore the state of experimentation practice, challenges, and success factors in the software industry.

However, all these studies have a different scope and do not comprehensively address the methods and practices for product discovery adopted by organizations and practitioners.

On the other hand, due to the topic’s novelty and rapid evolution, only limited research literature exists on product discovery (Münch et al., 2020).

The traditional research literature (due to lengthy publication processes) often lags behind industry practices in fast-evolving fields like product management, particularly product discovery. The gray literature, including industry reports, white papers, and non-peer-reviewed conference proceedings, offers several advantages for identifying industry practices. Therefore, the research on which this paper is based USED the gray literature to better understand product discovery in practice.

Research methodology

This research followed a multivocal literature review (MLR) strategy, specifically focusing on product discovery in product management. The selection of an MLR was particularly relevant due to the topic’s practical nature and the utility of incorporating direct insights from professionals and practitioners in the field of product management. The MLR approach allowed for a comprehensive exploration and analysis of gray literature, which offered recent, real-world insights often not accessible in academic literature.

The MLR was designed and implemented in a structured manner, encompassing three distinct stages presented in Fig. 1.

Planning the MLR set the foundation for this research, where the need for MLR was justified, and the review’s objectives were outlined: to explore product discovery phases, metrics, and techniques. The research questions were also formulated during this stage. The second stage, conducting the MLR, required a search for relevant gray literature. The different sources were selected based on their relevance to the topic and quality and then extracted into a database. The final stage, reporting, encapsulated the MLR’s findings. The extracted data were analyzed and processed into a concise summary, presenting the key discoveries from the gray literature review and providing a consolidated view of the current knowledge in product discovery.

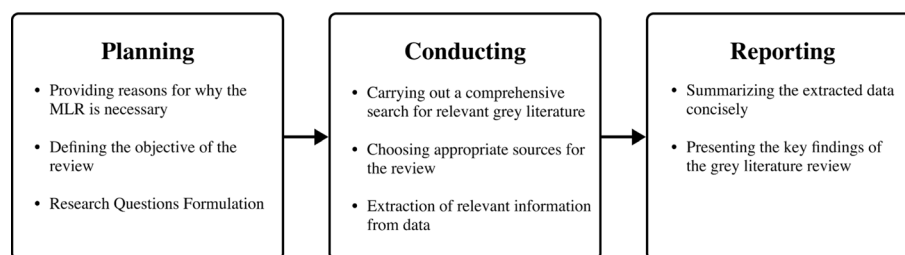


Fig. 1 The multivocal literature review process (MLR)

The gray literature provides valuable insights into current industry practices but has also some limitations. One of the main limitations is the potential bias in these sources, as they often prioritize practical solutions over theoretical rigor. To address this limitation, we have mostly cross-referenced multiple gray literature sources to ensure a balanced perspective and reduce the risk of relying on single, potentially biased viewpoints. We have also included some reference research papers in Sect. 2 to provide a more robust theoretical framework, countering the industry-focused insights from the gray literature. Future research could address this limitation by conducting a systematic literature review focused on peer-reviewed research papers.

Planning the review

This section details the initial planning and preparation for the MLR, starting with formulating the research questions. These questions, crucial to the process, serve as the roadmap to guide the review and structure the analysis. They help us navigate the vast and varied gray literature, ensuring the results are pertinent and comprehensive.

Research questions

To explore the relationships and provide a consolidated view of the methods and best practices adopted by organizations and practitioners in the realm of product discovery, the study will consolidate and analyze the existing gray literature, addressing the following research questions:

- **RQ1**—What is the definition of product discovery?
- **RQ2**—What are the product discovery phases?
- **RQ3**—What types of metrics are being used in product discovery?
- **RQ4**—What types of techniques are being used in product discovery?

This research addresses the outlined research questions to promote organizations' adoption of practical strategies and improve product development and management practices.

Gray literature

The decision to use gray literature in this study was made due to several factors contributing to its relevance and value in product management research. Product management is a relatively recent topic that has gained significant attention and popularity as more organizations recognize its importance in driving product success and ensuring competitiveness in rapidly evolving markets (Anastasiia & Ulfsnes, 2022).

Given the fast-paced nature of the technology sector and the continuously evolving landscape of product management practices, gray literature offers a unique opportunity to capture real-time insights and experiences from industry professionals and practitioners. Unlike traditional academic literature, which may take a considerable amount of time to be published and disseminated, gray literature provides timely and up-to-date information essential for understanding the current trends, challenges, and practices in the field (Garousi et al., 2016).

Moreover, gray literature often contains practical knowledge, case studies, and lessons learned from real-world experiences, which are invaluable for informing effective product management strategies and decision-making. By incorporating the perspectives of industry practitioners, this study aims to provide a more comprehensive and relevant understanding of product discovery metrics, phases, and techniques, ultimately offering valuable insights for organizations and professionals in the field of software product management (Adams et al., 2017).

Search strategy

A search strategy was implemented to ensure a rigorous and systematic literature review. Google Search was the primary engine for identifying relevant resources, using the specific search string "product discovery" metrics.

The search stopped when the point of saturation was reached. A rule determined this point: the search was halted when a full page of search results containing ten entries was considered unrelated to the topic of interest. This rule balanced the depth of the literature search without delving into unrelated content. This strategy resulted in a pool of 81 articles. The last phase involved thoroughly evaluating each article to assess its pertinence and contribution to understanding product discovery metrics.

Selection criteria

The articles were filtered based on a set of predetermined inclusion and exclusion criteria presented in Table 1, to ensure relevance and quality.

The inclusion and exclusion criteria were selected based on several factors, such as product management being an industry that is changing quickly and predominantly in English. Thus, retrieving up-to-date English content published less than ten years ago, focused on software-related product management, was crucial.

Furthermore, there were plenty of articles on "product management" regarding physical products and the e-commerce management of online product stores. These articles were not about the same software product management studied in this research and thus were excluded from the results.

Although some articles were related to software product management and discovery, some were not focused specifically on product discovery metrics, phases, or techniques, considerably reducing the research value needed to answer this study's research questions.

Table 1 Inclusion and exclusion criteria

Inclusion criteria	<ul style="list-style-type: none"> ● Articles are written in English ● Articles focused on product management in the software domain ● Articles discussing metrics, phases, or techniques related explicitly to product discovery ● Articles published within the last ten years to ensure relevance and up-to-date information
Exclusion criteria	<ul style="list-style-type: none"> ● Articles unrelated to software product management (e.g., e-commerce products, physical products) ● Articles that do not discuss product discovery or its related metrics, phases, or techniques ● Articles were published more than ten years ago to maintain the currency of the information



Fig. 2 The article filtering process

Article Distribution by Year

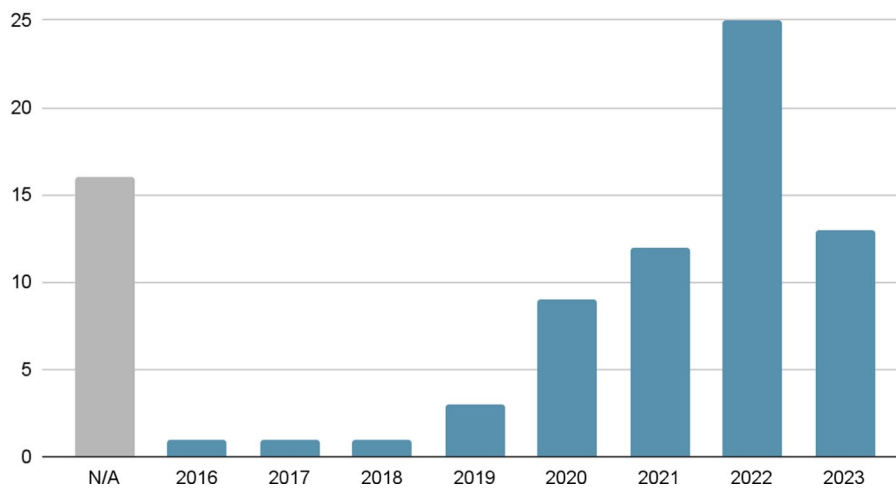


Fig. 3 Extracted article distribution by year

Data analysis and extraction

After applying the inclusion and exclusion criteria, 65 articles remained. Despite implementing these criteria, some articles remained too broad, not providing substantial, specific content to address the research questions adequately. Ultimately, 46 articles were used directly to answer the research questions. In Fig. 2, the process of applying the filtering is presented.

This methodology ensured that the selected articles were relevant, comprehensive, and of high quality, providing a strong foundation for the investigation and analysis of the current literature on product discovery metrics, phases, and techniques in software product management.

The recency of the information within the selected articles further supports this study’s choice of gray literature. A closer examination of the publication dates of the 81 articles, shown below in Fig. 3, reveals that most of the sources are from recent years, emphasizing the novelty and up-to-date nature of the data.

As can be observed, more than half of the articles (50 out of 81) were published within the last three years (2021, 2022, and 2023), highlighting the information’s relevance in the rapidly evolving field of product management. By focusing on industry professionals’ most recent insights and experiences, this study aims to comprehensively understand current, up-to-date product discovery metrics, phases, and techniques.

Conducting the review

This section outlines the MLR process, and the formulated research questions are addressed based on the gathered gray literature. It is important to highlight that the entirety of the material referenced in this section is sourced exclusively through specific search keywords, ensuring a focused and relevant review.

RQ1—Product discovery definition

The first research question aims to establish a clear definition of product discovery, which is essential for understanding the subsequent phases, metrics, and techniques that constitute the process.

Through the articles researched and filtered, various definitions by different authors were identified and presented in Table 2, capturing the essence of product discovery from multiple perspectives.

After analyzing the definitions presented in Table 2, several common themes emerge. Out of the 15 definitions, 8 emphasize that product discovery is a process (Maze, no date a; McGillvary, 2022 no; Gontarz, 2023; Guthrie, 2022; Herbig, 2023; Hotjar, 2022; Torres, 2016, 2020, 2021) with one author highlighting its challenging nature (Kaur, 2022). Furthermore, a substantial number of definitions converge on the importance of understanding and validating customer needs and problems (Beazley, no date; Maze, no date a; McGillvary, 2022), while others focus on minimizing risk through usability, feasibility, viability, and value considerations (Gontarz, 2023; Lozano, no date; Spinnangr, 2022). Additionally, some authors underline the necessity of engaging with customers regularly (Torres, 2016, 2020, 2021) and incorporating cross-functional teams to create effective solutions (Herbig, 2023).

Despite the similarities, some definitions diverge in their specific focus. For example, some authors emphasize the iterative exploration and experimentation involved in product discovery, stressing the role of continuous discovery (Firak, 2022; Gontarz, 2023; Spinnangr, 2022; Torres, 2020), while others underline the importance of making informed decisions about what to build (Hockley, 2020; Spinnangr, 2022; Torres, 2021; Userpilot, 2023).

A summary of the key aspects identified is presented in Table 3. Based on the authors' various definitions, a "key aspect" refers to a crucial or foundational element, attribute, or principle that recurs throughout product discovery's various definitions or descriptions. These key aspects are common themes or threads that consistently appear, often forming the cornerstone of understanding product discovery as a concept, process, or approach.

With this understanding of a "key aspect", let's revisit the definitions from the gray literature. Upon close examination of these definitions, several key aspects emerge. These are not isolated or standalone attributes; they often interconnect and influence one another, contributing to a comprehensive understanding of product discovery. Table 3 summarizes these key aspects as gleaned from the definitions provided by the authors. This overview allows for a clear understanding of the main themes and commonalities that emerge from the gray literature extracted.

Table 2 Product discovery definitions by different authors

Author	Product discovery definition
Adam Gontarz (Gontarz, 2023)	"(.) process of understanding the client's idea, identifying potential challenges, and validating that the end product will serve its purpose and fulfil business goals. It tackles the concept from all relevant perspectives to ensure the project can become what it was intended to be, and it's a foundation for a smooth, cost-effective, and risk-free development process."
Arshpreet Kaur (Kaur, 2022)	"Is unarguably the most challenging yet essential phase of your software development lifecycle. It is all about ensuring that you are trying to solve the right problem, for the right audience, and at the right time."
Caley McGillvary (McGillvary, 2022)	"(.) the process of gaining a deep understanding of your users. This understanding empowers you to create a data-driven, customer-led product strategy."
Chris Hockley (Hockley, 2020)	"(.) a phase where product teams run multiple experiments in parallel to validate their assumptions and make the best product decisions."
Georgina Guthrie (Guthrie, 2022)	"(.) the process of gathering insights, which you'll then use to shape your designs. Everyone's approach is a little different, but at a high level, the process involves three key areas: Researching, Testing, and Validating assumptions."
Hannah Beazley (Beazley, no date)	"(.) the process of understanding customers on a deeper level in order to develop products that suit their needs."
Hotjar (Hotjar, 2022)	"(.) the continuous process of learning how your product can better serve your customers. It helps you understand what product your team could build, whether you should build it, and what you need to know about your customers to build it right"
Johanna Lozano (Lozano, no date)	"The Product Discovery phase seeks to minimize uncertainty around a problem and reduce variables concerning an idea to ensure that the exact right product is built for the exact right audience."
Martin Spinnangr (Spinnangr, 2022)	"Product discovery for new products is about the search for a repeatable and scalable business model. Think business, not just product. To become successful, it needs a proven value proposition, pricing strategy, channel strategy, and the rest of the nine elements in the business model." (.) "Embrace a hypothesis-driven approach to product discovery— parts of, if not all, of the product idea are based on guesswork. Inherently, many of these guesses will be proven wrong, which calls for iterations and pivots. Discovery is never done."
Maze (Maze, no date)	"(.) the process of closely understanding what your users' problems and needs are, then validating your ideas for solutions before starting development."
Sigrid Hellberg (Hellberg, 2021)	"(.) the part of the product management process when you explore WHAT it is you need to build. WHAT are the customer needs? WHAT features will be valuable for the customers? The focus is on making sure you are building the right product to solve your customers' problems."
Teresa Torres (Torres, 2016, 2020, 2021)	"(.) process of engaging with customers on a regular basis, mapping the opportunity space, identifying and testing assumptions, iteratively exploring ideas, and shipping value often."; "the work that we do to make decisions about what to build" (.) "working to understand their customer's context and iteratively testing their ideas."
Tim Herbig (Herbig, 2023)	"(.) the evidence-informed process of reducing uncertainty as you find problems worth solving and solutions worth building. It emerges through a series of nonlinear activities, conducted as a cross-functional team. Product Discovery aims to reduce uncertainty and increase the confidence to invest resources in building a specific product-based on strong evidence, collected first-hand by product teams"
Userpilot (Userpilot, 2023)	"(.) the stage in the product management process during which the team decides what to build. Specifically, it focuses on identifying problems in users' lives that are significant enough that they are ready to pay for a solution."
Valentin Firak (Firak, 2022)	"Continuous discovery can be defined as "Weekly touch points with customers, by the team building the product, where they conduct small research activities, in pursuit of a desired product outcome"

Table 3 Summary of key aspects of product discovery identified by the authors

Key aspect	Explanation	References
Product discovery as a process	8 out of the 15 definitions emphasize product discovery as a process, with some highlighting its challenging nature	(Beazley, no date; Gontarz, 2023; Guthrie, 2022; Herbig, 2023; Hotjar, 2022; Kaur, 2022; Maze, no date a; McGillvary, 2022; Torres, 2016, 2020, 2021)
Iterative exploration and continuous experimentation	Some authors emphasize the iterative exploration and experimentation involved in product discovery, stressing the role of continuous discovery	(Firak, 2022; Gontarz, 2023; Spinnangr, 2022; Torres, 2020)
Making informed decisions about what to build	Underline the importance of making informed decisions about what to build	(Hockley, 2020; Spinnangr, 2022; Torres, 2021; Userpilot, 2023)
Regular engagement with customers and cross-functional teams	A few authors underline the necessity of engaging with customers regularly and incorporating cross-functional teams to create effective solutions	(Herbig, 2023; Torres, 2016, 2020, 2021)
Minimizing risks: Usability, Feasibility, Viability and Value	Some definitions focus on minimizing risk through usability, feasibility, viability, and value considerations	(Gontarz, 2023; Kharychkova, 2022; Spinnangr, 2022)
Understanding and validating customer needs	Many definitions converge on the importance of understanding and validating customer needs and problems	(Beazley, no date; Maze, no date a; McGillvary, 2022)

Considering the various perspectives provided by the definitions, it becomes apparent that product discovery constitutes a multifaceted and intricate process (Beazley, no date; Gontarz, 2023; Guthrie, 2022; Herbig, 2023; Hotjar, 2022; Kaur, 2022; Maze, no date a; McGillvary, 2022; Torres, 2016, 2020, 2021). This process encompasses the understanding and validation of customer needs and problems (Beazley, no date; Maze, no date a; McGillvary, 2022), engagement in iterative exploration and experimentation (Firak, 2022; Gontarz, 2023; Spinnangr, 2022; Torres, 2020), and data-driven decision-making concerning the development of products. The definitions accentuate the challenging and continuous nature of the process, emphasizing the necessity for hypothesis-driven approaches and cross-functional teams to mitigate risks and ensure the creation of valuable, feasible, usable, and viable products (Hockley, 2020; Spinnangr, 2022; Torres, 2021; Userpilot, 2023).

As we progress towards a more comprehensive understanding of product discovery, it is imperative to formulate a precise definition that can serve as a foundation for analyzing and evaluating methods and best practices adopted by organizations and practitioners in software product management. This synthesized definition will provide a foundation for the remainder of the study, facilitating a focused examination of the diverse product discovery phases, metrics, and techniques discussed throughout the literature.

To address this research question effectively, a review of the selected literature was conducted, considering the definitions provided by the authors presented in the previous tables. By examining the multiple perspectives and common ideas identified within the literature, the following definition has been formulated to reflect a well-rounded understanding of product discovery: Product discovery is the process

of understanding and validating customer needs and problems, iteratively exploring and testing ideas, and making informed decisions about what to build.

This definition covers three main aspects of product discovery: identifying and validating customer needs and problems, which entails understanding the target customers and the challenges they face (Beazley, no date; Maze, no date a; McGillvary, 2022); engaging in iterative exploration and experimentation, which involves generating and testing various ideas to address the identified needs and problems (Gontarz, 2023; Spinnangr, 2022; Torres, 2020); and making data-driven decisions about product development, which requires analyzing the outcomes of the exploration and experimentation to determine the most viable and valuable solutions to build (Hockley, 2020; Torres, 2021).

This definition of product discovery, synthesized from analyzing various definitions and their common themes found in gray literature, plays a pivotal role in this study. It serves as the basis for a unified definition and understanding of the concept of product discovery, enabling a focused examination of the diverse product discovery phases, metrics, and techniques discussed in the gray literature. This definition emphasizes the key aspects of product discovery, including customer-centricity, iterative learning, and informed decision-making, and serves as the foundation for the remainder of the study.

By clearly and concisely defining product discovery, the study can effectively proceed with the analysis, ensuring that the findings remain relevant and valuable to practitioners and organizations.

RQ2—Product discovery phases

The second research question focuses on delineating the phases of product discovery. This understanding is integral to achieving an effective product discovery process, as it provides a step-by-step guide for systematically addressing customer needs and problems.

The phases of product discovery reflect the sequential steps a product team undertakes to understand customer needs, ideate solutions, validate these ideas, and make informed decisions about what to create. This in-depth exploration of the phases of product discovery is essential to provide a clear roadmap for the process (Kaur, 2022). Different authors and sources have identified various phases involved in the product discovery process. Exploration of the gray literature revealed two primary approaches to defining the phases of product discovery. The two principal frameworks identified were the adaptable product discovery approach and the double diamond approach. While both models embody the product discovery process's essence, each offers a unique perspective on the stages of understanding customer needs, ideating solutions, validating these proposals, and determining what to build (Herbig, 2023).

The following section will more deeply examine these two product discovery phase approaches. This analysis will provide an understanding of each phase's activities, purpose, and role within the larger framework of the product discovery process. Although different in structure, these methodologies seek to provide a systematic pathway toward successful product creation.

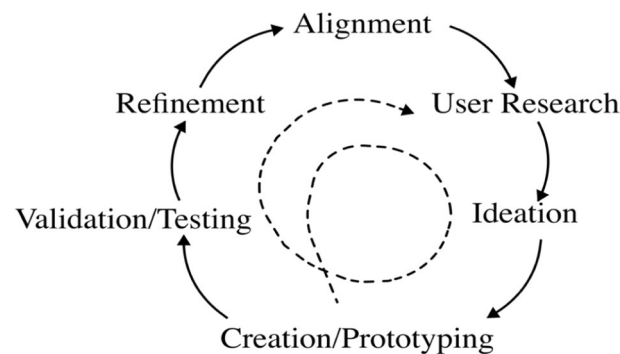


Fig. 4 Adaptable product discovery—adapted from Herbig (2023)

Adaptable product discovery

One of the proposed distributions of phases of the product discovery process is adaptable product discovery, which is presented in Fig. 4 and encompasses six crucial stages: Alignment, Research, Ideation, Creation/Prototyping, Validation, and Refinement (Herbig, 2023). Although with different names for similar phases, similar approaches also appeared in the gray literature (Kaur, 2022). This approach aims to improve the effectiveness of product development by iteratively addressing user needs and reducing uncertainty. This section will explore the details of each phase and discuss how they contribute to the overall product discovery process.

It is important to note that these stages do not follow a strictly linear order and may necessitate iterative thinking, modifications, and adaptability, thus the name adaptable product discovery. Teams must be ready to re-examine previous stages and implement alterations as they gain new knowledge and insights throughout the product discovery journey (Herbig, 2023).

The *Alignment* phase is the foundation for the entire product discovery process. By establishing a shared understanding among stakeholders and the product team, this phase ensures that everyone is on the same page regarding goals and outcomes. In this stage, teams identify the problem and solution spaces, clarify the scope and objectives, and emphasize desired outcomes over specific features. This alignment helps foster team autonomy and collaboration, setting the stage for the rest of the process (Herbig, 2023).

The *User Research* phase involves profoundly exploring the most critical user problems the product should address. By prioritizing user needs and motivations, product teams can identify areas where their product can have the greatest impact. Gathering user insights through various research methods and analyzing existing sources of user feedback are vital components of this phase. The knowledge gained from this phase is crucial for informing the Ideation stage (Kaur, 2022).

In the *Ideation* phase, the product team collaborates to generate creative ideas that could address the identified user problems. This phase encourages out-of-the-box thinking and the involvement of stakeholders and temporary collaborators. Teams then prioritize ideas based on their potential impact, focusing on those that are most likely to provide meaningful solutions to user problems (Guthrie, 2022; Kaur, 2022).

The *Creation* (or Prototyping) phase transforms ideas into tangible prototypes. These prototypes help teams test their assumptions by simulating user experiences and validating proposed solutions. Developing prototypes with various prototyping tools and focusing on user experience over interface design are essential aspects of this phase. Additionally, leveraging no-code tools allows for rapid prototype development, enabling teams to test and iterate more effectively (Kaur, 2022).

During the *Idea Validation* (or Testing) phase, product teams assess the feasibility of their proposed solutions by testing prototypes and gathering evidence. This stage involves prioritizing assumptions, selecting appropriate experimental techniques, and testing with users. By focusing on actionable insights, product teams can make well-informed decisions about which ideas to refine and ultimately implement (Inabo, 2023).

The *Refinement* phase facilitates the transition of validated ideas into Product Delivery. In this stage, product teams polish concepts, slice user stories and prioritize features for implementation. By focusing on the most valuable features for release and collaborating closely with UX and engineering team members, teams can prepare their product for implementation in iterative increments (Herbig, 2023).

The adaptable product discovery framework, characterized by its six key stages, provides a comprehensive and iterative approach to product discovery. The phases of Alignment, Research, Ideation, Creation/Prototyping, Validation, and Refinement ensure that the final product aligns with user needs and delivers meaningful solutions.

Different interpretations of this approach have appeared in the gray literature, underscoring the same fundamental principles (Guthrie, 2022; Herbig, 2023; Inabo, 2023; Kaur, 2022). These methodologies stress the importance of a comprehensive understanding of user needs and the iterative validation of assumptions throughout the development process. This commonality emphasizes the importance of a user-centric approach to product discovery. While sharing core research, ideation, and validation stages, these approaches exhibit subtle differences. Some introduce an explicit alignment phase or incorporate prototyping within validation, while others define product specifications in a separate stage. Despite these differences, all maintain the adaptable product discovery approach's spirit, emphasizing user alignment through iterative validation. These variations allow teams flexibility to select a method best suited to their specific needs.

The double diamond approach from design thinking

The double diamond approach is a problem-solving methodology used in design thinking. It focuses on human-centered design and innovation and emphasizes understanding customer problems and identifying creative and effective solutions. The approach can be used in product discovery and consists of four phases, presented in Fig. 5: Discover, Define, Develop, and Deliver (LogRocket, 2023; Stories On Board, no date; Heffernan, 2017; Kaur, 2022; Piotr Małek, 2022; Userpilot, 2023).

The first phase is product discovery. In the Discover phase, the goal is to understand customers and their problems through divergent thinking. The team gathers insights and builds empathy for the customer through exercises such as empathy mapping and customer journey mapping. This phase involves exploring the problem space, identifying

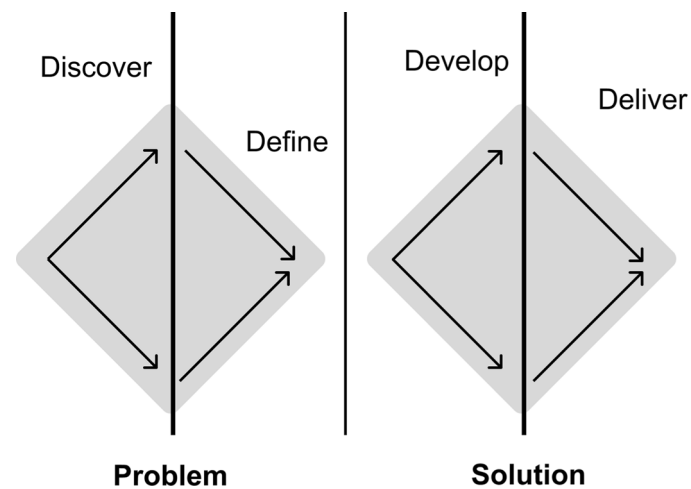


Fig. 5 Double diamond phases approach—adapted from design thinking (Heffernan, 2017)

opportunities, and understanding customer needs. Following that, in the Problem Definition phase, convergent thinking is used to focus on specific customer problems. The objective is to identify key pain points in the customer experience. These pain points are then redefined as "How Might We" (HMW) questions to guide the problem-solving process. This phase is about framing the problem in a way that allows for effective ideation (Heffernan, 2017).

After the problem is properly framed, the Solution Discovery starts with the Development phase, involving divergent thinking once again as teams brainstorm a wide range of potential solutions to the identified customer problems. Using multiple techniques, such as Brainstorming, teams generate numerous ideas based on the HMW questions and a variety of guiding considerations (Heffernan, 2017). The goal is to develop as many ideas as possible, emphasizing quantity over quality at this stage. This phase is about generating a broad range of ideas and solutions (Userstorymap, no date).

Finally, in the Deliver phase, or Concept Validation, as some authors describe it, convergent thinking is employed to evaluate the feasibility and viability of the proposed solutions. Teams vote on the most promising ideas to build upon and refine these ideas. This phase is about refining the solutions and determining which ones are feasible to move forward with (Inabo, 2023).

Once the best solutions are chosen, the next steps involve prototyping, testing, iterating, and ultimately building the final product. The double diamond approach provides a structured, practical framework for solving customer problems and delivering innovative, customer-centric solutions.

Adaptable product discovery vs double diamond approach

The adaptable product discovery and double diamond approaches are two distinct methodologies for navigating the product discovery process. The adaptable product discovery method, proposed by Tim Herbig (2023) and other authors comprise six crucial stages: Alignment, Research, Ideation, Creation/Prototyping, Validation, and Refinement. This approach provides a detailed pathway for product teams, covering every aspect, from

establishing a shared understanding among stakeholders to refining and implementing validated ideas.

On the other hand, the double diamond approach, derived from design thinking, involves a four-phase process: Discover, Define, Develop, and Deliver. Though it is more general and less prescriptive than the adaptable product discovery approach, it holds significant value in fostering a human-centered design mindset, emphasizing the understanding of customer problems, and devising creative solutions. Taking into consideration its similarities, Table 4 presents the comparison of the two approaches.

The adaptable product discovery, with its six comprehensive stages, provides a detailed roadmap encompassing all aspects from initial alignment to final refinement. This makes it a potentially more complete approach for product teams seeking a thorough and systematic methodology. While originating from design thinking and being more general in nature, the double diamond still offers valuable principles for understanding user needs, ideating, and validating solutions. Both frameworks underscore the importance of centering user needs and iterative validation, demonstrating their potential value in different contexts. Selecting between them should be influenced by a team’s specific needs, project characteristics, and preferred level of detail in the process.

RQ3—product discovery metrics

Product discovery metrics are essential for gauging the success of the discovery process and ensuring that teams stay on track with their goals. Successful product discovery hinges on understanding user needs and validating ideas early on, resulting in a product that resonates with the target audience. Given the importance of metrics in product discovery, there is a growing need and interest to investigate the various metrics used, leading to the third research question related to the metrics being measured today.

To measure product discovery effectively, it is crucial to understand the distinction between leading and lagging indicators. Leading indicators are quantifiable metrics that can be measured as you progress through each cycle of the discovery process, offering valuable insights into potential future outcomes. In contrast, lagging indicators provide information on the results achieved after specific actions have been taken. While lagging indicators can help assess product success, they may not offer the context needed to make more informed decisions for future discovery cycles (Torres, 2020).

The metrics measured will depend on your stage in your discovery journey; thus, mapping metrics to the different phases of the product discovery process might be beneficial. For example, during the research phase, you might focus on leading

Table 4 Comparison between adaptable product discovery and double diamond approach

Adaptable product discovery	Double diamond approach
1. Alignment	(Implicit in all phases)
2. User research	1. Discover
3. Ideation	2. Define
4. Creation/prototype	3. Develop
5. Validation	4. Deliver
6. Refinement	

indicators such as the number of user interviews conducted, while the validation phase may involve tracking the number of successful prototypes based on user feedback. As you move further into the development and launch stages, lagging indicators like customer satisfaction scores, conversion rates, and revenue generated become more relevant for assessing product success (Várkonyi, 2022).

Incorporating leading and lagging indicators throughout each phase of the product discovery process allows teams to monitor progress and make data-informed decisions, ensuring that they continually work towards creating a successful product that meets user needs. By understanding the relationship between these metrics and the discovery stages, product teams can develop a more comprehensive and effective approach to product discovery (Straube, 2021; Torres, 2020).

However, avoiding relying solely on vanity metrics is essential, which may provide a false sense of progress. These metrics, such as the number of customer interviews, tend to only increase over time but may not necessarily reflect the quality of insights gained. As product discovery expert Teresa Torres suggests, measuring cycle time between activities can provide more meaningful insights into the effectiveness of the discovery process (Hoadley, no date; Várkonyi, 2022). By focusing on a combination of leading and lagging indicators and avoiding vanity metrics, product teams can better assess the success of their product discovery efforts and make informed decisions for continuous improvement (Torres, 2020).

The listed metrics, in Table 5, cover a broad spectrum of leading and lagging indicators, offering a comprehensive view of a product's performance and team's efficiency in the product discovery process.

Starting with leading indicators, metrics like Cycle Time between Customer Interviews, Idea Rejection Cycle Time, Cycle Time between Assumption Tests, Cycle Time between Prototype Tests, Discovery Cycle Time, Number of Tested Assumptions per Cycle, and Shipped Measured Value per Week focus on the efficiency of your discovery process. These metrics help to identify bottlenecks, speed up learning, and improve the overall efficiency of your discovery process. For example, a shorter Cycle Time between Customer Interviews or Assumption Tests indicates a fast-paced, efficient discovery process. Conversely, longer cycle times may suggest areas where the team could improve its processes.

On the other hand, lagging indicators like Monthly Recurring Revenue (MRR), Retention Rate, Active Users, Customer Acquisition Cost (CAC), Customer Lifetime Value (CLV or LTV), Net Promoter Score (NPS), Customer Satisfaction (CSAT), Churn Rate, User Engagement Rate, Conversion Rate, Time to Value (TTV), Sessions per User, Average Users, and User Actions per Session are critical for evaluating the overall success and profitability of your product. For instance, a high Retention Rate and low Churn Rate suggest that your product is engaging and meets the needs of your users. High MRR and CLV indicate a profitable product, while a low CAC suggests efficient marketing and user acquisition strategies.

In summary, when analyzed together, these metrics provide a holistic view of your product's performance and the effectiveness of your product discovery process. Monitoring and analyzing these metrics regularly is crucial, as they can inform

Table 5 Product discovery metrics in gray literature

Metric	Type	Definition	References
Cycle time between customer interviews	Leading	Measures the time between customer interviews	(Maze, no date b ; Torres, 2020 ; Productboard, 2021 ; Firak, 2022 ; Hotjar, 2022 ; Spark Equation, 2022 ; Inabo, 2023)
Monthly recurring revenue (MRR)	Lagging	The total revenue that comes in monthly	(Butts, 2023 ; Chouhan, 2022 ; Frank, 2021 ; Hoadley, no date ; Productfolio, no date ; ProductPlan, no date ; Torkut, 2022 ; Torres, 2016 ; Várkonyi, 2022)
Retention rate	Lagging	The percentage of users who continue to use the product	(Chouhan, 2022 ; Hoadley, no date ; Marinac, 2022 ; Productfolio, no date ; ProductPlan, no date ; Torkut, 2022 ; Torres, 2016 ; Userpilot, 2023 ; Várkonyi, 2022 ; Zeda, no date)
Active users	Lagging	The number of users actively using the product	(Berring, 2023 ; Chouhan, 2022 ; Frank, 2021 ; Guthrie, 2022 ; Hermoni, 2022 ; Maze, no date a ; ProductPlan, no date ; Torres, 2021)
Customer acquisition cost (CAC)	Lagging	The average amount spent to acquire each new customer	(Butts, 2023 ; Chouhan, 2022 ; Frank, 2021 ; Hermoni, 2022 ; Hoadley, no date ; Productfolio, no date ; ProductPlan, no date ; Torkut, 2022)
Customer lifetime value (CLV or LTV)	Lagging	The total amount an average customer spends during their entire relationship with an organization	(Butts, 2023 ; Chouhan, 2022 ; Frank, 2021 ; Hermoni, 2022 ; Hoadley, no date ; Productfolio, no date ; ProductPlan, no date ; Torkut, 2022 ; Várkonyi, 2022)
Net promoter score (NPS)	Lagging	A measure of how likely customers are to recommend the product to others	(Butts, 2023 ; Chouhan, 2022 ; Frank, 2021 ; Hoadley, no date ; Productfolio, no date ; ProductPlan, no date ; Torres, 2016)
Customer satisfaction (CSAT)	Lagging	A measure of how happy customers are with the product	(Butts, 2023 ; Frank, 2021 ; Guthrie, 2022 ; Torres, 2016 ; Userpilot, 2023)
Idea rejection cycle time	Leading	The number of days between instances of rejecting or discarding ideas during the product discovery stage. This metric indicates the effectiveness of the discovery process, emphasizing the team's ability to identify and eliminate ideas that are not worth pursuing	(Torres, 2020 ; Productboard, 2021 ; Hotjar, 2022 ; Spark Equation, 2022 ; Spinnangr, 2022)
Churn rate	Lagging	The percentage of users who stop using the product during a period	(Butts, 2023 ; Frank, 2021 ; Productfolio, no date ; ProductPlan, no date ; Várkonyi, 2022)
User engagement rate	Lagging	A measure of user interaction with the product	(Frank, 2021 ; Guthrie, 2022 ; Marinac, 2022 ; Torres, 2016)
Time to value (TTV)	Lagging	The time it takes for a customer to realize the value of a product or service	(Frank, 2021 ; Hatch, 2022 ; Spark Equation, 2022 ; Várkonyi, 2022)
Conversion rate	Lagging	A ratio of conversions to total visitors	(Chouhan, 2022 ; Guthrie, 2022 ; Hatch, 2022 ; Hermoni, 2022 ; Productfolio, no date)
Cycle time between assumption tests	Leading	Measures the time between assumption tests	(Hotjar, 2022 ; Torres, 2016 , 2020)
Cycle time between prototype tests	Leading	Measures the time between prototype tests	(Hotjar, 2022 ; Torres, 2016 , 2020)

Table 5 (continued)

Metric	Type	Definition	References
Discovery cycle time	Leading	The amount of time it takes to complete a full cycle of the product discovery process, from ideation to validation or rejection of an idea	(Hockley, 2020; Productboard, 2021)
Number of tested assumptions per cycle/rate of experimentation	Leading	Learning speed is achieved through experimentation, validation, and discovery activities, such as a sprint, within a given time frame	(Hockley, 2020; Productboard, 2021)
Sessions per user	Lagging	A measure of the number of times a typical user engages with the product	(Productfolio, no date; Torkut, 2022)
Average users	Lagging	The number of active users within a period	(Productfolio, no date)
Shipped measured value per week (quality)	Leading	“Shipped measured value” measures how many quantifiably valuable product improvements were shipped	(Hockley, 2020)
User actions per session	Lagging	A metric to understand the actions users take and the number of times they do so	(Productfolio, no date)

decision-making and help your team continuously improve its product discovery practices and outcomes.

RQ4—product discovery techniques

Finally, to address the fourth research question: "What types of techniques are being used in Product Discovery?" The goal is to elucidate the various techniques utilized in the product discovery process and their contributions to successful product development. In an ever-evolving digital landscape, the product discovery process has grown increasingly dynamic, innovative, and user-centric, necessitating a diverse set of techniques to address customer needs and market demands effectively.

Product discovery techniques span a wide range of activities, tools, and frameworks to comprehend user needs, pinpoint opportunities, generate and validate ideas, and design solutions that deliver tangible value to users. These techniques are integral to creating products that resonate with target audiences and achieve market success.

A thorough understanding and appropriate application of these techniques allow product teams to better understand their users, validate their assumptions, hone their product ideas, and make data-driven decisions. It is crucial to note that these techniques are not universally applicable; different techniques are better suited to different stages of the product life cycle, types of products, team structures, and organizational cultures. Therefore, product teams often employ a mix of techniques that align with their specific circumstances and objectives.

As can be observed in Table 6, specific techniques are more frequently referenced than others, indicating their prominence and acceptance in product development and management. Techniques such as Customer Interviews, Prototyping, and Customer Journey Mapping feature the most citations, highlighting their significance.

Table 6 Product discovery techniques in gray literature

Technique	Definition	References
Customer interviews	Engage with users to gather insights and opinions about the product. Helps to identify their needs, preferences, and pain points, informing product development decisions	(Beazley, 2024; Gilad, 2022; Hoadley, no date; LogRocket, 2023; Maze, no date a, no date b; Patel, no date; Userstorymap, no date; Zeda, no date; Torres, 2016, 2020, 2021; Firak, 2022; Hatch, 2022; Hotjar, 2022; Kaur, 2022; Spark Equation, 2022; Torkut, 2022; Berring, 2023; Herbig, 2023; Inabo, 2023; Productboard, 2023)
Prototype	Develop a simplified version of the product, allowing for user interaction and feedback. This helps refine the concept and identify potential issues early in the development process	(Gilad, 2022; LogRocket, 2023; Maze, no date a, no date b; Patel, no date; Stories On Board, no date; Userstorymap, no date; Zeda, no date; Torres, 2020; Guthrie, 2022; Hatch, 2022; Hermoni, 2022; Kaur, 2022; Melkoumov, 2022; Piotr Malek, 2022; Spark Equation, 2022; Torkut, 2022; Dobulbekova, 2023; Gontarz, 2023; Inabo, 2023; Productboard, 2023; Userpilot, 2023)
Customer Journey Map	Visual representation of the user's experience with a product or service, highlighting key touchpoints and interactions throughout the entire process, from initial awareness to post-purchase activities	(Beazley, no date; LogRocket, 2023; Maze, no date a; de Villaumbrosia, 2020; Frank, 2021; Torres, 2021; Hermoni, 2022; Hotjar, 2022; Kaur, 2022; Marinac, 2022; Melkoumov, 2022; Spark Equation, 2022; Torkut, 2022; Berring, 2023; Dobulbekova, 2023; Productboard, 2023)
Customer surveys	Feedback is collected from users, and their needs, preferences, and satisfaction are assessed through a survey	(Gilad, 2022; Maze, no date a, no date b; Patel, no date; Userstorymap, no date; Zeda, no date; de Villaumbrosia, 2020; Kaur, 2022; Spark Equation, 2022; Torkut, 2022; Berring, 2023; Dobulbekova, 2023; Userpilot, 2023)
Opportunity Solution Tree	Visual tool to map solution ideas to real opportunities identified through discovery interviews, ensuring a customer-centric approach. The opportunities are then mapped to experiments	(Beazley, no date; LogRocket, 2023; Maze, no date b; Torres, 2016, 2018, 2021; Hockley, 2020; Hatch, 2022; O'Connell, 2022a, 2022b; Spark Equation, 2022; Inabo, 2023; Userpilot, 2023)
Assumption test	Identifying and challenging the underlying assumptions of a product idea, validating or disproving them through experiments, research, or user feedback to make better-informed product decisions	(LogRocket, 2023; Maze, no date a, no date b; Torres, 2016, 2020, 2021; Hermoni, 2022; Hotjar, 2022; Piotr Malek, 2022; Spark Equation, 2022; Spinnangr, 2022; Userpilot, 2023)
A/B tests	Comparing two or more variations of a product feature, design, or marketing strategy, measuring their effectiveness to determine the best-performing option for the desired outcomes	(Beazley, no date; Berring, 2023; Gilad, 2022; Hatch, 2022; Hotjar, 2022; Kaur, 2022; LogRocket, 2023; Melkoumov, 2022; Patel, no date; Torkut, 2022; Torres, 2016, 2021)
User personas	Creating fictional characters representing target user groups aids product design and marketing	(Beazley, no date; Berring, 2023; de Villaumbrosia, 2020; Dobulbekova, 2023; Gontarz, 2023; Kaur, 2022; LogRocket, 2023; Marinac, 2022; Melkoumov, 2022; Userpilot, 2023)
Usability tests	Evaluate the product's user interface and overall user experience through structured tests with users, identifying areas for improvement and ensuring the product meets the user's needs	(Dobulbekova, 2023; Guthrie, 2022; Hatch, 2022; Hermoni, 2022; LogRocket, 2023; Maze, no date a, no date b; Torres, 2021; Userstorymap, no date)

Table 6 (continued)

Technique	Definition	References
Jobs-To-Be-Done	A framework for understanding the underlying customer needs and motivations that drive their purchasing decisions, focusing on the product's functional, social, and emotional aspects	(LogRocket, 2023; Maze, no date a; Stories On Board, no date; Torres, 2021; Piotr Malek, 2022; Userpilot, 2023)
OKRs (Objective key results)	A goal-setting framework used by organizations to define, track, and measure specific objectives and their corresponding key results, promoting alignment, focus, and accountability across teams	(Lozano, no date; Torres, 2016, 2021; de Villaumbrosia, 2020; Piotr Malek, 2022; Torkut, 2022; Herbig, 2023)
Product analytics	Systematic evaluation of a product's performance, features, and market position	(Dobulbekova, 2023; LogRocket, 2023; Maze, no date a, no date b; McGillvary, 2022; Productboard, 2023; Userpilot, 2023)
Focus groups	Small, diverse group discussions to gather opinions, insights, and feedback on a product	(LogRocket, 2023; Patel, no date; Zeda, no date; Spark Berring, 2023; Equation, 2022; Productboard, 2023; Torkut, 2022)
Design thinking	Human-centered problem-solving framework, focusing on empathy, experimentation, and iteration	(LogRocket, 2023; Shirey, 2020; Stories On Board, no date; Userstorymap, no date; Kaur, 2022; Piotr Malek, 2022; Userpilot, 2023)
Impact mapping	Connects product features to business goals using user behaviors, facilitating data-informed decisions and tactical choices	(Herbig, 2023; Herbig, 2019; LogRocket, 2023; Stories On Board, no date; Torres, 2021; Userstorymap, no date; Zeda, no date)
User story mapping	A visual representation of user stories, organized according to the sequence of user tasks or interactions with a product, helping teams prioritize features, plan releases, and maintain a user-centric approach	(Dobulbekova, 2023; Guthrie, 2022; LogRocket, 2023; Lozano, no date; Maze, no date a; Stories On Board, no date; Torres, 2018, 2021)
Assumption mapping	Visually organize and prioritize product assumptions, identifying areas of uncertainty and risk that require validation and testing to guide the product discovery process	(Gilad, 2022; Stories On Board, no date; Torres, 2018, 2021; Spark Equation, 2022)
Competitive/market analysis	Examining competitors' products and strategies to identify opportunities and threats, informing product development and decision-making	(Gilad, 2022; Gontarz, 2023; Hermoni, 2022; Marinac, 2022)
Brainstorming	Team-based idea generation, encouraging open-mindedness and creativity	(Dobulbekova, 2023; Productboard, 2023; Userstorymap, no date)
Dual Track Agile	An approach that runs product discovery and delivery concurrently, allowing teams to constantly validate and iterate on ideas, ensuring efficient and user-focused development	(Shirey, 2020; Hotjar, 2022; Piotr Malek, 2022)
Empathy map	Visual tools capture user's thoughts, feelings, and experiences for deeper understanding	(Kaur, 2022; Melkoumov, 2022; Userpilot, 2023)

Table 6 (continued)

Technique	Definition	References
Experience mapping	A comprehensive visualization of a user's interactions and experiences with a product, service, or brand across various channels and touch-points aims to identify improvement opportunities and enhance overall user satisfaction	(LogRocket, 2023; Maze, no date b; Torres, 2021)
ICE (Impact, Confidence, Ease)	Prioritization matrix that evaluates the Impact (I) you think it will have on your business, Confidence (C) that it'll solve the problem, Ease (E) of building it	(Gilad, 2022; Maze, no date a; Stories On Board, no date)
Idea Validation Grid	A structured approach to experiment design; prioritizes idea value and includes decision-making criteria, assumptions, behavior change description, and the chosen experiment	(Herbig, 2023; Userstorymap, no date; Zeda, no date)
Mind mapping	Visual representation of concepts, ideas, and relationships, aiding in problem-solving	(Patel, no date; Productboard, 2023; Userstorymap, no date)
RICE (Reach, Impact, Confidence, Ease)	Prioritization Matrix that evaluates the Reach (R), Impact (I) you think it will have on your business, Confidence (C) that it'll solve the problem, and Ease (E) of building it	(Berring, 2023; Marinac, 2022; Stories On Board, no date)
Storyboarding	Visual narrative outlining user experiences, showcasing product interactions, and flow	(Patel, no date; Productboard, 2023; Userstorymap, no date)
Crazy 8's	Rapid ideation technique, generating 8 ideas in 8 min, fostering creativity and speed	(Productboard, 2023; Shirey, 2020)
Demand tests	Assessing the market's appetite for a product by measuring potential customers' interest, engagement, or willingness to pay helps to predict product success and inform pricing strategies	(LogRocket, 2023; Torres, 2021)
Mission briefing	Co-creating a plan with the team that defines the context, intent, tasks, and boundaries. It enables top-down direction while allowing for individual freedom and back-briefing	(Herbig, 2023; Zeda, no date)
North Star	A guiding vision, usually a key metric, representing long-term product goals and success: Reach * Engagement * Frequency An example for Netflix could be <"The number of users"> * <"hours watched per session"> * <"sessions per week">	(Gontarz, 2023; Straube, 2021)
Opportunity Canvas	It evaluates potential product features, ensuring a comprehensive understanding of the problem, user, expected results, and business impact before implementation	(Productboard, 2021; Shirey, 2020)

Table 6 (continued)

Technique	Definition	References
Product discovery retrospectives	Regularly scheduled meetings where the team reflects on the product discovery process discusses challenges, and identifies areas for improvement, helping optimize the discovery process over time	(Productboard, 2021; Torres, 2020)
Actor–Job–Outcome mapping	Tool to interpret insights and articulate behavior changes in measurable proxies, helping to connect insights to outcomes worth focusing on	(Herbig, 2023)
Ethnography studies	Research methodology involves in-depth observation and analysis of people within their natural environments to understand their behavior, culture, and experiences. It is often applied to product development and design to gain insights into user needs, preferences, and pain points	(Torres, 2021)
Fake Door Testing	A kind of low-fidelity prototype test. It involves tricking users into believing a feature exists and tracking their engagement to gauge their interest levels	(Userpilot, 2023)
MoSCow	Prioritization technique for features or requirements, categorizing them as Must-haves, Should-haves, Could-haves, and Won't-haves	(Stories On Board, no date)
Timeboxing individual discovery activities	Setting fixed time limits for each product discovery activity helps focus on essential ideas, build credibility with stakeholders, and pivot if necessary	(Productboard, 2021)
Wizard of Oz	A prototyping technique where users interact with a seemingly functional product while a human simulates its functionality behind the scenes to gather feedback	(Gilad, 2022)

Customer interviews are often cited, underscoring their vital role in obtaining direct feedback and insights from users in product discovery. This technique aids in understanding users' needs, preferences, and pain points and informs and shapes product development decisions.

Prototyping is also frequently cited, illustrating its importance in the early stages of product development. Creating a simplified product version for users to interact with can identify and address potential issues early in the process, saving time and resources later.

Similarly, the frequent citation of Customer Journey Mapping demonstrates its value in visually representing a user's experience with a product. This technique helps product developers and managers understand and improve user experience by highlighting key touchpoints and interactions.

The frequency of citations for these techniques underscores their critical role in product management and, more specifically, in product discovery. By leveraging these

methods, teams can better understand their users, prototype and iterate effectively, and map out and improve the customer journey, all essential for creating successful products.

Discussion

Conclusively addressing the research questions, this section will dive into their interconnections.

Product discovery was initially defined as identifying and validating customer needs and problems, iteratively exploring and testing ideas, and making data-driven decisions about what to build. This definition, along with the associated phases, metrics, and techniques, was derived from a thorough analysis of the gray literature. With these elements in place, we can now extract some key insights.

This study reveals that the identified techniques and metrics are deployed across different stages of the product discovery process. Specific techniques align more closely with testing solutions or assumptions, while others are more applicable to the ideation phase. Similarly, metrics can be categorized into leading and lagging indicators, with their applicability varying across the different phases of product discovery. This differentiation underscores the dynamic nature of product discovery, where diverse strategies and measures come into play at different stages.

Furthermore, in a deeper dive into the phases section, specifically regarding the double diamond approach, the connection between product discovery and design thinking has sparked considerable discussion within the product development and management realms (VP Innovation Team, 2021). In fact, in the conducting of this study, many articles regarded design thinking as a technique in the realm of Product Discovery (LogRocket, 2023; Shirey, 2020; Stories on Board, no date; Userstorymap, no date; Kaur, 2022; Piotr Małek, 2022; Userpilot, 2023).

These methodologies share an overlapping approach centered around understanding user needs, fostering iterative development, and encouraging a bias toward experimentation. In the words of one designer, "Product Discovery partly resembles Design Thinking and Human-Centered Design, and it shares many of the same methods." This comparison underscores the similarities between the two, particularly in their shared emphasis on empathizing with the user, understanding the problem space, and generating and validating potential solutions (Shirey, 2020).

Yet, while design thinking can be applied to any problem-solving context, product discovery has a more specialized role. It is a process designed to identify the right product to build before significant resources are committed to its development. It integrates both qualitative and quantitative feedback, recognizing that what people say often differs from what they do (Google, no date). While design thinking strongly emphasizes qualitative aspects, primarily empathy and understanding users' needs, it does not place as much weight on quantitative measures such as metrics.

This dual emphasis on the user and the business side of product creation is a distinguishing feature of product discovery. As the designer notes, "Product Discovery... takes things further by focusing on the business side of creating features and products... I want to know that my designs are creating real value for people and for the company I work for" (Shirey, 2020).

Moreover, product discovery inherently facilitates collaboration between designers, product managers, and developers, positioning them as equal partners working towards a shared goal. This collaborative approach often leads to better products as each role brings unique expertise. In conclusion, while design thinking provides a human-centered framework that can guide the product discovery process, it should not be viewed simply as a tool or technique within this process. It represents an overarching philosophy or mindset that is crucial throughout the entire product development.

This study's exploration of product discovery processes extends beyond the comparison with design thinking. As revealed through this research, the different product discovery techniques and metrics highlight that the discovery process is complex, and adaptability is a key aspect required in modern product management. Based on the findings gathered, we advise having a holistic approach to product discovery that should be adaptable to the product's phase and context.

Additionally, continuous discovery emerges as a key theme in adapting to the dynamic nature of the market (Torres, 2020). Product discovery is an ongoing process beyond the product's initial launch. Regularly revisiting user needs, market trends, and technological advancements is crucial for maintaining the product's relevance and competitiveness. This continuous discovery ensures the product remains aligned with the ever-changing market realities, safeguarding its long-term success.

In conclusion, adaptability, informed by qualitative and quantitative insights, iterative learning, cross-functional collaboration, and an ongoing commitment to the discovery process, is essential in modern product management.

Conclusion

In this MLR, a critical exploration and examination of the field of product discovery has been undertaken, focusing on its various phases, metrics, and techniques. The review provides a comprehensive overview of various techniques and metrics utilized in product discovery, including an analysis of the frequency of these references in the gray literature. Each technique and metric are defined, and many references support the definitions. Hopefully, this compilation serves as a valuable resource for practitioners in the field, equipping product managers, designers, and developers with a guide that can deepen their understanding and enhance their implementation of product discovery methods in their professional practice. The findings of this review encourage further exploration into the effectiveness of various product discovery techniques in different contexts, thus adding a fresh perspective to the discourse on product development methodologies.

While conducting this gray literature review, several limitations were encountered, which may have affected the comprehensiveness and depth of the study. First and foremost, the selection of literature was heavily dependent on the specific keywords used in the search. It is possible that some relevant literature may not have been included due to variations in terminology. In this case, the keyword used was "product discovery metrics", but some authors might refer to the same concept with phrases such as "product management KPIs" or "product ideation evaluation metrics". Similarly, the discovery phase could be labeled differently, with terms such as "early-stage product development"

or "pre-development product research" potentially being used. This could have led to the exclusion of some pertinent content, thus impacting the breadth of the review.

Additionally, because the scope of the review was confined to the publicly available gray literature, it does not represent the entirety of knowledge in the field of product discovery. Proprietary knowledge and practical real-world scenario techniques used within specific companies or by individual practitioners, often not publicly shared, were not included in this review. Furthermore, while the review included a broad range of literature types, including blog posts, articles, and book chapters, it did not include scientific papers. This was primarily due to the nature of the field, which is largely practice-based and thus not extensively covered in traditional scientific literature. However, this limitation may have resulted in a lack of rigorous, scientific, and empirical evidence supporting the effectiveness of the various product discovery techniques.

Lastly, analyzing the frequency of references to each technique provided insights into their popularity but did not comprehensively understand their effectiveness. The number of references to a technique or metric does not necessarily correlate with its effectiveness or suitability for a particular context. Further research, ideally involving empirical studies or case studies, would be required to assess the effectiveness of these techniques and metrics.

Future research could address these limitations by employing more diverse search terms, extending the scope to include scientific literature, and incorporating empirical research to better evaluate product discovery techniques' effectiveness. While gray literature provides timely insights into this fast-evolving field, it is essential to validate whether the research papers in the domain present significant differences or confirm the techniques and practices presented in this paper. This approach would ensure a more comprehensive understanding of both industry trends and scholarly perspectives. Moreover, future research could investigate integrating leading and lagging indicators to create a balanced and comprehensive set of metrics for evaluating product discovery success.

Building on the insights gained from this research, future work could be focused on developing a comprehensive evaluation matrix or framework that connects the metrics, phases, and techniques in the product discovery process presented in this study. By providing organizations with a systematic approach to assessing and improving their product management practices and applying such a framework or model, we believe that product discovery can gain from a more structured approach, contributing to adopting effective strategies and enhanced performance throughout the product management life cycle.

Another aspect that might be interesting to explore in the future is the impact of organizational culture on the applicability and effectiveness of different product discovery approaches. This exploration could lead to a deeper understanding of other factors that influence the success of various product discovery strategies.

Finally, researching methods to measure discovery efficiency and the return on investment of product discovery could provide a clearer image of how investing in product discovery generates increased revenue for companies. This could shift their organizational culture towards a product mindset.

Abbreviation

MLR Multivocal literature review

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Author contributions

Gonçalo Canhoto (IST Instituto Superior Técnico) was the primary author of this paper, based on his master's thesis. He was responsible for the conception, design, and execution of the study, as well as the analysis and interpretation of the data. Professor Miguel Mira da Silva (IST Instituto Superior Técnico) and Rafael Almeida (INOV Instituto de Engenharia de Sistemas e Computadores Inovação) provided extensive guidance throughout the entire process. They reviewed the text, assisted in defining the scope of the work, and contributed significantly to various other critical aspects of the study, including the methodology and data interpretation. All authors actively participated in the final review of the manuscript and approved the submitted version.

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References

- Adams, R. J., Smart, P., & Huff, A. S. (2017). 109—Shades of Grey: Guidelines for working with the Grey Literature in systematic reviews for management and organizational studies. *International Journal of Management Reviews*, 19(4), 432–454. <https://doi.org/10.1111/ijmr.12102>
- Beazley, H. (no date). 8—Product discovery process: Everything product managers need to know, Chameleon. <https://www.chameleon.io/blog/product-discovery-guide>. Accessed 27 June 2024
- Berring, A. (2023). 38—Ask me anything: Product discovery and the problem space, product school. <https://productschool.com/blog/product-fundamentals/ama-product-discovery-problem-space>
- Butts, S. (2023). 26—Product metrics cheat sheet, product coalition. <https://uxdesign.cc/the-toughest-question-of-product-discovery-2aa590232f76>
- Casarotto, C. (2021). 103—What is product management and why is it important for your company? Rockcontent Blog.
- Chouhan, J.S. (2022). 23—7 Key product management metrics to track your product success, Kellton Blog. <https://www.kellton.com/kellton-tech-blog/7-key-product-management-metrics-to-track-your-product-success>
- Dobulbekova, C. (2023). 37—Software discovery process agile team, Mad Devs. <https://maddevs.io/blog/product-discovery-process/#a-product-discovery-framework-for-agile-teams-with-jira>
- Fagerholm, F., Guinea, A. S., Määttä, A., & Münch, J. (2017). The RIGHT model for continuous experimentation. *Journal of Systems and Software*, 123, 292–305. <https://doi.org/10.1016/j.jss.2016.03.034>
- Firak, V. (2022). 32—Continuous discovery and continuous benchmarking, Airfocus. <https://airfocus.com/blog/continuous-discovery-and-benchmarking/>
- Frank, L. (2021). 52—The 10 product metrics you need to track right now, Stream. <https://getstream.io/blog/product-metrics/>
- Garousi, V., Felderer, M., & Mäntylä, M. (2016). 108—The need for multivocal literature reviews in software engineering: complementing systematic literature reviews with grey literature. pp. 1–6. <https://doi.org/10.1145/2915970.2916008>
- Garousi, V., Felderer, M., & Mäntylä, M. V. (2019). 106—Guidelines for including grey literature and conducting multivocal literature reviews in software engineering. *Information and Software Technology*, 106, 101–121. <https://doi.org/10.1016/j.infsof.2018.09.006>
- Gilad, I. (2022). 18—How much product discovery is enough? *Itamar Gilad Blog* [Preprint]. <https://itamargilad.com/how-much-product-discovery/>.
- Gnanaambandam, C. et al. (2023). 101—What separates top product managers from the rest of the pack, McKinsey. <https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/what-separates-top-product-managers-from-the-rest-of-the-pack>
- Goetzen, F. (2023) 102 - A case study: How our own product discovery made us pivot Reveall towards product discovery, Mind The Product. Available at: <https://www.mindtheproduct.com/a-case-study-how-our-own-productdiscovery-made-us-pivot-reveall-towards-product-discovery>
- Gontarz, A. (2023). 17—What is product discovery? Our guide to the product discovery process, frameworks, and techniques, Crustlab. <https://crustlab.com/blog/product-discovery-process-frameworks-techniques/>
- Google. (no date). 67—Design sprint methodology. Google. <https://designsprintkit.withgoogle.com/methodology/overview>

- Gutbrod, M., Münch, J., & Tichy, M. (2017). Empirical results from a qualitative interview study. In M. Felderer, D. Méndez Fernández, B. Turhan, M. Kalinowski, & F. Sarro (Eds.), *Proceedings of the 18th International Conference on Product-Focused Software Process Improvement* (pp. 297–304). Springer. https://doi.org/10.1007/978-3-319-69926-4_21
- Guthrie, G. (2022). 6—Understanding the product discovery process, Nulab. <https://nulab.com/learn/design-and-ux/understanding-the-product-discovery-process/>
- Hatch, R. (2022). 53—Introducing the continuous impact loop. Headway. <https://www.headway.io/blog/introducing-the-continuous-impact-loop>
- Hellberg, S. (2021). 40—What is product discovery: And why should you care, Desifer. <https://desifer.se/insights/what-is-product-discovery-and-why-should-you-care/>
- Herbig, T. (2019). 50—Impact mapping: How to focus on outcomes in product management, Miro. <https://miro.com/blog/impact-mapping/>. Accessed 27 June 2024
- Herbig, T. (2023). 5—Product discovery: A practical guide for product teams, Herbig. Available at: <https://herbig.co/product-discovery/>. Accessed 27 June 2024
- Hermoni, S. (2022). 54—What is product discovery, impltech.de. <https://impltech.de/en/blog/product-discovery/>
- Hoadley, J. (no date). 59—How to measure product market fit: 6 indicators to help you build products people love, Department of Product. <https://www.departmentofproduct.com/blog/how-to-measure-product-market-fit/>. Accessed 27 June 2024
- Hockley, C. (2020). 1—Discovery metrics: How to quantify the effectiveness of your discovery efforts. <https://medium.com/superawesome-engineering/discovery-metrics-how-to-quantify-the-effectiveness-of-your-discovery-efforts-9854fb36d31a>
- Hotjar (2022). 7—What is product discovery and why does it matter?, Hotjar. <https://www.hotjar.com/product-discovery/>
- Inabo, S. (2023). 29—Continuous product discovery, usability hub. <https://usabilityhub.com/blog/continuous-product-discovery>
- Heffernan, K. (2017). 66—Design thinking 101—The double diamond approach, SEEK Blog. <https://medium.com/seek-blog/design-thinking-101-the-double-diamond-approach-ii-4c0ce62f64c7>
- Kaur, A. (2022). 22—What is product discovery? Net solutions. <https://www.netsolutions.com/insights/what-is-product-discovery/>
- Kharychkova, A. (2022). 56—How to run product discovery: Process, frameworks, and best practices, ODG. <https://www.odg.group/blog/product-discovery>
- Lanyon, P. (2018). 104—Building the right product vs. building the product right, Mojo Tech. <https://www.mojotech.com/blog/building-the-right-product-vs-building-the-product-right/>
- Lindgren, E., & Münch, J. (2016). Raising the odds of success: The current state of experimentation in product development. *Information and Software Technology*, 77, 80–91. <https://doi.org/10.1016/j.infsof.2016.04.008>
- LogRocket. (2023). 20—What is product discovery? Process, techniques, and templates, LogRocket Blog. <https://blog.logrocket.com/product-management/product-discovery-process-techniques-template/>. Accessed 27 June 2024
- Lozano, J. (no date). 55—Product discovery 101, UruIT. <https://uruit.com/blog/product-discovery-101/>. Accessed 27 June 2024
- Marinac, I. (2022). 24—A 6-step-guide to great product discovery, Decode. <https://decode.agency/article/product-discovery-guide/>
- Maze (no date a). 10—Building great products: The modern team's guide to product discovery, Maze. <https://maze.co/guides/product-discovery/>. Accessed 27 June 2024
- Maze. (no date b). 11—What is continuous product discovery? Everything you need to get started, Maze. <https://maze.co/guides/product-discovery/continuous/>. Accessed 27 June 2024
- McGillvary, C. (2022). 12—Product discovery: What you need to know, Thematic. <https://getthematic.com/insights/product-discovery/>. Accessed 27 June 2024
- Melanie Joh, J., & Mayfield, M. (2009). The discipline of product discovery: Identifying breakthrough business opportunities. *Journal of Business Strategy*, 30(2/3), 70–77.
- Melkoumov, A. (2022). 57—Product discovery: Process and systems, Crowdfunder. <https://www.crowdfunder.com/blog/what-is-product-discovery>
- Münch, J., Trieflinger, S., & Heisler, B. (2020). 105—Product discovery—Building the right things: Insights from a grey literature review. In *2020 IEEE International Conference on Engineering, Technology and Innovation (ICE/ITMC)*, pp. 1–8. <https://doi.org/10.1109/ICE/ITMC49519.2020.9198328>
- Münch, J., Trieflinger, S., & Lang, D. (2019). The product roadmap maturity model DEEP: validation of a method for assessing the product roadmap capabilities of organizations. In *Software Business: 10th International Conference, ICSOB 2019, Jyväskylä, Finland, November 18–20, 2019, Proceedings 10* (pp. 97–113). Springer International Publishing.
- Nguyen-Duc, A., & Abrahamsson, P. (2016). Minimum viable product or multiple facet product? The role of MVP in software startups. In A. Nguyen-Duc & P. Abrahamsson (Eds.), *XP2016*.
- Nguyen-Duc, A., Wang, X., & Abrahamsson, P. (2017). What influences the speed of prototyping? An empirical investigation of twenty software startups. In A. Nguyen-Duc, X. Wang, & P. Abrahamsson (Eds.), *XP2017*.
- O'Connell, M. (2022a). 33—Discovery and outcome based roadmaps, Vistal. <https://blog.vistal.com/posts/discovery-and-outcome-based-roadmaps>
- O'Connell, M. (2022b). 34—Get more out of your discovery work (OSTs), Vistal. <https://blog.vistal.com/posts/getting-more-out-of-osts>
- Patel, A. (no date). 13—The case for product discovery: A 4-step guide to saving time and money, Appcues. <https://www.appcues.com/blog/the-case-for-product-discovery-a-4-step-guide-to-saving-time-and-money>. Accessed 27 June 2024
- Malek, P. (2022). 14—Product discovery—Why, how, when and many others—answered! Railsware. <https://railsware.com/blog/product-discovery/>. Accessed 27 June 2024
- Productboard. (2021). 2–4 Important product discovery steps to measure success, Productboard. <https://www.productboard.com/blog/measuring-impact-of-product-discovery/>

- Productboard. (2023). 9—The product discovery playbook 2.0, Productboard. <https://www.productboard.com/wp-content/uploads/2023/01/The-Product-Discovery-Playbook-2.0-2022.pdf>
- Productfolio. (no date). 47—Key product metrics. *Productfolio*. <https://productfolio.com/key-product-metrics/>.
- ProductPlan. (no date). 63—Product success metrics, ProductPlan. <https://assets.productplan.com/content/Product-Success-Metrics-by-ProductPlan.pdf>. Accessed 27 June 2024
- Shirey, J. (2020). 58—Product discovery fundamentals—How to use discovery to avoid building features no one wants or needs, Bay Bridge UX. <https://www.baybridgeux.com/articles/2020/3/27/product-discovery-fundamentals>. Accessed 27 June 2024
- Spark Equation. (2022). 15—Make better product decisions with continuous discovery. The best product teams cultivate these mindsets, Spark Equation. <https://sparkequation.com/2022/08/24/effective-continuous-discovery/>
- Spinnangr, M. (2022). 25—The toughest question of product discovery: Continue, pivot, kill, or charge ahead? UX Collective. <https://uxdesign.cc/the-toughest-question-of-product-discovery-2aa590232f76>
- Stories On Board. (no date). 46—The ultimate guide to the best product management frameworks for agile product discovery, Stories On Board Blog. <https://storiesonboard.com/blog/the-ultimate-guide-to-the-best-product-management-frameworks-for-agile-product-discovery/>. Accessed 27 June 2024
- Straube, S. (2021). 31—North star metric—Measure the right thing, Product Coalition. <https://productcoalition.com/north-star-metric-measure-the-right-thing-294b6f4b6f9>
- Anastasiia, T., Ulfsnes, R., & M.N.B. (2022). 107—Toward an agile product management: What do product managers do in agile companies?. In K.-J., P.M., K.P. Stray Viktoria, Stol (Eds.) *Agile Processes in Software Engineering and Extreme Programming*. Cham: Springer International Publishing, pp. 168–184.
- Torkut, D. (2022). 16—The ultimate guide to software product discovery process, AscendixTech. <https://ascendixtech.com/product-discovery-process-guide/>
- Torres, T. (2016). 41—Why this OST is changing the way product teams work, Product Talk. <https://www.producttalk.org/2016/08/opportunity-solution-tree/>
- Torres, T. (2018). 42—6 Guiding principles for effective product discovery, Product Talk. <https://www.producttalk.org/2018/08/effective-product-discovery?relearningloop.io>.
- Torres, T. (2020). 3—Doing discovery well: How to measure and guide your team, ProductTalk. <https://www.producttalk.org/2020/06/measure-discovery/>
- Torres, T. (2021). 4—Product discovery basics: Everything you need to know, ProductTalk. <https://www.producttalk.org/2021/08/product-discovery/>
- Userpilot. (2023). 19—Product discovery techniques, Userpilot. <https://userpilot.com/blog/product-discovery-techniques/>
- Userstorymap. (no date). 27—Guide to Product Discovery Process and Techniques, Userstorymap. <https://userstorymap.io/guide-to-product-discovery-process-and-techniques/>. Accessed 27 June 2024
- Várkonyi, M. (2022). 49—How to measure your product-led growth: Product value metrics, VeryCreatives. <https://verycreatives.com/blog/product-led-growth-metrics>
- de Villaumbrosia, C.G. (2020). 21—Product discovery 101 for product managers. *Product Coalition*. <https://productcoalition.com/product-discovery-101-for-product-managers-4987bd15933a/>
- VP Innovation Team. (2021). 110—The product discovery vs design thinking, VP Innovation. <https://www.vp-innovation.com/the-product-discovery-vs-design-thinking/>
- Zeda. (no date). 35—Product discovery—The ultimate guide for product managers, Zeda. <https://zeda.io/resources/what-is-product-discovery>. Accessed 27 June 2024

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