Navigating Performance Measurement Challenges in Component-Level Development

From product-level to component-level at IKEA Components AB

Master’s thesis in Management and economics of innovation

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Abstract

This thesis explores the challenges of performance measurement in component-level product development, a domain that plays a vital role in multi-level development environments yet remains underrepresented in current research. Through a qualitative case study in a global manufacturing context, the study examines how component-level development differs from product-level processes, identifies performance measurement challenges specific to the component-level, and proposes practical improvements.

The findings highlight that component-level development is typically reactive, triggered by product-level needs, and constrained by narrower scopes and reduced autonomy. While it shares structural features with product-level development, its integration-dependent value and indirect contribution to end-customer outcomes present unique measurement challenges. Six key challenges are identified across three categories: process-related challenges (e.g., isolated evaluations, ambiguous requirements and late involvement), measurement system design challenges (e.g., subjectivity, limitations with scoring system), and interpretation and strategic use challenges (e.g., symbolic use of metrics, misleading measurements).

Based on these challenges, the study proposes five targeted improvements, categorized into two groups. The first group targets organizational and contextual enablers: involving component teams earlier in the process, introducing an independent evaluation group, and enabling collective evaluations. These improvements aim to create the necessary conditions for performance measurement to function effectively. The second group focuses on improving the measurement system itself: incorporating project-specific requirements into evaluations and redefining success to include both implementation and reuse. Together, these measures aim to make performance measurement more relevant, practical, and aligned with component-level realities.

By identifying structural differences, examining context-specific challenges, and offering targeted solutions, this study contributes to a more nuanced understanding of how performance measurement systems can be adapted to support innovation, alignment, and strategic decision-making at the component-level.

Keywords: Performance Measurement, Component-Level Development, Product Development, Performance Indicators, Performance Measurement Systems, Product Innovation, Operational Performance, Product Performance

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List of Terminology

Component	A functional part essential for the assembly, movement, or operation of a product. This includes hinges, connectors, drawer slides and fastening systems e.g., which enable structural integrity, adjustability, and functionality.
Product	A complete, market-ready product designed for consumer use, typically composed of multiple integrated parts and components (e.g., a wardrobe). In this thesis, it refers to the final furniture item developed through product-level processes at IKEA of Sweden.
Component-Level Development	The process of designing individual components that serve specific functions within a larger product.
Product-Level Development	The end-to-end process of designing, developing, and launching a complete, market-ready product, including the integration of components.
Performance Measurement	The process of systematically quantifying the outcomes of actions to determine the extent to which intended objectives are being achieved.
Performance Measurement System	A structured set of methods and tools used to monitor, analyze, and improve performance over time.
Performance Indicator	A quantitative or qualitative metric used to evaluate how effectively objectives are being met.
Operational Performance	A measure of how well internal goals are achieved during development.
Stage-Gate Model	A structured product development framework that divides the process into stages separated by decision gates.
Democratic Design	IKEA's design philosophy balancing five dimensions: form, function, quality, sustainability, and price.

Abbreviations

PMS	Performance Measurement System
PI	Performance Indicator
IoS	KEA of Sweden AB
IKEA C	IKEA Components AB
DNP	Develop New Products (Internal IKEA process name)

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1 Introduction

This chapter provides an overview of the study. It introduces the research context and background, presents the aim and research questions, outlines the delimitations, and concludes with the structure of the thesis.

1.1 Background

Organizations today operate in increasingly complex and fast-changing environments, where rapid technological development, global competition, and shifting stakeholder expectations place continuous pressure on organizations to remain adaptive and efficient (Verhoef et al., 2021). To navigate in these conditions, organizations must ensure that their internal processes and strategic initiatives remain aligned with organizational goals and market demands. In response, the ability to manage and measure performance has become a central organizational capability, not only to evaluate outcomes, but also to influence behavior, support decisions, and navigate change under uncertainty (Neely et al., 1995; Pollanen et al., 2017).

A well-structured performance measurement system supports organizations in setting goals, evaluating progress, and optimizing the use of resources. When grounded in relevant and transparent metrics, these systems improve operational efficiency, enhance organizational effectiveness, and ensure alignment between actions and strategic objectives (Neely et al., 1995; Bititci et al., 1997; Cruz Villazón et al., 2020). Over the past decades, performance measurement systems have evolved from a narrow focus on financial indicators to more comprehensive frameworks that include operational, strategic, and stakeholder-driven dimensions (Kamble et al., 2020). Despite progress in developing performance measurement frameworks, many organizations continue to face challenges when applying them in complex contexts such as innovation and product development. These environments are characterized by non-linear, iterative, and highly context-dependent processes, which make traditional performance measures difficult to apply effectively (Driva et al., 2000; Evans, 2004).

Product development is widely recognized as a central driver of innovation and long-term competitiveness (Lyu et al., 2022). It involves navigating uncertainty through cross-functional collaboration, iterative learning, and continuous decision-making across multiple phases (Loch & Tapper, 2003; Chiesa et al., 2009). In this context, performance measurement becomes essential, not only to ensure alignment with strategic objectives, but also to balance operational and market outcomes, manage uncertainties, and enable continuous improvement in product development projects (Tatikonda & Montoya-Weiss, 2001).

While extensive research has examined performance measurement in product development, particularly at the product and project levels, less attention has been directed towards the specific context of component development. Components are essential building blocks of products, and their performance shapes the overall functionality, quality, and competitiveness of a product (Ulrich, 1995; França et al., 2022). A product's ability to meet performance expectations, adapt to market demands, and enable system-level optimization is dependent on the capabilities and performance of its constituent components.

Despite its strategic importance, performance measurement in component development remains under-researched. Many established performance measurement frameworks in product development are primarily designed to assess complete, end-user-facing products, offering limited guidance on the distinctive characteristics and demands of component-level development. França et al. (2022) note that performance measurement at the component-level remains underexplored, especially regarding how it is conceptualized and managed during product development processes. This highlights the need to better understand the link between component-level performance, its measurement, and its role in shaping product-level outcomes. Consequently, there is insufficient understanding of how component and product development differ, and what unique challenges organizations face when trying to evaluate component-level performance.

While components are fundamental to product success, their development processes and performance often remain in the background. This underexplored area presents important challenges for both research and practice. As such, this thesis seeks to investigate performance measurement in component-level product development, with the aim of understanding its unique characteristics, identifying specific challenges, and proposing more meaningful, context-sensitive ways to measure and improve performance at the component-level.

1.2 Aim and Research Question

The aim of this thesis is to contribute to a better understanding of performance measurement in component-level product development, a domain that has received limited academic attention. To address this topic, the study first aims to explore how component-level development differs from product-level development, as this understanding must first be established to determine whether any differences exist, what these differences are, and how they may contribute to specific challenges at the component-level. Building on this, the thesis aims to identify the challenges associated with measuring performance at the component-level and to explore how performance measurement practices can be developed or adapted to better support component-level development, rather than evaluate the effectiveness of any specific existing system.

By systematically addressing this, the study seeks to fill a gap within the area of performance measurement research. It aims to contribute to the academic understanding of how performance measurements may need to be adapted at different organizational levels and types of development. Moreover, the intent is to provide practical implications for organizations seeking to improve how performance is measured and managed in component-level product development.

More specifically, this study seeks to address the following research questions:

- How does the development process for component-level differ in relation to product-level?
- What are the challenges with measuring performance in component-level product development?

- How can the specific challenges of measuring performance at the component-level be overcome?

1.3 Research Setting

This thesis was conducted at IKEA Components, the business unit responsible for developing and supplying components across IKEA's global product range. The organizational separation between component-level and product-level development within IKEA provides a unique opportunity to explore the specific challenges of measuring performance at the component level. Although the study is limited to a single organization within the furniture industry, the distinctive characteristics of IKEA Components offer insights that may be valuable for other companies facing similar challenges in managing and evaluating component-level product development.

1.4 Delimitations

This thesis is delimited to exploring performance measurements in component-level product development. While an initial understanding of the differences between component-level and product-level development is crucial and therefore included, it serves primarily as a foundation for understanding the meaning and context of component-level development, to distinguish it from product-level development. The main focus is on identifying and analyzing the specific challenges organizations face when measuring performance at the component-level.

Although the first research question adopts a comparative perspective, the study is primarily approached from the component-level viewpoint. The product-level process is included as a reference point to highlight key differences and interdependencies, rather than being studied in detail. As such, the empirical findings and analysis are grounded in the component-level development context, with an emphasis on its specific characteristics, needs, and challenges in relation to product-level development.

This study is based on a single-case study conducted at a multinational organization within the furniture industry. As such, the findings reflect a specific industrial and organizational context and are not intended to be directly generalized to other sectors or types of companies. However, the results may still offer valuable insights for organizations in other industries that operate in comparable contexts, particularly those engaged in component-level product development.

Furthermore, this study is delimited to product development processes and excludes aspects such as supply chain operations, logistics, and financial performance metrics. The focus is on how performance is understood, evaluated, and managed within the component development work itself.

1.5 Thesis Outline

This section gives an overview of the thesis outline, and each chapter is summarized in figure 1.1.

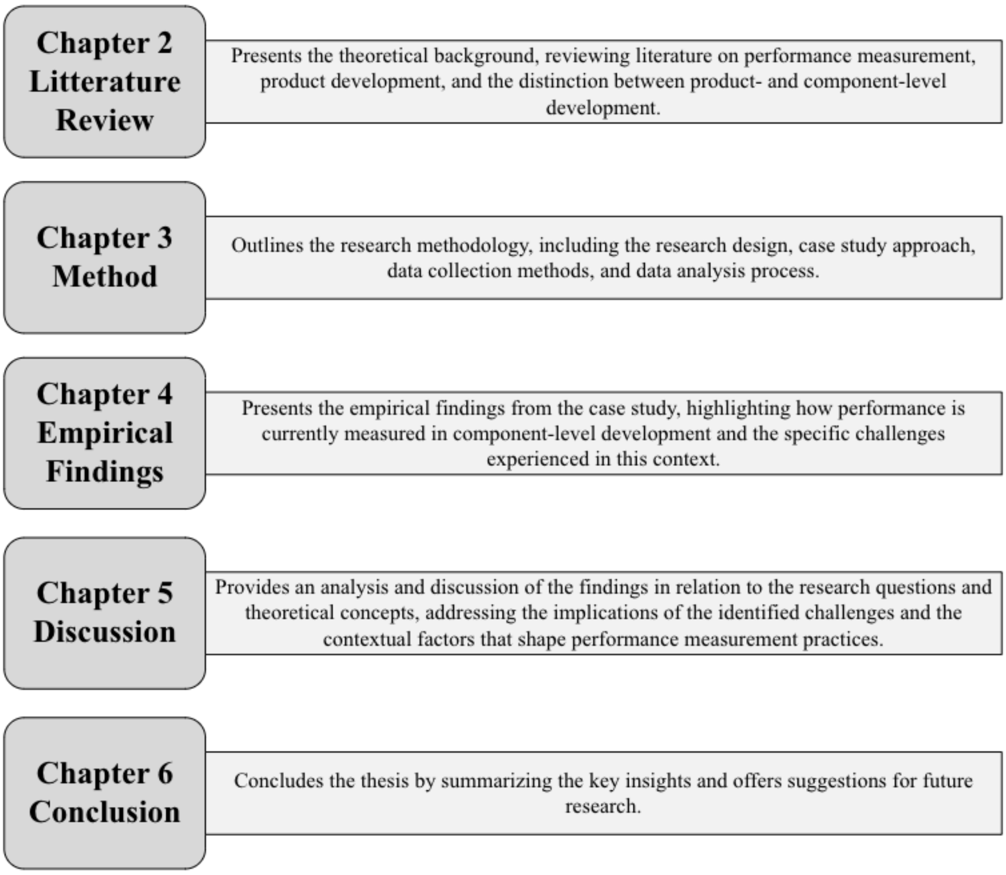

Figure 1.1: *Thesis Outline*

2 Literature Review

This chapter presents the theoretical background for the study. By drawing on literature related to the topic, the chapter establishes the academic context for the research problem and provides a foundation for the study's approach. It identifies key theories, concepts, and findings from previous studies, highlighting gaps and limitations within the existing body of knowledge.

2.1 Product Innovation

Un et al. (2010) define product innovation as introducing a new or significantly changed product to the market. More recently, OECD (2018) define product innovation as *"a new or improved good or service that differs significantly from the firm's previous goods or services and that has been introduced on the market"*.

Product innovation exists on a scale, ranging from incremental improvements, which involve small refinements to existing products, to radical innovations, which involve introducing completely new ideas that transform or disrupt entire industries (OECD, 2018). On one side of the spectrum is incremental innovation, which consists of small but significant refinements to existing products, helping firms enhance functionality, efficiency, or quality without fundamentally changing the product's concept. Such innovations are common and necessary for firms to remain competitive, as they allow businesses to adapt to changing market needs while leveraging existing capabilities.

Incremental innovation often becomes the dominant approach as industries mature and product designs become more standardized. In this context, firms focus on refining and optimizing existing products to improve performance and maintain competitiveness (Brown & Eisenhardt, 1995). Such innovations typically involve small but meaningful changes that enhance efficiency, reduce costs, or improve overall product quality (Un et al., 2010). However, incremental innovation can take multiple forms, including new products derived from established designs, product variants, or manufacturing improvements that preserve core functionality while increasing efficiency (Veryzer, 1998).

Although product innovation and incremental innovation are typically associated with improved or modified products introduced to the market, this thesis extends the concept to individual components. The focus is specifically on incremental innovation, defined as smaller, meaningful improvements. While these innovations may be less visible to end-users, they are often critical to enhancing functionality and performance.

2.2 Product Development

Product development acts as the bridge between product innovation and market application. The long-term success and sustainability of a company depends on its ability to continuously develop and introduce products that meet market demands and maintain a competitive edge (Cooper, 2019). While product innovation lays the conceptual foundation, a well-executed product development process is crucial for transforming ideas into viable, market-ready solutions.

2.2.1 Product Development Process

The concept of product development has been approached in various ways in the literature, often emphasizing different aspects such as structure, decision-making, or organizational dynamics. Despite these variations, most definitions converge around the idea of transforming an initial concept into a marketable product. One widely cited definition from Cooper (2019) is that product development is a structured step-by-step process that transforms an idea from conception to a commercially viable product, improving success rates and reducing risks through a systematic approach. According to Krishnan and Ulrich (2001), product development is best understood as a decision-centric process, where progress is driven by a series of interdependent choices rather than a strictly stepwise sequence. These decisions span multiple domains, such as defining product attributes, configuring the supply chain, and determining production strategies, each of which significantly shapes the outcome. Each decision should be made where the most relevant and up-to-date information resides, enabling more flexible and informed choices in the face of complexity and uncertainty. This view acknowledges the iterative nature of product development, where decisions are often revisited as new insights emerge.

In addition to structured processes and decision-making, an important perspective emphasized by Brown and Eisenhardt (1995) is the role of effective communication. According to this view, successful product development depends not only on formal planning and decisions but also on the strength of internal- and external interactions. Effective communication between team members, suppliers, and customers forms a *"communication web"* that facilitates coordination, adaptability, and knowledge sharing throughout the development process. Adding to these theoretical perspectives, Barczak et al. (2009) provide empirical evidence showing that high-performing firms adapt and integrate development practices based on the specific needs and context of each project. This adaptability reflects a shift towards product development models, where flexibility, cross-functional integration, and iterative processes are emphasized (Barczak et al., 2009). By aligning development practices with project-specific complexities and market dynamics, high-performing firms enhance their ability to manage uncertainty, accelerate cycle times, and improve outcomes. This evidence challenges traditional linear models and underscores the strategic importance of tailoring the development process to organizational and environmental needs.

A successful product development process involves clear strategy, adequate resources, iterative decision-making, and strong communication across functions to adapt to uncertainty and align with evolving market and organizational needs. These elements collectively enhance innovation and increase the likelihood of turning ideas into viable products (Cooper, 2019; Krishnan & Ulrich, 2001; Brown & Eisenhardt, 1995). However, their application should be adapted to the specific context, size, and complexity of each project to ensure relevance and effectiveness (Barczak et al., 2009). While the literature outlines success factors in product development, it remains unclear whether these elements hold the same importance at the component-level development and raises the question of whether contextual differences may shift the emphasis between strategic planning, decision-making, and communication.

2.2.2 Product Development Models

To navigate the complexities of product development, organizations rely on formal models that structure the journey from idea to launch. These frameworks help manage complexity, reduce uncertainty, and support informed decision-making. Numerous models have been proposed to guide new product development, however, due to the nature of different processes and projects, no single standardized approach is generally effective. Empirical evidence suggests that high-performing firms adapt and tailor their development processes according to project-specific needs and contexts. Still, formalized processes have become widely adopted and companies rely on structured methodologies to manage development activities efficiently (Barczak et al., 2009).

One widely used model is the Stage-Gate process, which provides a step-by-step framework for managing product development (Tidd & Bessant, 2009). In addition to the well-known Stage-Gate model, the literature presents a broad range of frameworks. Saren (1984) classifies these models based on their focus, where some emphasize departmental responsibilities, others outline sequences of tasks or decisions, and some concentrate on how inputs such as materials or knowledge are converted into finished products. There are also models that interpret product development as a reaction to external or internal triggers. These diverse approaches illustrate the multiple ways in which product development can be understood and organized, ranging from straightforward, step-by-step systems to more flexible and iterative decision-making structures.

An overall understanding of product development models is essential for this study, as these shape how development activities are structured and managed. Models such as Stage-Gate offer distinct approaches to organizing development processes, influencing decision-making, coordination, and communication.

2.2.3 Stage-Gate Product Development Process

Recognized as one of the most established frameworks, the Stage-Gate process is widely used in product development, especially by organizations committed to structured and systematic practices (Cooper, 2019). According to Cooper (1990), it is a step-by-step framework designed to improve efficiency, reduce risk, and increase success rates. The model divides development into distinct stages (Figure 2.1), where specific activities are conducted, and gates, where decisions are made on whether to proceed, revise, or terminate the project. The Stage-Gate process typically includes five stages: *Preliminary Assessment*: a quick evaluation of feasibility and market potential. *Detailed Investigation*: development of a business case through research and analysis. *Development:* includes design, prototyping, and planning. *Testing & Validation:* includes trials and feedback to ensure readiness. And *Full Production & Launch*.

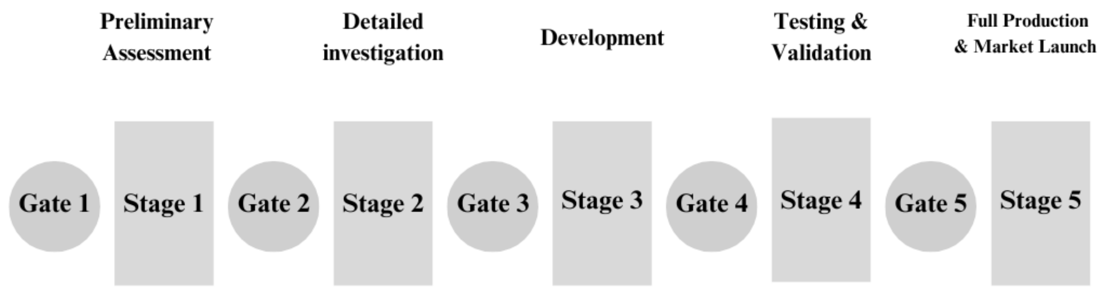

Figure 2.1*: Illustration of Stage-Gate Process*

Previously, organizations viewed Stage-Gate as a strict, step-by-step system that had to be followed precisely. However, modern adaptations recognize that different projects require different levels of structure. Specifically, the degree of formalization should align with each project's size, risk, and complexity (Cooper, 2008). This aligns with Barczak et al. (2009), who emphasize that high-performing firms tailor their product development processes to fit the specific needs and characteristics of each project, rather than applying a one-size-fits-all approach.

Cooper (2008) also highlights improvements such as overlapping stages, which allow work in the next phase to begin before the previous one is fully completed. These changes reflect a broader shift toward flexibility and contextual adaptation in development models. While this flexibility is well documented, it remains unclear how such adaptations are applied, or if they are needed, within component-level development. This raises important questions about how structured models like Stage-Gate function across different levels of development, and whether the same principles hold in varying contexts.

2.3 Clarifying Product- and Component-Level

For the aim of this thesis, it is important to distinguish between product-level and component-level development. Krishnan and Ulrich (2001) define product development broadly as the transformation of a market opportunity into a product ready for commercial sale. Building on this definition and drawing from Ulrich´s (1995) conceptualization of product architecture, this study defines product-level development as the process of designing and realizing a complete, integrated product that is ready for the market. This process entails the coordination and integration of multiple subsystems and components into a cohesive and functional whole.

Component-level development refers to the design and realization of individual physical components that serve specific functional roles within the overall product architecture. According to Ulrich (1995), components are physical elements that implement functional requirements, and the way they are arranged and interfaced defines the product architecture. Therefore, component-level development focuses on creating those discrete parts that, when integrated, contribute to the broader functionality and performance of the final product.

2.3.1 Defining Product

In line with the distinction between product- and component-level development, it is important to clarify what is meant by a product in this study. A product is defined as the final outcome of an assembly or manufacturing process, where various physical subassemblies and/or components are integrated into a complete, functional whole (De Kok & Visschers, 1999; Ceryan et al., 2012). This thesis focuses on physical consumer products intended for use in domestic or commercial environments, which are developed through a process that spans from initial concept to market introduction, ensuring that all integrated elements operate together as a cohesive and functional whole (Ulrich, 1995; Krishnan & Ulrich, 2001).

2.3.2 Defining Component

To ensure clarity throughout the thesis, this section clarifies the concept of a component. According to Ulrich (1995), a component is the smallest individual physical part of a product that contributes to its structure and function and serves a specific purpose but requires integration with other parts to function effectively. Ulrich (1995) highlights that components are directly linked to specific functional elements of a product and can vary in complexity. It is also relevant to consider how the concept is understood in practice. In this thesis, a component is defined, together with the case company, as follows:

"A component is a functional part essential for the assembly, movement, or operation of a product. This includes hinges, connectors, drawer slides and fastening systems e.g., which enable structural integrity, adjustability, and functionality."

2.3.3 Clarifying Product and Component

To support the focus of this thesis, it is essential to clearly distinguish between a product and a component. In this study, a product refers to the complete furniture, while components are the individual functional parts that enable its assembly and operation.

Figure 2.2: *Illustration of a wardrobe (product-level) and its components.*

Figure 2.2 illustrates a wardrobe (a product) from IKEA with several components highlighted, all essential for its function and assembly. Hinges allow the doors to open and close smoothly, door handles provide an easy grip for opening and closing. Inside the wardrobe, there are pull-out drawers mounted on sliding rails, enabling them to open and close. Various fasteners, such as screws and brackets, are used to secure the structure, as illustrated in the bottom-right detail. These components are crucial for ensuring the wardrobe's stability, usability, and overall functionality. This example illustrates how components play a critical role in enabling both the structural and functional performance of the final product. For this reason, this study takes a deeper look at component-level development, and how it contributes to the success of the product.

2.4 Performance Measurement

Performance measurement refers to the process of systematically quantifying the outcomes of actions to determine the extent to which intended objectives are being achieved. It involves consistent collection and analysis of data to evaluate performance, forming the basis for understanding results, identifying trends, and informing decisions. It is important to distinguish performance measurement from a performance measurement system. While a performance measurement system encompasses the broader structure, tools, processes, and frameworks used to manage performance, performance measurement focuses specifically on the act of tracking and assessing outcomes over time (Neely et al., 1995).

2.4.1 Performance Measurement Systems

Performance Measurement System (PMS) serve as the essential tool for organizations, enabling the evaluation of operational efficiency, strategic alignment, and continuous improvement. By establishing well-defined metrics, a structured PMS not only tracks efficiency and effectiveness but also helps ensure alignment with overarching business objectives (Neely et al., 1995).

Historically, PMS have largely prioritized financial measures, such as profitability, revenue growth, and cost control. While these measures offer essential insights, scholars have increasingly questioned their adequacy in capturing the full scope of organizational performance. Bititci et al. (1997) argue that financial metrics alone are insufficient, as they tend to be backward-looking and often fail to reflect the strategic and operational drivers of success. This critique marked a shift toward more balanced measurement approaches that integrate both financial and non-financial dimensions. Building on this, Neely et al. (1995) emphasize the importance of aligning performance measurement with long-term strategic goals and the broader business environment. Despite this theoretical advancement, practical challenges remain. As Evans (2004) demonstrates, many organizations struggle with inconsistent application of PMS, often defaulting to short-term financial results at the expense of strategic alignment and continuous improvement. Furthermore, misalignment and the lack of integration between operational and financial data further undermine the system's effectiveness.

Recent literature extends these foundational perspectives by emphasizing a dynamic and context-sensitive approach to performance measurement. Kamble et al. (2020) highlight the evolution from traditional static and historical PMS toward proactive, real-time performance management enabled by advanced technologies. They argue that PMS should leverage real-time data analytics to proactively predict and respond to operational issues, rather than solely analyzing past performance. According to Kamble et al. (2020), a modern PMS integrates diverse performance dimensions, including cost, quality, flexibility, productivity optimization, real-time diagnosis and prognosis, and sustainability, to provide a comprehensive and forward-looking assessment of organizational performance. Furthermore, Korhonen et al. (2023) complements traditional frameworks by arguing that performance measurement should support alignment between project actions and organizational success. Performance measures should navigate ambiguity, manage shifting stakeholder expectations, and adapt to evolving definitions of success throughout the project lifecycle. Thus, PMS increasingly act as active enablers of strategic outcomes rather than merely passive reporting mechanisms.

Strategic alignment of PMS is important, but it is equally important to consider the external environment in which organizations operate. In this regard, Neely et al. (2001) introduce the Performance Prism, which offers a stakeholder-oriented perspective on performance measurement. The authors argue that both the strategy and the PMS itself should be shaped by the needs and expectations of key stakeholders. This stakeholder-oriented perspective expands the logic of alignment beyond internal strategic objectives, recognizing that organizations are embedded in networks of mutual influence. The Performance Prism encourages organizations to ask not only what they aim to achieve, but also who their stakeholders are, what those stakeholders expect from the organization, and what the organization needs from them in return. In this view, an effective PMS depends on the organization's ability to identify, manage, and balance the interests of both internal and external stakeholders, such as employees, customers, suppliers, and regulators, whose contributions and satisfaction are vital to long-term success. Integrating stakeholder expectations into both strategic planning and performance measurement fosters a more holistic, responsive, and adaptive approach to managing performance.

To ensure the effectiveness of a PMS, it is crucial to clearly define what performance means in the organizational context and to ensure that the metrics used are both accurate and meaningful. Further, Kamble et al. (2020) emphasize the need for continuous revision and validation of the PMS to reflect changes in technology and market dynamics. A critical task in designing a PMS is the selection of performance indicators (PIs), as these represent a core element of the system and must align with strategic objectives (Bititci et al., 1997). While PMS provide the structural framework for managing organizational performance, their effectiveness depends on the quality and relevance of the PIs they contain.

2.4.2 Performance Indicator

Improvement efforts become meaningful when their outcomes are tracked. Without a structured way to measure and monitor progress, it's difficult to know whether actions are leading to desired results or simply consuming resources without impact. PIs serve an essential role in this process, enabling organizations to monitor, evaluate, and control improvement initiatives by comparing actual outcomes against predefined targets (Fortuin, 1988). According to del-Río-Ortega et al. (2013) PIs are measurable data points gathered over time to assess the effectiveness, efficiency, and success of a system, process, organization, or individual in achieving predefined objectives. Bishop (2018) defines PIs as quantitative or qualitative measures used to evaluate how effectively an organization is achieving its goals. Shahin and Mahbod (2007) emphasize the distinction between goals and indicators, noting that while goals define the desired outcomes, PIs are tools for tracking meaningful and strategically aligned progress.

To ensure meaningful performance measurement, Bishop (2018) emphasizes the importance of defining clear objectives for each indicator, aligning them with organizational or project-specific goals. Additionally, the author highlights the risk of overloading organizations with too many indicators, which can conceal critical insights and reduce their usefulness. Instead, PIs should be categorized based on relevant dimensions, so that performance evaluations remain targeted and actionable. Neely et al. (1997) emphasize the importance of not selecting indicators merely for their ease of measuring, warning that such approach risks prioritizing what is most readily quantifiable over what is strategically meaningful. Instead, Blackburn and Valerdi (2009) argue for a value-driven selection process, where indicators are chosen based on their relevance to long-term goals and their capacity to inform meaningful action.

Recent literature emphasizes the importance of strategically balanced PIs. Karamouz et al. (2021) emphasize the need to combine various PIs within the PMS to avoid incomplete or misleading evaluations. Their study identifies critical PIs including defect rates, on-time delivery, product conformity, employee satisfaction, and supplier reliability, and recommends a multidimensional approach that accounts for both internal and external organizational factors. According to Karamouz et al. (2021), a well-structured set of PIs ensures clarity, strategic alignment, and supports continuous improvement across the entire supply chain.

Another important view on PIs presented by Franceschini et al. (2013) emphasizes that PIs should not be viewed as neutral or purely objective tools. Instead, they actively shape organizational behavior, decision-making processes, and overall strategic direction. According to the authors, an overemphasis on certain types of PIs can produce unintended and potentially harmful consequences. Organizations that focus too narrowly on minimizing costs might inadvertently sacrifice other critical objectives, such as maintaining product quality or fostering innovation. As a result, rather than supporting balanced growth, poorly chosen or misapplied PIs lead to short-term gains and long-term strategic weaknesses. Franceschini et al. (2013) argues for a more critical and structured selection of PIs to ensure that they align with broader organizational goals and minimize unintended trade-offs. Neely et al. (2005) reinforce this concern, highlighting that PIs and PMS must be carefully designed to avoid reinforcing short-term gains at the expense of long-term sustainability.

2.4.3 Attributes of Indicators

Beyond selecting appropriate PIs, it is equally important to ensure that each individual indicator is well-designed. According to Neely et al. (1997), the practical usefulness of an indicator largely depends on how clearly and precisely it is defined. To promote consistency and usability, each indicator should include a specification that clearly outlines its purpose of what is being measured and why it matters. For example, the formula used for calculating the indicator, the source of data that will be used, the frequency of measurement, and who holds ownership of the indicator.

Neely et al. (1997) emphasize that a clear and standardized indicator is essential to ensure that PIs are consistently understood and correctly interpreted across different parts of the organization. The collected data should be clearly specified, credible, and readily accessible, ensuring the reliability of the measurement. In addition, the frequency of measurement must be defined so that the indicator remains relevant and can support timely decision-making. Assigning clear ownership, both for maintaining the indicator and interpreting its results, reinforces accountability and encourages active use. When these attributes are well-defined, performance indicators become more than just technical metrics, they function as dependable tools for tracking progress and supporting decisions.

2.4.4 Types of Performance Indicators

While PIs are widely used, the types of indicators selected, and how they are interpreted, can vary significantly. Since this thesis aims to explore how performance is measured, it is important to understand different types of PIs discussed in literature. This provides a theoretical foundation for analyzing which types of indicators are currently used in practice and whether some may be more effective or overlooked depending on the context.

A distinction exists between hard and soft indicators. Hard indicators are quantifiable, objective, and data driven. Including metrics like production efficiency, revenue growth, and defect rates, providing clear, measurable benchmarks. In contrast, soft indicators are qualitative and perception-based, measuring aspects like leadership effectiveness, employee engagement or customer experience. While hard indicators provide precise benchmarks, soft indicators capture behavioral and cultural factors that influence performance (Popova & Sharpanskykh, 2010). Gomes et al. (2004) emphasizes that despite recognition of soft indicators, many firms tend to prioritize hard metrics due to accessibility.

Another distinction exists between leading and lagging indicators. Seip and McNown (2007) explain that leading indicators are forward-looking and provide insights into future trends and help organizations take proactive measures by identifying early signs of potential risks or opportunities. On the other hand, lagging indicators measure past performance. These indicators reflect completed tasks and outcomes, making them useful for evaluating success and failure, but less effective for anticipating challenges or risks.

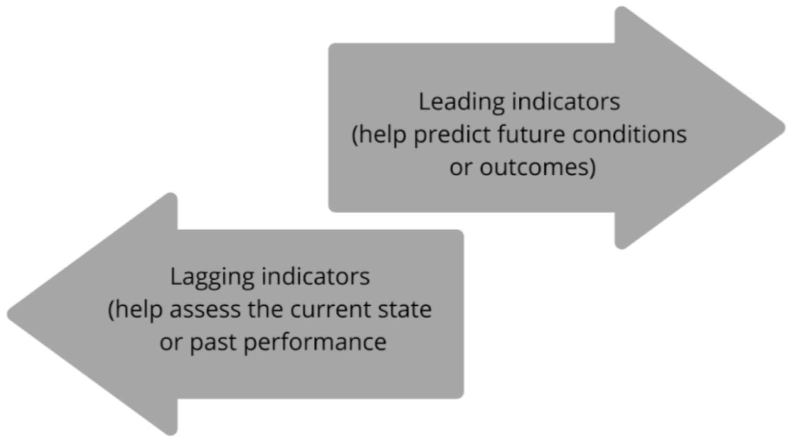

Figure 2.3: *Difference between lagging and leading indicators*

PIs can also be classified into outcome indicators and preventive indicators. Outcome indicators measure the attainment of project objectives, and preventive indicators help identify potential risks and deviations before they escalate. Outcome indicators are useful for analyzing completed projects but often fail to prevent failures during the process. Preventive indicators, in contrast, are forward-looking and designed to identify potential risks or deviations before they escalate. While outcome indicators help evaluate project success, preventive indicators provide real-time insights that allow teams to take corrective actions before major issues arise (Taylor & Ahmed-Kristensen, 2018). These distinctions offer relevant knowledge for analyzing how organizations evaluate performance. It also provides a lens for examining whether different types of indicators may be more suitable depending on the structure, timing, and focus of the development work.

2.4.5 Implementation Challenges and Success Factors

Bourne et al. (2000) present a process-oriented view of PMS, dividing the lifecycle into three key stages: design, implementation, and use. While considerable attention is often placed on the design phase, focusing on defining appropriate PIs and aligning them with organizational goals, the authors highlight that implementation and ongoing use are often more difficult to achieve. Common barriers include unclear ownership of indicators, limited managerial engagement, employee resistance, and insufficient integration into daily decision-making. As a result, even well-designed PMS frameworks may fail if not embedded effectively within organizational routines and culture. In addition, Bourne et al. (2000) highlight the importance of continuously updating the measurement system to ensure alignment with changing strategic objectives. Without mechanisms for regular review and revision, performance measures risk becoming obsolete or misaligned with organizational priorities.

Extending these insights, Keathley-Herring et al. (2024) offer an empirical perspective on PMS implementation. Drawing on a large-scale study, the authors identified three core dimensions of successful implementation: actual use of the system, the system's operational performance, and its contribution to improved results and processes. Their findings revealed nine critical success factors, including leadership support, organizational culture, reward system alignment, employee participation, and the overall quality of system design. These factors influence both the technical and human aspects of implementation, helping to ensure that the PMS is not only correctly developed but also actively used and accepted throughout the organization. By addressing these areas, organizations can better integrate performance measurements into daily routines and foster a performance-driven culture.

Together, these studies underscore that a successful PMS depends not only on how it is designed, but equally on how it is implemented, maintained, and continuously integrated into the broader management and decision-making processes. Attention to both technical and cultural dimensions is therefore essential for ensuring that PMS are used effectively and remain relevant over time. While this addresses performance measurement systems from a general organizational perspective, the following section will focus on performance measurements within product development, an area where complexity and uncertainty introduce distinct challenges and demands.

2.5 Performance Measurement in Product Development

Measuring performance in product development is essential since it directly influences behavior, decision-making, and organizational outcomes (Loch & Tapper, 2003). For managers and decision-makers, performance measurement provides critical information to assess progress, learn from past efforts, and make informed decisions for the future (Davila et al., 2006).

Before examining existing literature on why and how performance should be measured in product development, it is essential to clarify what *performance* means. When reviewing the literature, it presents a variety of interpretations and there is not only one definition. As Folan et al. (2007) describes it "*Performance is socially constructed reality*", meaning that its definition depends on context. Within the context of product development performance, related to Tatikonda and Montoya-Weiss (2001) it is important to distinguish between two dimensions, *operational performance* and *product performance*.

2.5.1 Operational Performance

Operational performance concerns how effectively and efficiently a product development project is executed in relation to its internal objectives and project goals. This includes achieving targets related to maintaining schedules and budgets, as well as meeting quality requirements. Tatikonda and Montoya-Weiss (2001) highlight operational performance as a reflection of an organization's internal development capabilities, how well the team manages resources, addresses complexity, and delivers according to set specifications throughout the development process.

2.5.2 Product Performance

Product performance refers to the market success of the developed product and its technical attributes, such as functionality and reliability. Within the context of product development, it represents a key dimension of a project's outcomes. According to Tatikonda and Montoya-Weiss (2001), product quality, unit cost, and time-to-market are crucial internal (operational) outcomes that reflect the effectiveness of the development process. These internal outcomes, in turn, contribute to market performance such as customer satisfaction and sales.

In this thesis, these two dimensions will serve as the foundation for how performance in product development is understood. While Tatikonda and Montoya-Weiss (2001) discuss performance at the product-level, this study applies these dimensions to the component-level. That is, product performance refers to the technical performance of individual components, and operational performance reflects how well the development project of a specific component has met internal goals such as cost, timeline, and technical specifications.

2.5.3 Challenges with Performance Measurements in Product Development

A challenge with measuring performance in product development is the lack of consistency in evaluation criteria across different stages. Early-stage indicators rely heavily on technical feasibility and intuition, while later stages emphasize financial performance and market acceptance. The shifting focus makes it difficult to compare measurements throughout the development process since variation in criteria may lead to diffused decision-making, especially when different functions define success differently (Hart et al., 2003). McGrath and Romeri (1994) similarly emphasize that there is no widely accepted measurement for evaluating product development success. The absence of a common approach makes it difficult to compare performance across projects and departments, increasing the risk of misguided decision-making. Hertenstein & Platt (2000) argues that performance measurement in product development is often misaligned with company strategy. Firms rely heavily on financial measures, such as costs and revenue, which do not fully capture a product's long-term impact on the strategy. At the same time, non-financial indicators, such as customer satisfaction and time-to-market, are often used inconsistently, leading to an incomplete evaluation of success.

In addition to these challenges, Taylor & Ahmed-Kristensen (2018) highlights that firms rely too much on lagging, outcome-based measurements. This reliance on historical data limits a company's ability to identify development risks early, making it difficult to adjust strategies proactively. As a result, firms often detect problems only after they have impacted the project, rather than integrating real-time performance measures that could help mitigate risks in advance. Bititci et al. (2012) argue that traditional models, rooted in stable organizational contexts, are insufficient in today's complex and dynamic environments, advocate for performance measurement systems that are adaptive, learning-oriented, and sensitive to context, systems that can evolve in parallel with the nature of the development process. Their perspective reinforces critiques of static evaluation models by highlighting the structural mismatch between traditional performance measurement systems and the emergent demands of contemporary organizational settings.

2.6 Our Research Questions

The preceding sections have outlined the theoretical landscape of product innovation, product development processes, and performance measurements. While existing literature provides valuable insights into product development and performance measurement, it pays limited attention to performance measurement at the specific conditions of component-level development. This reveals a critical gap in understanding the distinct characteristics of component-level development and the performance measurement challenges it entails.

To address this, the study is guided by the following research questions:

- How does the development process for component-level differ in relation to product-level?
- What are the challenges with measuring performance in component-level product development?
- How can the specific challenges of measuring performance at the component-level be overcome?

The first question aims to explore the differences between product- and component-level development processes. Existing literature describes that product development is commonly defined as the transformation of a market opportunity into a product ready for sale (Krishnan & Ulrich, 2001; Cooper, 2019). Several models explain this process, including the Stage-Gate model (Cooper, 1990), decision-centric approaches (Krishnan & Ulrich, 2001), and adaptive, communication-based frameworks (Brown & Eisenhardt, 1995). However, these models are primarily developed for product-level contexts, focusing on market-facing outcomes and customer alignment. Since current research does not clearly define how these processes differ, this thesis seeks to identify those differences as a basis for understanding the performance measurement challenges unique to component-level development.

The second research question investigates the challenges of measuring performance in component-level product development. While there is extensive research on performance measurement, both in general and within the context of product development, these studies primarily focus on product-level applications. Although they offer valuable insights into performance evaluation, it is a question whether they fully capture the specific complexities with component-level development (Hart et al., 2003; Hertenstein & Platt, 2000; Taylor & Ahmed-Kristensen, 2018).

The third research question explores how the specific challenges of measuring performance at the component-level can be overcome. While the literature highlights several key principles for improving performance measurement, such as adaptability to context (Bititci et al., 2012), the use of real-time and predictive indicators (Kamble et al., 2020), and alignment with stakeholder expectations (Neely et al., 2001), these approaches have primarily been discussed in relation to product-level contexts. This thesis therefore aims to explore if and how these principles could be applied to improve performance measurement at component-level.

3 Method

This chapter outlines the methodological approach used to address the research questions. It presents research strategy, case study design, data collection methods, and the process of data analysis.

3.1 Research Strategy

The selection of a research strategy is a critical decision in any study and depends on the studies objectives, research questions, and the type of data needed to address them. Quantitative methods are widely recognized for their ability to measure variables, test hypotheses, and provide generalizable results based on structured, numerical data (Bryman & Bell, 2011). These methods are particularly valuable in studies where the goal is to establish relationships between variables or to test theories (Bell et al., 2019). In contrast to quantitative research, which prioritizes breadth and generalizability, qualitative research is tailored to delve into the understanding of experiences, processes, and contextual nuances. These approaches emphasize exploring complexity and uncovering detailed insights, making them particularly suitable for examining phenomena that are complex to understand (Creswell & Creswell, 2017). By focusing on experiences, behaviors, or interpretations, qualitative research enables researchers to investigate not only what happens but also why and how it happens in dynamic organizational settings (Easterby-Smith et al., 2015).

Given the exploratory nature of this thesis, investigating component-level development and performance measurement, a qualitative approach was selected as the most suitable method. This choice was driven by the complexity of the subject, which involves diverse stakeholder perspectives, detailed processes, and the need to understand both formal structures and informal practices within the organization. Semi-structured interviews with experts and stakeholders were conducted to collect in-depth insights into the product development process, organizational objectives, and performance measurement practices. This method allowed for open-ended exploration, enabling participants to share detailed perspectives on interactions, experiences, beliefs, and behaviors within the organization (Creswell & Creswell, 2017; Bell et al., 2019).

Bell et al. (2019) describes the iterative and flexible nature of qualitative research, as illustrated in Figure 3.1. The approach aligned with the thesis aims to uncover complex and evolving phenomena. The flexibility of the method facilitated the refinement of research questions and allowed for the collection of additional data as the study progressed, contributing to a more targeted and insightful analysis. By continuously revisiting the research focus in the light of findings, the iterative process enhanced both the theoretical and practical contributions of the thesis. This design also enabled deeper engagement with participants and supported the integration of nuanced perspectives into the evolving analysis.

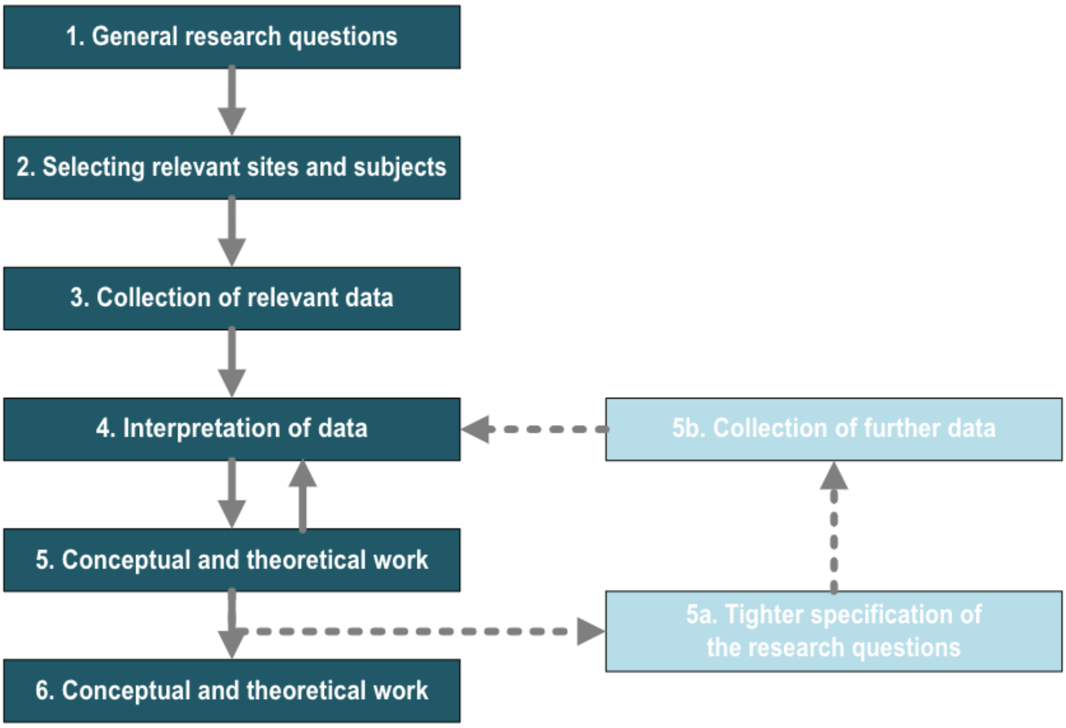

Figure 3.1: *Illustration of the qualitative research process (Bell et al., 2019)*

For this thesis, an abductive research approach was chosen, as it combines elements of both deductive and inductive reasoning, making it well-suited for understanding complex phenomena (Bell et al., 2019). While existing theories on product development and performance measurements provided a strong starting point, a purely deductive approach would not have accounted for the unique challenges of component-level development. Similarly, an inductive approach, relying solely on observations, would have overlooked the valuable insights offered by existing theoretical frameworks. The abductive approach enabled movement between theory and empirical findings, allowing existing ideas to be adapted to the specific context while remaining open to new insights emerging from the data. This flexibility ensured that the conclusions were grounded in both real-world observations and established theory, contributing to a deeper and more practically relevant understanding of the study.

3.2 Research Design

Once the research strategy was established, it became essential to design the study, as the research design serves as the framework for data collection and analysis, guiding the entire research process. It involves key decisions about how the study will address its objectives and answer the research questions, ensuring alignment between the research strategy, methods, and data analysis (Bell et al. 2019). To address the aim and research questions effectively, this thesis adopted a case study design. As Bell et al. (2019) explain, case studies are a research design used to conduct in-depth exploration of the complexity of a specific organization, situation, or system within its real-world context.

Building on this, a single-case study approach was selected. As Yin (2009) explains, single-case studies are particularly useful for investigating unique or critical cases in detail, especially when the phenomenon is closely tied to its context. In this case, performance measurement within IKEA Components is deeply embedded in the organization's specific culture, industry demands, and strategic priorities. These contextual factors shape how performance is defined, measured, and interpreted. Therefore, a single-case study allows for an understanding of performance measurement as it occurs in its real-life setting.

This approach is well-suited for studying a specific organizational setting where the complexities of a phenomenon can be fully captured and understood. Although the case focuses on a single organization, the analysis includes two distinct organizational units: one subsidiary responsible for developing components and another unit developing the final product. This design allows for a detailed examination of both units and their roles in performance measurement. By adopting this approach, the study provides an opportunity to generate deep insights while situating them within the broader theoretical and practical context of performance measurement in product development. Furthermore, case studies offer flexibility in data collection. The ability to adjust research questions, interview guides, and document analysis based on emerging findings makes it an ideal approach for investigating evolving business processes (Pearson et al., 2015).

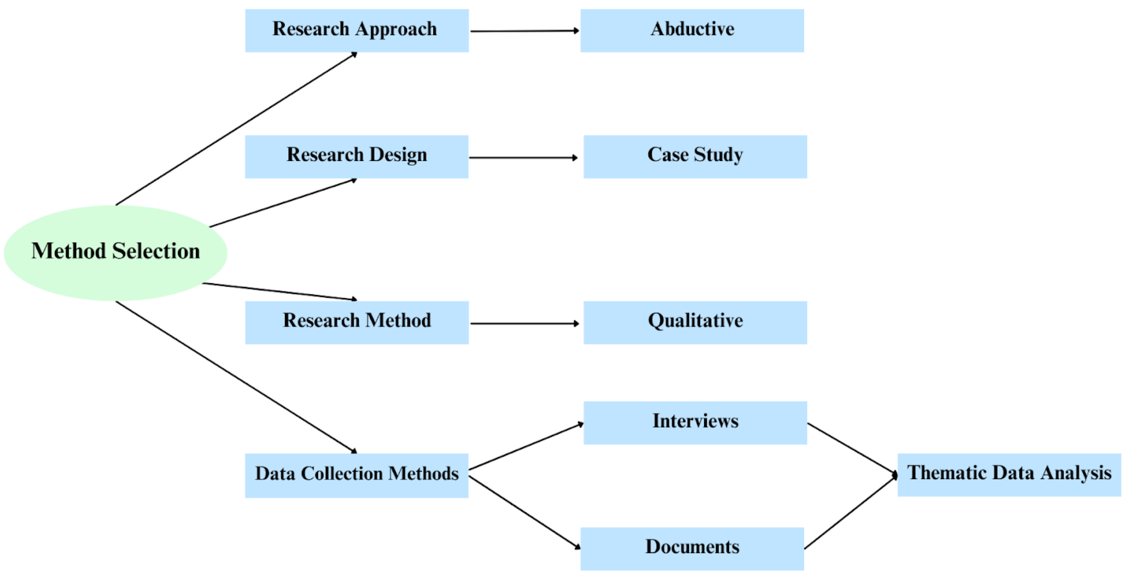

Figure 3.2: *Description of the thesis method selection.*

Figure 3.2 provides an overview of the method selection process, illustrating how the research approach, design, method, and data collection techniques were chosen and connected to the thematic analysis used in this study.

3.3 Literature

The literature review helps to identify research gaps and provides a foundation for data collection. Drawing on Snyder (2019), a semi-systematic approach was adopted for the review. This method is particularly suited to research areas that involve thematic analysis, making it ideal for this case study. The semi-systematic review offers flexibility in identifying literature, guiding the identification of relevant sources while maintaining the flexibility to refine search terms and include emerging themes as the thesis progresses. Search terms were chosen to reflect the scope of the study and to capture relevant literature from both theoretical and practical perspectives. The keywords included: *Performance Measurement, Product development, Component-Level Development, Performance Indicators, Product Innovation, Product development processes.* These terms were combined using AND, OR, and NOT to refine the search results and ensure precision. Synonyms and related terms were also included to broaden the scope of the review.

The literature search was conducted using reputable academic databases, primarily Scopus and Google Scholar. A selection process was applied to filter relevant literature. Articles were screened based on predefined criteria to ensure quality and relevance. The articles were primarily required to be published in reputable journals ranked in Academic Journal Guide (Chartered Association of Business Schools, 2024), with a ranking of 3 or higher, ensuring their quality and relevance, and with a focus on empirical findings. For less established topics, related to component-level development, studies from lower-ranked journals were considered if they demonstrated significant contributions to the field.

3.4 Data Collection

A crucial aspect of research is data collection, as it builds up and directly influences the reliability and validity of the study's findings. However, selecting the appropriate methods can be a complex decision that requires careful consideration. Several factors must be considered when determining the most suitable approach, including the research objectives, the nature of the data required, and available resources (Opoku et al., 2016). Choosing the right method ensures that the data collected is relevant, accurate, and supports the research. To ensure a thorough examination of the research topic, this study employed a triangulated approach, drawing insights from multiple data sources to enhance validity and reliability (Bell et al., 2019). The data collection for this thesis primarily relied on semi-structured interviews and documents.

3.4.1 Interviews

To gather in-depth insights while maintaining flexibility during data collection, this thesis employed semi-structured interviews. According to Bell et al. (2019), this method is widely used in qualitative research as it combines a predetermined structure with the adaptability to explore emerging themes. The interviews were guided by a set of predefined, open-ended questions that allowed the interviewer to go deeper into topics based on the responses. The interview guides can be found in Appendix A.

A key advantage of semi-structured interviews is their ability to capture detailed and nuanced information. The flexibility of the approach is particularly valuable in exploring complex processes and organizational practices as it allows researchers to uncover perspectives that may not be immediately evident. However, Bell et al. (2019) note that semi-structured interviews require skilled interviewers who can effectively balance the predetermined questions with emergent themes, ensuring that the discussion remains focused and meaningful.

In this thesis, semi-structured interviews with employees at the case company were conducted to explore the context of component-level development and performance measurements. This approach was selected for its capacity to get detailed insights from the interviewee's experiences, providing a richer understanding of the research topic. The interview guide was thoughtfully designed, drawing on existing literature and theoretical frameworks to ensure coverage of key themes. The flexibility of the semi-structured format allowed to adapt questions to the specific roles and expertise of participants. This adaptability enabled the collection of diverse, in-depth data that was both rich in context and closely aligned with the study's goals.

To ensure a broad and representative range of perspectives, the selection of interview participants was conducted using a snowball sampling approach. This involves identifying an initial set of participants with relevant expertise who then assist in recruiting additional interviewees within their networks (Bell et al., 2019). The initial participants were carefully selected in collaboration with the supervisor at the case company, in order to ensure relevance to the thesis. These individuals were selected based on their expertise and involvement in key areas of the development process, as they were expected to provide valuable insights. Following these initial interviews, participants were then asked to recommend other participants who could contribute further perspectives on the subject. This approach enriched the data collection process by incorporating diverse viewpoints while maintaining a targeted focus.

To gather in-depth insights for this thesis, the interviews were conducted through both face-to-face and virtual meetings via Microsoft Teams. While the aim was to prioritize in-person interviews, as they often lead to more engaging and dynamic discussions, logistical constraints due to geographical distance forced some of the interviews to be conducted online. The interviews were, as mentioned, conducted with employees relevant to the topic, specifically employees involved in the product development process at IKEA of Sweden, employees working with component-level development at IKEA Components, and managers at IKEA Components. In order to get a range of perspectives and insights into the study.

Company	Role	Person	Date	Length
IKEA Components	Requirement & Design Engineer	Interviewee A	7/2-2025	45 minutes
IKEA Components	Requirement & Design Engineer	Interviewee A	17/2-2025	30 minutes
IKEA Components	Requirement & Design Engineer	Interviewee A	11/3-2025	45 minutes
IKEA Components	Business Process Leader	Interviewee B	17/2-2025	90 minutes
IKEA of Sweden	Product Design Engineer	Interviewee C	19/2-2025	60 minutes
IKEA Components	Development project leader	Interviewee D	25/2-2025	55 minutes
IKEA of Sweden	Product Design Engineer	Interviewee E	5/3-2025	50 minutes
IKEA Components	Requirement & Design Engineer	Interviewee F	11/3-2025	30 minutes
IKEA Components	Requirement & Design Engineer	Interviewee G	11/3-2025	30 minutes
IKEA Components	Requirement & Design Engineer	Interviewee H	11/3-2025	30 minutes
IKEA Components	Requirement & Design Engineer	Interviewee I	12/3-2025	30 minutes
IKEA Components	Requirement & Design Engineer	Interviewee J	12/3-2025	30 minutes
IKEA Components	Requirement & Design Engineer	Interviewee K	21/3-2025	35 minutes
IKEA Components	Range & Engineer Manager	Interviewee L	8/4-2025	35 minutes

Table 3.1: *List of interviewees.*

The initial estimation was to conduct between 10 and 20 interviews, however, no fixed number was predetermined. Instead, interviews continued until saturation was reached, that is, until no significant new insights emerged from additional interviews (Bell et al., 2019). To achieve this, the researchers continuously evaluated the collected data throughout the interview process, identifying recurring themes and monitoring when new interviews no longer contributed with meaningful additions to the study. This iterative process helped determine an appropriate stopping point and ensured that the data collected remained relevant, prioritizing depth and richness over quantity. Saturation was reached after the interviews conducted shown in Table 3.1, at which point the data was considered sufficient to address the research aim.

3.4.2 Secondary Data Collection

Organizational documents, such as reports and corporate communications, are valuable data sources in qualitative research. These documents provide insights into company strategies, decision-making processes, and historical contexts. However, their credibility and representativeness must be carefully evaluated, as they often reflect an organization's intended image rather than an objective account of its operations (Bell et al. 2019). In addition to the interviews and as part of this study's secondary data collection, this study incorporates data from internal company documents, reports, and databases. These documents serve as essential references for understanding the organization's strategic objectives, performance measurement frameworks, and product development processes. By examining these documents, the study gains access to empirical evidence that can either support or challenge insights gathered through interviews, thereby enhancing the validity and reliability of the findings.

3.5 Data Analysis

The qualitative method generates a large volume of data that can be complex to structure, as qualitative analysis does not follow a clearly defined or standardized analytical approach (Bell et al., 2019). To address this, a thematic analysis was selected as the method for analyzing empirical findings. Thematic analysis enables the identification, analysis, and interpretation of patterns within qualitative data, offering a flexible and systematic approach to organizing findings by categorizing responses into meaningful themes.

This method is particularly valuable when exploring complex organizational processes, as it allows for capturing diverse perspectives while ensuring analytical rigor. In this study, the thematic analysis made it possible to examine the challenges associated with performance measurement in component-level development. It helped identify recurring patterns in stakeholder experiences and provided insight into how performance is understood, evaluated, and managed in this context. This ensured that findings remained grounded in empirical data while allowing for a detailed and nuanced interpretation of how performance measurement functions in a real-world organizational setting.

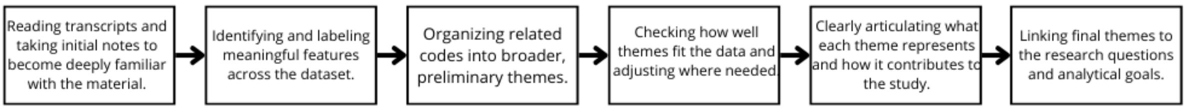

Figure 3.3: *Representation of the thematic analysis process used (Braun & Clarke, 2006)*

The analysis is summarized in Figure 3.3 and began with the full transcription of all interviews. To develop a strong understanding of the material, both researchers read through the transcripts and took notes to capture early impressions and thoughts. During the coding process, important quotes and expressions from participants were identified and used to create first-order codes. These codes were then grouped into second-order themes that reflected broader patterns in the collected data. Finally, the themes were organized into overarching categories, referred to as aggregate dimensions. The coding and the development of themes followed an iterative process, allowing to refine categories as the analysis progressed. Through regular discussions, the researchers refined the coding and ensured consistency throughout the analysis. The final thematic analysis is presented in Chapter 4 (see Figure 4.1) and forms the foundation of this thesis findings.

3.6 Quality of Research

In qualitative research, the concepts of reliability and validity have been the subject of much discussion and debate. Bell et al. (2019) explains that these criteria, traditionally associated with quantitative research, often are questioned in the context of qualitative studies. The challenge lies in adapting these concepts to address the unique nature of qualitative methods, where the emphasis is less on measurement and more on understanding contexts and phenomena. The quality of qualitative research is often evaluated using adapted criteria for reliability and validity. LeCompte and Goetz (1982) provide a framework that addresses these concerns and focuses on external and internal reliability, as well as external and internal validity, to ensure consistency and credibility within qualitative studies. Lincoln and Guba (1985) argue that the criteria of reliability and validity are less suitable for qualitative research and propose the concept of trustworthiness, which includes credibility, transferability, dependability, and confirmability.

3.6.1 Reliability

"Reliability is concerned with the question of whether the results of a study are repeatable" (Bell et al. 2019, p. 46). LeCompte and Goetz (1982) distinguish internal and external reliability as key factors in ensuring consistency in qualitative research. Internal reliability refers to the extent to which different researchers or repeated observations within the study yield consistent findings. This study ensures internal reliability through systematic data collection and analysis from semi-structured interviews. Both researchers were present in all interviews and review of documents. Low-inference descriptors have been used to maintain objectivity, by recording the majority of interviews and transcribing them carefully.

External reliability concerns the replicability of the study, meaning whether another researcher could obtain similar results under comparable conditions (LeCompte & Goetz, 1982). While complete replication is difficult in qualitative research due to the contextual nature of data, reliability was strengthened by detailed documentation of the research process, structured data collection, and transparency regarding the researchers' roles. By maintaining a consistent and transparent approach, this study aimed to ensure that the findings are both trustworthy and transferable.

3.6.2 Validity

"Validity is concerned with the integrity of the conclusions that are generated from a piece of research" (Bell et al., 2019, p. 46). In qualitative research, validity focuses more on credibility and contextual accuracy than on statistical generalization. LeCompte and Goetz (1982) argue that internal validity in qualitative research depends on the researcher's ability to accurately reflect participants' realities and experiences within the studied context.

Factors influencing internal validity include the duration and depth of engagement with the research setting. Longer interaction allows for deeper familiarity and trust-building with participants, contributing to more accurate findings. To strengthen internal validity, triangulation was employed, incorporating data from interviews and documents. However, the limited duration of the data collection presents a potential constraint. A longer engagement period could have yielded richer data and a deeper understanding of organizational processes.

External validity, often referred to as transferability in qualitative research, concerns whether the findings can be applied to other settings (Bell et al., 2019). Rather than claiming universal generalizability, this study aims to offer insights that may be transferable to similar organizational contexts. To support this, the thesis provides detailed descriptions of the organizational setting, development processes, and case-specific conditions, allowing readers to assess the relevance of the findings to other contexts.

3.6.3 Trustworthiness and Authenticity

In qualitative research, Lincoln and Guba (1985) propose four key criteria for ensuring trustworthiness, which are credibility, transferability, dependability, and confirmability. Credibility concerns the accuracy of findings as perceived by participants and transferability relates to the applicability of results in other contexts. Dependability refers to methodological consistency and confirmability ensures that findings are grounded in data, not researcher bias. Guba and Lincoln (1989) then expanded this by adding authenticity, highlighting the ethical and social impact of research, including fair representation and participant engagement.

To ensure trustworthiness, this study incorporates triangulation by collecting data from multiple sources, which helps validate the findings and provides a comprehensive perspective on the research problem. In addition, all steps of the research process are documented in detail to increase transparency and allow others to trace how conclusions were drawn. Authenticity is supported by presenting perspectives from different roles within the case company, and by ensuring that participants had the opportunity to clarify or elaborate on their answers during and after the interviews. Together, these efforts aim to provide an authentic and trustworthy account of the studied context (Lincoln & Guba, 1985; Guba & Lincoln, 1989).

3.7 Ethical Considerations

Ethical considerations are a critical aspect of any study, research or thesis and it is important to understand and be aware of principles regarding ethics in research (Bell et al., 2019). Ethical considerations were central to this study to ensure that the thesis was conducted responsibly and transparently. Ethical principles outlined by Bell et al. (2019) were followed throughout the study to ensure responsibility, transparency, and integrity in the research process. To ensure the participants rights and comfort, all individuals involved in the research were provided with detailed information about the study's purpose, methods, and objectives prior to their participation. This information was communicated to participants, ensuring a clear understanding of their role and their rights. All participants provided informed consent prior to participating in the study, and separate consent was obtained for recording the interviews to ensure full awareness and agreement regarding data collection methods.

Respecting agreements and privacy were also important (Bell et al. 2019). Privacy and confidentiality have been prioritized, applying to both personal information and company-sensitive details. Personal data is anonymized, and all information has been securely stored to prevent unauthorized access. Participants were assured that their responses, as well as any information the company wished to keep confidential, would be handled with care, and that no identifiable details would be disclosed in the presentation of the results. Transparency and respect formed the foundation of the research process, ensuring that ethical standards were upheld throughout all stages of the process of the study. These contributed to building trust with participants and supported the credibility and validity of the research findings.

3.8 Case Company

In order to give a real-world perspective to the thesis, the case study was conducted at IKEA Components AB in Älmhult, Sweden. Information and details about Inter IKEA Group (IKEA), IKEA of Sweden (IoS) and IKEA Components (IKEA C) will be presented below. The information presented is an explanation from the initial interview with the supervisor at IKEA C (E. Eiderbrant, personal communication, 14 January).

IKEA, established in Älmhult, Sweden in 1943 by Ingvar Kamprad, has grown from a small business to one of the world's most recognized home furnishing brands. IKEA revolutionized the furniture industry with its flat-pack concept where customers assemble their products themselves, allowing easier transport, reducing costs and environmental impact. IKEA is a globally recognized leader in furniture and home decor, known for its stylish, functional, and affordable designs. With a vision *"to create a better everyday life for the many people"*, IKEAs business idea is *"to offer a wide range of well-designed, functional home furnishing products at prices so low that as many people as possible will be able to afford them".* With 480 IKEA stores in 63 markets in 2024, IKEA continues to expand into new areas while maintaining its commitment to affordability, innovation, and sustainability.

IKEA operates in three main business areas: Range, Supply, and Retail Concept. IKEA C, is a subsidiary of IKEA Supply AG and was founded in 1986 to ensure consistency in components across the IKEA product range, aligning with the company's quality standards. The focus for IKEA C is to create a price advantage through economies of scale, while securing excellence in quality and sustainability. Currently, IKEA C is responsible for developing, sourcing, packaging, and supplying components and materials in ways that add value to both IKEA and its customers.

While the primary focus of this thesis is on component-level development, product-level considerations will also be examined, specifically through the lens of component development. This approach allows for an exploration of how product-level activities shape and connect to component-level outcomes. Consequently, the analysis will focus on the business areas of Supply and Range, meaning that the case study will examine the subsidiaries IKEA C and IoS. Range, led by IoS, focuses on developing and improving the IKEA product range of home furnishings, which in this thesis is referred to as the product-level. In contrast, IKEA C is responsible for developing and supplying components to IoS and will be referred to as component-level in this thesis.

3.8.1 Relevance for Study

This case study is situated within an organizational context where product-level and component-level development are separated into two distinct units. IoS is responsible for developing complete products, while IKEA C focuses on the development of components. This separation allows for a comparison of development processes, revealing structural or strategic differences that would be difficult to identify in organizations where these levels are integrated. Since component-level development is managed by a subsidiary, IKEA C can be studied in depth as an independent unit. This allows for a focused exploration of the specific conditions, constraints, and challenges that shape its development work. The ability to investigate IKEA C makes it possible to identify and analyze issues that are unique to component-level development. This would have been more difficult if component- and product-level development were integrated within the same organization, as overlapping responsibilities and shared resources would likely obscure the distinct challenges and needs of each level.

The organizational separation between component- and product-level development within a real-world setting creates an empirical setting that is valuable for research. This structural division enables a situation where differences between development levels can be observed and where challenges specific to component-level development can be identified. As such, the case study offers a strong foundation for exploring how performance measurement practices may need to be adapted to fit different levels or types of development. Ultimately, this provides an opportunity to contribute to a better understanding of performance measurement in component-level product development.

4 Empirical Findings

This chapter presents the empirical findings, structured around the research questions. First, in order to create an understanding, this chapter begins with a contextual overview of IKEA's product development process, explaining both the formal structure and how it is applied in practice (Section 4.1). Then, as shown in Figure 4.1, the thematic analysis resulted in 14 aggregate dimensions, grouped under the three research questions. The first group of dimensions relates to *Differences Between product- and Component-level Development* (Section 4.2). The second highlights *Challenges with Measuring Performance in Component-level Product Development* (Section 4.3) and the third focuses on *Addressing Challenges with Component-Level Performance Measurements* (Section 4.4).

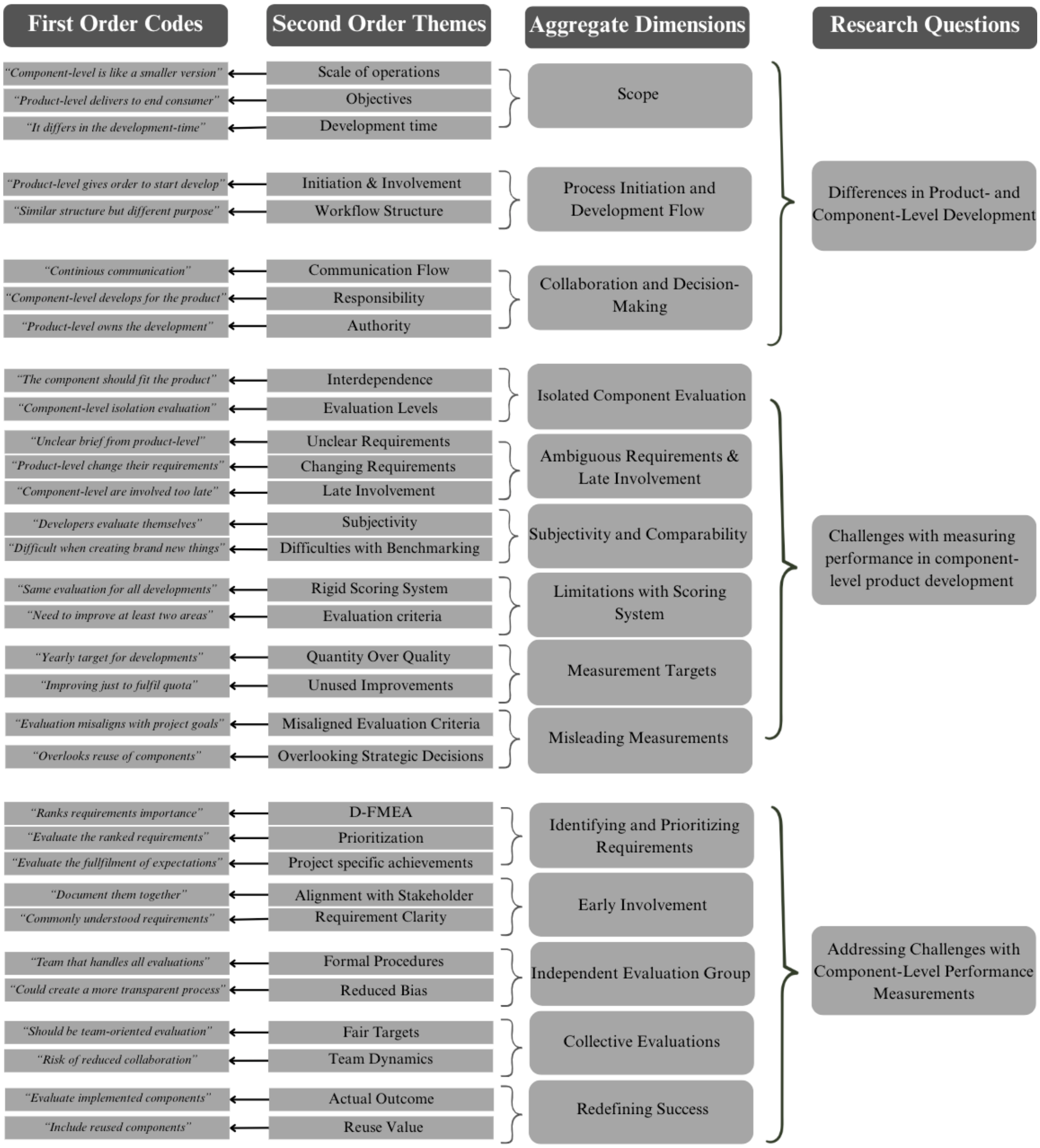

Figure 4.1: *Visualization of thematic analysis*

4.1 Understanding the Product Development Context

This section provides an overview of IKEA's product development process, forming the foundation for understanding the findings that follow. It begins with the design philosophy known as Democratic Design, which guides all product development activities. Then, the formal Develop New Product (DNP) process is presented as described in internal documents. Finally, the section outlines how development unfolds in practice at the product-level and component-level development.

4.1.1 Democratic Design

The foundation of IKEA's design is known as Democratic Design. Understanding this concept is crucial, as it guides IKEA in creating products. *"All we do should be done through the lens of Democratic Design, considering its five key parameters: quality, low price, sustainability, form, and function. Ultimately, the most important thing is ensuring that none of these aspects are overlooked"* (Interviewee C).

Democratic Design is built on five dimensions, form, function, quality, sustainability, and low price. Each dimension of democratic design serves a purpose. *Form* captures visual appeal, while *function* ensures that every product has a clear purpose and practical use. *Quality* is a fundamental pillar, ensuring both durability and longevity of the product and its materials, since a high-quality product is, by definition, a sustainable one. Design should be simple, efficient, and free from unnecessary complexity or waste. Products developed today should remain relevant in the future, emphasizing a long-term perspective and *sustainability*. Additionally, accessibility and *low price* is a core principle, every product should be available to a broad audience, ensuring that form, function, quality, and sustainability are within reach for everyone. While the five dimensions of Democratic Design are embedded in every IKEA-product, their balance may vary. To uphold this concept and meet customer expectations, designers continuously need to assess, refine, and enhance the product range.

4.1.2 Develop New Product

"Develop New Product (DNP) process provides a common and customer focused way of developing products based on new and existing solutions to create a better everyday life for the many people" (IKEA, 2025).

The DNP-process is used at IKEA when making changes to existing products, such as adding a new color, finish, or size, or when improving features or materials while keeping the same form and function. It is also applied when developing completely new products or entire product families. This process provides a structured approach for product development, ensuring alignment with action plans and strategies to support the IKEA vision. It emphasizes strengthening a culture of interdependency, where seamless collaboration and smooth transitions of ownership and leadership enhance efficiency. Furthermore, the process is customer-centric, adapting to both current and future needs. A key is the ability to explore, ideate, and co-create, ensuring that product solutions uphold all dimensions of democratic design while delivering strong customer and business value (IKEA, 2025).

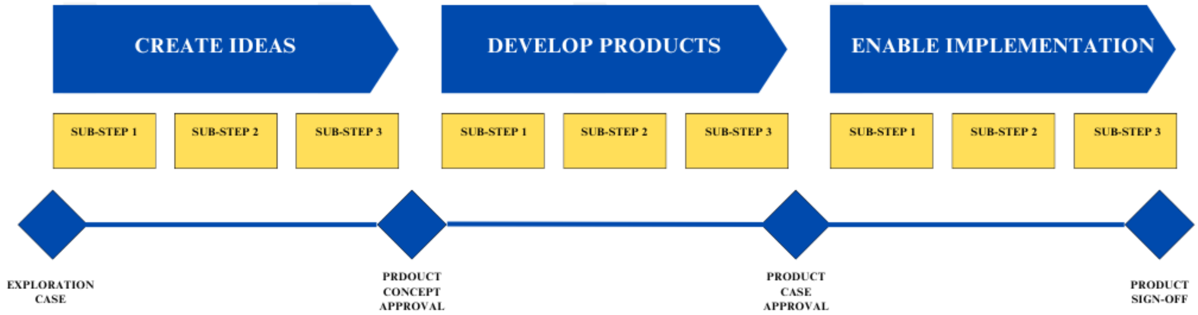

Figure 4.2: *Simplified illustration of the DNP-process.*

Formally, the DNP-process is structured into the stages of *Create ideas*, *Develop products and Enable implementation*, illustrated in Figure 4.2. However, different product development projects may vary in their sub-steps, as some steps may be unnecessary depending on the requirements of the specific development project.

The DNP-process starts with *Create ideas*, which is about exploring opportunities by gathering both internal knowledge and external insights, ensuring alignment with the project's problem statement. This phase includes generating and clustering ideas into related concepts. When concepts are created, the concepts are prioritized based on the expected amount of customer value it will generate, and the most promising concepts will be selected for further refinement. The selected concept is then evaluated through early prototypes, allowing for the precise definition of its form, function, color, and material composition. This structured approach ensures a first design, easy to visualize for the stakeholders involved in the DNP-process.

In the next phase, *Develop products*, the development needs are defined in collaboration with involved stakeholders, and prototypes considering all aspects of democratic design are created. In this phase, risks are analyzed and mitigated, product verification is conducted through development tests to ensure alignment with democratic design targets. Additionally, products are validated with customers to ensure they meet the intended purpose and user needs before the market entry.

In *Enable implementation*, the focus is on ensuring a successful product launch by establishing the necessary preconditions for production, supply chain management, and warehouse operations. Before starting the full-scale production, an initial batch is produced to verify manufacturing feasibility and quality standards. Additionally, all necessary buying- and sales requirements are finalized to facilitate a seamless supply chain. Product communication content is developed and refined for all sales channels, ensuring consistency in messaging for the consumer. Finally, the product is approved for implementation across all sales channels, marking the completion of the formal development process at IKEA, described in internal documents (IKEA, 2025). In the next section, an explanation, based on interviews, will reveal how the process unfolds in practice and how it differs between the product-level and component-level.

4.1.3 Practical Execution of the Development Process

To understand the differences in product- and component-level development, it is essential to first describe the overall development flow between IoS (product-level) and IKEA C (component-level). While both operate within the same overarching DNP-process, their responsibilities and roles differ.

Product-level Initiation

The process begins with IoS identifying a gap, either something that is missing in the market or an existing product that is starting to decline. If a product is declining, the management of IoS addresses it by identifying the product type and searching for a replacement. This creates the need for a new product, which is the starting signal for a new DNP-project. Interviewee C explained that what happens when a DNP-project is initiated is that the management-team of IoS creates a product-card, which serves as the brief and foundation for the development team. Interviewee E explains that the product cards are an outcome from the management and portfolio leaders' long-term strategy for the product assortment. This card provides information, including inspiring images regarding how the product should look, the intended product range, the target customer segment, and the expected price range.

This serves as the starting point, providing an initial understanding of what needs to be developed. It sets the direction for the DNP-project, outlining the initial requirements and guiding the steps forward in the process. After this, the first part for the development team at IoS is the step of *Create ideas*, which basically starts with designers together with the product development team developing ideas on concepts, where concepts are explained as similar ideas grouped together. Then, the designers, product developers, and the range managers decide which concepts to move forward with. When the first design and the concept are in place, engineers start working on creating initial visualizations of the concept. This is done to have simple sketches, to have something to discuss and get a first understanding of how different parts within the design could be manufacturable products, *"Once we have the concepts, we as engineers start looking at the design and identifying what aspects need extra focus"* (Interviewee C).

Component-level Initiation

Interviewee E explained that once the development team at IoS begins refining its concepts, they may identify a need for specific components within the product. At that point, a project leader at IoS reaches out to a development project leader at IKEA C with a request. It is then up to IKEA C to assess whether an existing component from their assortment can be used, or if a new one needs to be developed. Interviewees stated that the DNP-process at IKEA C is initiated by IoS. As Interviewee B described: *"In DNP, we have someone giving us orders that we need to develop something. It could be IoS making the furniture, and that is one fitting we don't have that we need to create since it doesn't exist today. So, we have a brief that comes from IOS, a need that comes to us"*. In short, IoS identifies a need and sends a request; IKEA C receives it and, if no existing component exists, begins developing a new or improved component. This marks the formal start of the development process at IKEA C.

Development Flow

The initial stage of IKEA C's development process is strategic project planning and opportunity exploration. Interviewee B explains that *"The project leader takes the lead and creates a case and starts to explain what the problem is. Make a plan for it, what timeline do we want to see, what resources do we need, what engineers do we need. And then initiate a kick-off, and that is basically the first step"*. Here it is important to know that within IKEA C, engineers called "Requirement & Design Engineers", are responsible for a specific category of components. Interviewees described that if the specific need for a component falls within their category, that individual is expected to take ownership of the development work.

Related to this, Interviewee A clarified that while the description by Interviewee B reflects how it should work, it can vary. In some projects, it is the responsibility of engineers at IKEA C to take the initiative and establish the initial contact with IoS. As Interviewee A explains, *"If it falls within your own area, you are responsible for finding out what you need to know. This means engaging with the product developers at IoS and gaining an understanding of the furniture. We need to take the initiative for these meetings, or the Development Project Leader introduces us to the project-group during a kick-off meeting, which then integrates us into the team"*. Interviewee A explained that from this stage, there will be two DNP-processes running in parallel, one at IoS focusing on product-level development and one at IKEA C focusing on component-level development. Even if the processes are in parallel, they still work together to create a unified final product.

Once the project has been initiated and planned at IKEA C, Interviewee B described that the process transitions into a more technical phase, during which engineers at IKEA C take the lead in driving the component development forward. The work begins with brainstorming and idea generation and during this, many ideas emerge. To structure these, similar ideas are clustered together to form broader concepts, still not fully developed solutions, but potential directions for the component. Specific details are still to be decided, but a fundamental approach for the problem is defined. The concepts are then reviewed in collaboration with the project leader to select the most promising option. However, in order to progress, a final approval is required from IoS and to confirm and ensure this, the project leader at IKEA C presents the selected concept during a Product Concept Approval meeting, a key milestone meeting between IKEA C and IoS. Interviewee E describes that during this meeting, IoS evaluates the concept's feasibility, functionality, and alignment with project goals. If IoS approves the concept, the project at IKEA C moves forward into the phase of *Develop Product*. However, if the concept does not meet the necessary requirements, revisions must be made, or a new concept must be developed and presented for reassessment before the process can continue.

With a confirmed concept, focus shifts to mechanical design and prototyping, where IKEA C works on refining the component to ensure it meets all technical and functional requirements.

Interviewees described it involves both digital- and physical prototyping, allowing engineers to test and optimize the design of the component. The *Develop Product* phase is in interviews described as comprehensive, addressing mechanical design, risk assessments, manufacturability, tests and supply chain feasibility. A critical part of this stage is to finalize the design details, including material selection and manufacturability. Engineers at IKEA C work through iterations, adjusting the design to ensure it meets performance expectations while remaining cost-efficient and manufacturable. Once the mechanical design is complete, the component moves into testing and validation. Here, IKEA C conducts functional and safety tests to confirm that the component performs as needed. With successful verification, IKEA C documents the component's final list of requirements and specifies the cost structure, which is then presented to IoS for approval in the next milestone meeting, called Product case approval meeting.

Once the product is approved by IoS, it moves into the final stage, known as *Enable Implementation*. At this stage, the focus shifts from developing products to sourcing, production, and logistics. According to Interviewee B, this phase involves selecting the most suitable supplier for production, primarily based on cost, production capacity, and feasibility. Once these aspects are approved, production starts to ensure that the new product can be launched. Engineers at IKEA C are not directly involved in this phase, but they remain connected to the project due to their responsibility for the developed component. If issues arise, or further input is needed, they may be called upon to support the process by providing technical clarification or addressing specific questions related to the component.

4.2 Differences in Product- and Component-Level Development

In this section, the findings related to Research Question one is presented according to the key themes identified during the thematic analysis. These findings highlight differences between product- and component-level development and are presented in three aggregate dimensions: Scope, Process Initiation and Development Flow, and Collaboration and Decision-Making.

4.2.1 Scope

According to interviewees a key distinction between component-level and product-level lies in the scope of responsibilities they cover. Interviewee C explains that IKEA C and IoS operate within a supplier–customer relationship, where *“IKEA C acts as a supplier to IoS”*, with each having a distinct scope of work. IoS's development process has the scope of delivering a final product to the end consumer. In contrast, IKEA C's scope of development is centered around developing components that fit and fulfill the requirements of IoS. Expanding on this, Interviewee D explained that IKEA C's engineers are not involved in shaping the overall product design but instead focus on ensuring that components function correctly within the final product. While IoS is responsible for developing a product composed of multiple integrated parts that must work together as a whole, IKEA C focuses on one part of that system, ensuring that their component aligns with predefined requirements and functions as intended within the broader context of the finished product.

Another difference explained by interviewees lies in the size and structure of operations. IoS, as a larger organization, manages product development projects that involve extensive cross-functional collaboration. Engineers at IoS are often specialized, each focusing on a specific aspect of the development process. In contrast, IKEA C, as a smaller organization, operates on a smaller scale. Interviewee A highlighted that, *"We have to keep track of many aspects related to requirements, testing, and similar tasks. As a result, we almost take on the role of project leaders for our specific project".* Explaining further that this broader scope of responsibility leads to greater variation in tasks and deeper involvement in multiple parts of the development process. Interviewee E further explained, *"IKEA C is like a smaller version of IoS. It is a smaller company, and the smaller the company, the greater the understanding one tends to have of multiple parts of the value chain".* At IKEA C, engineers typically work individually and are responsible for several functions, including component design, manufacturability analysis, testing, and documentation. In contrast, these roles are divided across specialized positions at IoS, with different engineers handling design, mechanical engineering, drawings and documentation, packaging, and testing.

Beyond differences in scale, interviewees also pointed out differences in timeframes. IoS's product development cycles are longer. However, the total development time varies depending on the nature of the project. Interviewee E elaborates, *"It usually takes between 1.5 to 2 years, depending on whether it is simply changing color or a completely new development. If it is a new development, it is closer to two years"*. In contrast, component development at IKEA C is approximately half the time of product-level development, since product development involves broader and more extensive development.

4.2.2 Process Initiation and Development Flow

Although IoS and IKEA C operate within the same DNP-project, Interviewee A and D explained that the roles in initiating and driving development differ significantly. The product-level initiates the process and their development is proactive, driven by strategic goals and guided by product cards created by management and portfolio leaders. These product cards set the direction for product development from the outset. In contrast, in the collaboration, IKEA C operates more reactively. Component-level development begins when IoS identifies a need and submits a request for support. As Interviewee B stated: *"In DNP, we have someone giving us orders that we need to develop something. We have a brief that comes from IoS, a need that comes to us"*. Interviewee B highlights a difference, IoS initiates the product development, while IKEA C work becomes reactive, triggered by IoS's need for components.

Interviewees highlighted another distinction that lies in the timing of involvement. IoS is engaged from the earliest stages, guiding the product's direction throughout the process. IKEA C, on the other hand, enters the process only once a specific component need is identified. Interviewee A described that IKEA C's involvement can vary; in some projects, they are involved early in the development process, while in others, they are brought in later. This variability means that IKEA C must often adapt their development timeline to an already progressing product-level process, limiting flexibility and planning autonomy.

Further, Interviewee E explained that while both levels follow the same formal checkpoints, such as Concept Approval and Product Case Approval, these checkpoints serve different purposes. For IoS, they support alignment with strategic goals and broader product development. For IKEA C, the same milestones act as validation points to confirm technical feasibility and integration of the component with the product-level design.

4.2.3 Collaboration and Decision-making

Building on the previous section, a difference exists between product- and component-level development in how collaboration is structured and who makes decisions during the process. Interviewee D explained that IoS, as the product owner, is responsible for the product and therefore leads development and defines what needs to be created and decides which components are needed and has the flexibility to source from both IKEA C as well as external suppliers. IKEA C, on the other hand, develops components based on the needs communicated by IoS. In this relationship, IoS sets the direction, while IKEA C contributes by identifying and developing the most suitable component.

Interviewee D described that IKEA C is consistently embedded in IoS and participates in weekly meetings and monitors upcoming needs. Still, their role remains reactive, as involvement begins only when IoS identifies a need. As Interviewee E explains, *"It is my responsibility to involve IKEA C at the right time. From the moment you have a brief and start working together with the specialists at IoS, you should inform and involve IKEA C"*. IoS leads the early development stages, setting the sales start date and creating the product brief. IKEA C, in turn, translates these needs into feasible components. Interviewee D describes, *"What ends up on my desk is to translate the brief and the problem statement that comes from IoS into something that our engineers at IKEA C can work with"*. This reflects the dynamic where IoS defines the need, and IKEA C responds within given constraints.

IKEA C and IoS follow the structured milestone approach but allows for flexibility when needed. According to Interviewee E, the communication between IoS and IKEA C is primarily a continuous dialogue rather than a structured process. While certain milestones exist, much of the collaboration happens continuously throughout the project. Despite this collaboration, interviewees describe how IKEA C faces challenges in influencing decision-making regarding component development. A shared perspective among interviewees was the variability in IKEA C's role in the collaboration. Their involvement in decision-making differs significantly between projects. Interviewee E explained: *"Sometimes we provide IKEA C with exact specifications. Other times, we define the function but leave the technical solution open, such as: We need a mechanism to move something down or flip something up, but we don't know what it should look like. In some cases, we create an initial concept, which IKEA C then refines further"*. Interviewee A highlighted how flexibility in the process affects IKEA C's impact, *"It* *depends a lot on the project. If the project is really time-limited from the start and IoS knows exactly what they want. Then the solution is somewhat already there. But, in some projects they say they have the design, but we see that it could be used in another way. And IoS came back and said that the new idea is better. So, it depends a lot on the people involved, timeline and deadline. Some will just have a specific solution, and some are more open to IKEA C and want us to be highly involved".* These quotes illustrate how project-specific conditions shape IKEA C's degree of influence, ranging from executing predefined solutions to contributing creatively to the technical concept.

4.2.4 Summary of Differences

Based on the interviews, several differences between product-level and component-level development were identified. These differences are summarized in Table 4.1 to give a clear overview.

Aggregate Dimensions	***Product-Level Development***	***Component-Level Development***
Scope	Focuses on the product, ensuring it meets market and customer needs.	Develops components that fit within the product design and constraints.
	Operates at a larger scale with specialized roles.	Smaller teams with broader individual responsibilities.
	Development cycles span between 1.5 to 2 years.	The development process is about half as long.
Process Initiation & Development Flow	It begins when declining products and market needs are defined.	Begins when product-level requests a component.
	Uses meetings to guide and align development with strategic goals and product vision.	Use the same meetings to confirm technical feasibility and ensure the component fits within the product.
Collaboration & Decision-Making	Collaboration is directive, initiating, setting the direction early, and maintaining control during the continuous dialogue.	Collaboration is more responsive and engaged once needs are defined, relying on continuous dialogue with product-level.
	Has the flexibility in deciding the product's design and adjusting priorities.	Works within constraints, developing components to requirements, yet influences decisions through expertise.
	Leads the development process and communicates requirements to component-level.	Responding to product-level requirements while optimizing component functionality.

Table 4.1: *Differences in product- and component-level development.*

4.3 Challenges With Measuring Performance in Component-level Product Development

This section presents findings related to research question two, focusing on the challenges associated with measuring performance in component-level development. These challenges include difficulties with isolated component evaluation, ambiguous requirements and late involvement, subjectivity and comparability, limitations with scoring systems, measurement targets and misleading measurements.

4.3.1 Isolated Component Evaluation

The first challenge highlighted by Interviewee G is that a component often holds low value on its own, as its purpose and performance is realized only when integrated into the complete product. Interviewee G also pointed out that while a component may appear simple on its own, it can greatly affect the final product, *"The difficulty is really, the component is for the entire piece of furniture, it is not just a component. Components may look very, very simple. But for production and the entire product, it can make a huge difference".* Interviewee G underscores the challenge in evaluating components, since evaluating only the component performance may provide an incomplete or even misleading picture, as it does not account for how the component influences the overall product. As Interviewee G stated,*"Sometimes you might make the component much more expensive, but for the whole product, it might become cheaper. And that could be something like being able to pack the furniture more compactly or making it easier to assemble or, well, anything".* Interviewee G highlights this as a challenge in component-level performance measurement: evaluations that focus solely on individual cost or improvements may miss the broader impact a component has on the final product. For example, a more expensive component might enable more efficient packaging, easier assembly, or reduced logistics costs, ultimately improving the overall product performance.

4.3.2 Ambiguous Requirements and Late Involvement

Related to the findings on collaboration between IKEA C and IoS, a challenge highlighted by interviewees is late involvement in development projects. Engineers at IKEA C are often brought in late, which limits their ability to influence requirements and to establish a shared understanding of these together with IoS. Interviewee J stated, *"Sometimes we get involved too late"*, and mentioned that this late entry into the process means that engineers at IKEA C have less time to explore alternative solutions. Interviewee D explained there is a risk that the development process may not be fully optimized. Instead, the focus may shift toward delivering something that simply works within the time constraints.

Further, at IKEA C, engineers develop components based on requirements from IoS, yet these requirements are not always clearly defined from the start. As interviewee A stated: *"A problem that always arises is that when we are supposed to get a project brief at the start, where it should state clearly what we need, we almost never get it. We have to find out for ourselves* *what types of requirements are needed on this product"*. Interviewee G and D confirms that initial project descriptions sometimes are vague and that this creates uncertainty in the development process and there is a risk that the components performance does not fully align with IoS actual expectations.

Besides ambiguous requirements and late involvement, changing requirements creates additional challenges. Interviewee H explained that IoS sometimes changes their requirements in the middle of projects, which often results in that IKEA C have to initiate new development loops, changing the direction of the development. Interviewee A explains, *"It happens in projects that our client, IoS and the project team, change their minds in the middle of everything and come up with new things".* Changing requirements creates a challenge of evaluating the work conducted. Interviewee A highlights that shifting expectations create complications in tracking what was originally expected versus what the project later required. This uncertainty risks making performance evaluations inconsistent, as they may fail to accurately reflect the success of the development process in relation to expectations.

4.3.3 Subjectivity and Comparability

Interviewees highlighted challenges related to subjectivity and comparability within the current performance measurement system at IKEA C. Engineers are responsible for developing the components themselves and they also have the role of evaluating their own work. Interviewees described that the method involves engineers evaluating their newly developed components by comparing them with existing ones, assigning scores on specific predefined criteria. For example, comparing a redesigned bracket to an older version. Interviewee G expressed that this self-evaluation process inherently introduces biases, affecting the reliability and credibility of the outcomes. Interviewee A explained: *"Since we assess our own work…. everything becomes very subjective"*, and Interviewee G elaborated further, underscoring the risk of biased interpretations influencing the evaluation results: *"You're naturally biased toward giving a favorable evaluation".* Another perspective was brought up by Interviewee L, who stated that the subjectivity also could be related to the complexity of conducting the evaluation itself, explaining that in some areas, engineers lack the necessary experience or information to make an objective judgment, which leads to responses being based on gut feeling. Ultimately, interviewees highlight that subjectivity remains a challenge in the performance measurement at IKEA C.

As mentioned, the evaluation at IKEA C is conducted by comparing newly developed components against existing ones. While this approach aims to provide a structured comparison, interviewees highlighted challenges with this. The challenge expressed was the difficulties in establishing relevant and consistent benchmarks against which new developed components could be evaluated. Interviewee A, I, F and H noted that while comparing new developments to existing components could sometimes be straightforward, it often became problematic, particularly when dealing with entirely new or innovative solutions that lacks similar historical references, forcing engineers to select a somewhat similar component as a baseline to compare and evaluate against.

Interviewee I clearly elaborated on the challenges faced when evaluating newly developed components: *"When you do the evaluation, you must compare it with something else. But what if it's a brand-new thing? What do you compare it with? This is very complicated to identify clearly".* Interviewee H, similarly, expressed difficulties in cases involving entirely new components: *"It's really easy when you have a baseline that is very similar, but it's quite difficult when you have something completely new. Then you no longer have a baseline, so you have to choose something as close as possible".* Interviewee F explained, *"In 90% of cases, we don't have anything to compare with, so we make up something".* Challenges arise when evaluation methods require engineers to compare developed components with existing ones. This becomes particularly problematic when evaluating entirely new innovative components, since finding a relevant baseline to compare against often proves difficult or even impossible.

4.3.4 Limitations with Scoring System

Building on the concerns related to the current evaluation method, Interviewee G further described limitations with the scoring systems, particularly its inability to assign negative scores. This limitation means that even if a developed component performs significantly worse than the existing comparable component in certain aspects, the scoring does not reflect this. Interviewee G explicitly stated: *"We only have positive scores down to zero; you can't score negatively. You could develop something that's twice as bad for the environment, yet it wouldn't receive negative points, just zero".* Without the possibility of assigning negative scores, evaluations might inaccurately illustrate all aspects of the development as improvements or neutral outcomes, even when the outcome in one of the aspects deteriorates in critical dimensions.

Another challenge that emerged was the effects of rigid scoring structure and predefined evaluation criteria. Interviewee K described that within the current method, for a newly developed component to be classified as a "successful" development, it must achieve improvements in at least two out of five predetermined evaluation areas and reach a certain total point. Interviewees indicated that this may lead to misleading evaluations. Interviewee A illustrated this issue, describing how a developed component that fulfills its intended stakeholder requirements exceptionally well, might still be classified as unsuccessful: *"You need to have improved in at least two different areas and also achieved a certain total score for the component to qualify as a successful development. If the focus of the development was solely on one aspect, for example, improving the quality, then it may only score well in that category, even if that was the main objective of the development from the start".* Meaning that even when a development achieves its most critical objective and performs strongly in that area, it may still be deemed unsuccessful if it does not show improvements across a broader set of categories. As a result, interviewees expressed concern that the scoring system does not always reflect the true purpose or success of a development.

4.3.5 Measurement Targets

The management team sets a collective target for the number of "successful" developments to be achieved annually. According to Interviewee J, quantitative targets could influence development work and how performance is measured. Interviewee J provided a concrete example of how these fixed targets in practice could shape development efforts, *"We have a goal of reaching 70 or 80 improvements per year. If we reduce the thickness of a component from 1.5 to 1.3 mm, that will be a material and cost-saving improvement, making it an improvement this year. Next year, we could reduce it to 1.2. The risk though, I don't know if it has happened, is that you end up developing non-optimized solutions just to meet the target".*

Interviewees expressed concerns that performance targets based on fixed numbers could influence the type of development being made. This may lead to changes that are favorable in terms of fulfilling targets, rather than being driven by the actual impact or value of the improvement. Interviewee F and I pointed out that some modifications are made primarily to meet improvement quotas, even when they do not serve a practical purpose. Interviewee F explained that *"We have changed and adjusted components in our product range just to fulfill the quota. It's about getting a good number".* Interviewee I expanded on this, describing how developments could be made only to be recorded as an improvement, even if they never will be used: *"Sometimes having an improvement just for the sake of an improvement is what happens. Just make it thinner. If it is like a metal bracket, for example, just remove some material, but then it's never used because you just made it. So, you have your improvement, but then you just store it somewhere".*

4.3.6 Misleading Measurements

Disconnect from Project-specific Expectations

Interviewees explained that performance evaluation is not designed to evaluate whether developed components meet the expectations of their stakeholder IoS, *"IKEA C only evaluates based on predetermined questions*" (Interviewee F). Further explained that evaluations are based on internal criteria and predefined categories. Accordingly, these criteria do not necessarily reflect stakeholder satisfaction or project-specific goals. Interviewee A explained: *"In one project, we focused on sustainability, so even if quality was lower or cost higher, we still delivered what was requested. But in the evaluation form, it looks like we didn't do a good job, even though we actually met the project's goals and IoS requirements".* Interviewee A described a situation where performance outcomes and performance measurement did not align, explaining that a component may be rated as "successful" according to internal metrics, even if it did not meet IoS expectations, or vice versa.

Overlooked Reuse and Alternative Valuable Decisions

Another view that emerged from the interviews was that performance evaluation does not account for alternative but equally valuable development decisions. Interviewee J pointed out that choosing to reuse existing, well-optimized, cost-effective and technically good components, is not reflected in performance evaluations, and reflected, *"The whole business model is actually about volume. The more we can reuse, the cheaper components. But as far as I know, that's not measured anywhere".* Describing that valuable contributions, such as strategically opting for existing high-performing components are overlooked in the evaluation. Instead, meeting annual improvement targets determines what is considered as successful performance, rather than assessing whether the best possible engineering decision was made. Interviewee I also highlighted how the current performance evaluation does not reward the reuse of well-functioning existing components, even though this might be the best decision: *"The whole idea of having IKEA C is being able to reuse the old components. So, if we have a very well-working bracket, why do I need to create a new one to achieve the KPI and get a pat on the shoulder from a manager? It would be smarter to reuse the old tools and the item that already exists in the IKEA store and in the warehouse".*

Overemphasis on Number of Developments

Another challenge is that if a performance measurement system focuses too much on the fixed number of "successful" developments. Several interviewees questioned the value of measuring success based purely on the number of developments. Interviewee I and J raised concerns regarding what should define success in component-level development. While they recognized that performance evaluation is necessary, there are concerns whether the number of "successful" developments is the best success metric. Interviewee J pointed out that many recorded "successful" developments are never implemented, making the measurement system disconnected from real outcomes: *"How many of all successful developments have we actually implemented? It feels a bit meaningless to have things we could use and say they are great, but then we only use 40% of them. It creates a false value, patting ourselves on the back, saying: look how good we are, but in the end, it's not used".*

4.3.7 Summary of Component-level Challenges

Based on the empirical findings presented, this section summarizes the different challenges identified in measuring performance at the component-level. These challenges reflect both limitations within current measurement evaluation and broader contextual factors related to development processes and organizational practices. Table 4.2 provides an overview of the six challenges, along with brief descriptions that reflect how these issues were expressed by interviewees. This summary serves as a foundation for the following chapter, which explores suggestions for overcoming performance measurement challenges.

Challenge	Description
Isolated Component Evaluation	*Component value only seen in full product context; isolated evaluation can mislead.*
Ambiguous Requirements & Late Involvement	*Late involvement creates development challenges. Unclear or shifting requirements make it hard to measure performance.*
Subjectivity & Comparability	*Self-evaluation create bias and inconsistency.*
Limitations in Scoring System	*No negative scores and rigid scoring system misclassify developments focused on specific aspects.*
Measurement Targets	*Focus on the number of developments completed, rather than the actual value or impact of those developments.*
Misleading Measurements	*Internal metrics don't reflect stakeholder satisfaction, reuse value and actual use.*

Table 4.2: Overview of challenges in component-level performance measurement.

4.4 Addressing Challenges with Component-Level Performance Measurements

To address challenges interviewees proposed several approaches aimed at improving performance measurement at the component-level. These suggestions have been grouped into five areas: Identifying and Prioritizing Requirements, Early Involvement, Independent Evaluation Group, Collective Evaluations, and Redefining Success.

4.4.1 Identifying and Prioritizing Requirements

Interviewee A described that the current evaluation is not designed to evaluate whether developed components actually meet the project specific requirements and expectations of IoS. To achieve project specific evaluations, it is essential that performance measurements reflect the priorities and expectations of IoS for each project. A possible way, suggested by Interviewee A, to address the challenge is to integrate Design failure mode and effect analysis (D-FMEA) into the final evaluations. Currently, D-FMEA is used to prioritize requirements in component development by ranking them based on importance, both those received from IoS and priorities based on the five cornerstones in democratic design. However, Interviewee A pointed out that this ranking is not reflected in the performance evaluation, creating a disconnect between what was prioritized during the development and what is measured. Interviewee A emphasized a way to overcome this, stating, *"One thing I really think should be included in the current evaluation method is the ranking we do in D-FMEA. We rank different requirements based on importance, aligning them with our five cornerstones. We establish a priority order, ranking them as first, second, third, and so on".*

Further, Interviewees described how the current evaluation method does not differentiate between the relative importance of different performance factors. A developed component could score well in areas that are not the primary project priorities or requirements and score badly in the most critical area and still be classified as a successful development. According to Interviewee A, integrating D-FMEA prioritization into performance measurement would create a more truthful evaluation of how well a component meets its specific goals, *"If we used this ranking in the evaluation, we would get a clearer picture of how well we actually performed. Did we meet expectations? Did we score well on the most important aspects? Or did we fall short? That would give us a more accurate evaluation of our work"*.

4.4.2 Early Involvement

A recurring point raised during the interviews was the importance of being involved early in the development process. Interviewee K described the fact that when engineers at the component-level are included from the beginning in the development process, they can influence the direction of the development and take part in defining what the requirements should be. Early involvement gives IKEA C more time to understand the problem thoroughly and explore possible alternatives, which according to Interviewee H creates better conditions for developing the optimal component.

Early involvement in the requirement setting was described as particularly important for establishing clarity and alignment. Interviewee A explained that *"When involved early, we can influence the design more. It just matters that at the beginning, that we talk early about what the requirements are for this, that we have a dialogue, that we document requirements together"*. Interviewees emphasized that by early involve IKEA C in the development process, they can actively shape the direction of the solution, contribute to defining the requirements together with IoS, and build a shared understanding of what needs to be achieved. Being part of this, also means participating in the documentation of those requirements, which strengthens alignment across teams. This provides a secure foundation for the work ahead and reduces the risk of misunderstandings or changes later in the process, which can often arise when requirements are unclear.

4.4.3 Independent Evaluation Group

Interviewee G described that self-evaluations introduce a risk of bias, where employees may score their own components favorably. Interviewee G stated, *"You're naturally biased toward giving a favorable evaluation when it's your own work"*. To reduce subjectivity in performance measurement, Interviewee A, D, H and I described current practices adopted to mitigate and overcome the challenge with subjectivity, such as involving colleagues in the evaluation process. Interviewee H explained that *"I usually complete the evaluation myself. But before approving or submitting it, I always invite the project leader to review it together. If I'm uncertain, when evaluating a completely new development, I might also involve my manager"*. Similarly, Interviewee L explained that *"The intended process is that the engineer first performs the evaluation independently. If the component appears to have potential to qualify as a successful* *development, the four-eyes principle is applied".* Meaning that another person needs to review the evaluation before submitting. However, interviewees described that the use of four-eyes principle varies. While some mentioned frequently involving colleagues or managers to reduce subjectivity, others described less consistent use of this approach or not involving others at all. Interviewee I reflected on this variation *"I think there should be at least two people doing it. I'm not sure what the formal rule is, but it makes sense to have at least a second pair of eyes looking at it".*

To address subjectivity and achieve more consistent evaluations, a further idea reflected by Interviewee A and G was the introduction of an independent evaluation group responsible for evaluating development projects objectively and independently from the engineers involved. Interviewee G suggested that having a team responsible for all evaluations would ensure greater objectivity in measurements.*"Instead of engineers rating their own work, there should be a team that handles all evaluations. They should be responsible for the process. That way, the assessment would be fairer".* Interviewee G emphasized that separating evaluation from the engineer responsible for the development, it could be possible to create a more transparent process, ensuring that performance evaluations are conducted by the same team under the same conditions. Interviewee A supported the idea of an evaluation team, highlighting that it could improve consistency across different evaluations: *"The best thing would be if there was a team that worked only with this, so that the data wouldn't differ so much between different components. It would be more uniform, more structured".* However, Interviewee K pointed out a challenge in implementing such a group: *"That would mean those people need to familiarize themselves with all projects, and that may be impossible".*

4.4.4 Collective Evaluations

A key point raised during the interviews was the importance of maintaining a team-oriented approach in performance measurement practices, as a way to overcome challenges related to collaboration and knowledge sharing. Although the current system at IKEA C applies collective targets, interviewees expressed concerns about the potential risks of shifting towards individual evaluations. Such a shift could encourage competition, undermine teamwork, and reduce openness within development teams. Interviewee F warned that individual evaluation could undermine collaboration: *"It is dangerous if we are measured and judged individually. If evaluations prioritize individual performance over team success, then we will stop collaborating".* And continued: *"If we start competing over who invents the most things, we won't talk to each other… People won't share their knowledge anymore; instead, they will go silent".* To avoid such unintended consequences, interviewees expressed a desire to continue with team-oriented evaluation. As Interviewee F put it: *"It should be a performance measurement tool that works in a group, so that it doesn't turn into individual measurement and competition".*

4.4.5 Redefining Success

According to Interviewee I, focusing the performance measurements only on new developments creates an illusion of success, highlighted the issue: *"Why do I need to create a new one* *to achieve the KPI and get a pat on the shoulder? It would be smarter to reuse the item that already exists".* Instead of just counting how many new developments have been made, performance evaluation should also measure the actual usage and implementation of these developments. Interviewee I reflected on this issue, stating: *"Maybe our job shouldn't be judged on how many new components we have released in a year"*. A more reality-based performance measurement approach, as suggested by Interviewee J, would recognize not just new developments, but also strategic reuse of existing components: *"It should be more connected to reality. We should track when we have actually reused something from the running range. We managed to avoid ten new developments because we pushed to use what we already had"*. Avoiding development through reuse can be just as valuable, if not even more, than constant new development and innovation.

4.5 Relationship Between Identified Challenges and Proposed Improvements

This section summarizes how the proposed improvements presented in Section 4.4 respond to the challenges identified in Section 4.3. The empirical findings on how to overcome challenges relates to one or more challenges in the development and evaluation process.

From the interviewees, integrating D-FMEA prioritization is a way of addressing the challenge of misalignment between evaluations and project-specific expectations. Early involvement of component-level teams helps mitigate issues related to ambiguous requirements and late involvement. Introducing an independent evaluation group responds to concerns about subjectivity. Finally, redefining success tackles the risk of misleading metrics and reinforces the importance of meaningful, value-creating outcomes, whether through new development or strategic reuse.

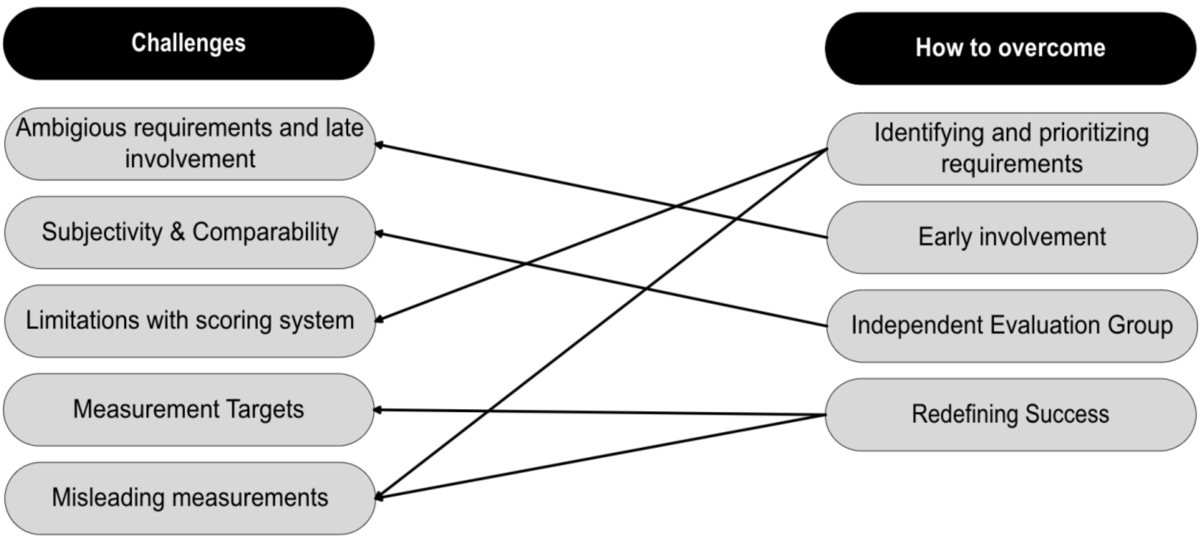

Figure 4.3: *Visual representation of the connection between identified challenges and ways to overcome these.*

As illustrated in Figure 4.3, the challenge of Isolated Component Evaluation and the proposed improvement Collective Evaluations are not included in the challenge-solution mapping. While both themes emerged clearly from the empirical findings, they do not correspond to a single, specific challenge-solution pair in the same way as the others presented.

Isolated Component Evaluation was identified as a broader challenge that underlies several of the issues, rather than as a discrete, addressable problem with a targeted solution. Similarly, Collective Evaluations was proposed by interviewees as an important guiding principle for maintaining collaboration and openness, but not as a direct response to any single performance measurement challenge. Both will therefore be further discussed in Chapter 5, where their implications can be explored in relation to the broader organizational and cultural context.

5 Discussion

This chapter discusses the findings of the study in relation to the research questions. The discussion begins by examining how the product development process differs between component- and product-level, followed by a discussion of the challenges with measuring performance at the component-level. The next section explores how these challenges can be addressed and what adaptations may be needed to improve performance measurement practices. The final section presents the implications of the study, including a concluding discussion, theoretical contributions, and managerial implications.

5.1 How does the Development Process for Component-level Differ in Relation to Product-level?

This section addresses the first research question: *How does the development process for component-level differ in relation to product-level?* It focuses on key differences identified in the empirical findings.

5.1.1 Scope

The case study revealed important distinctions between the component-level and product-level in terms of scope and development context. These differences have implications for how each level contributes to the overall product development effort and how established theoretical models apply in the development settings. The product-level has a broader and more end customer-facing role. Responsible for the delivery of a complete, market-ready product and therefore must orchestrate the integration of various aspects, manage longer development timelines, and engage directly with end customer requirements.

Established theories emphasize that product development should aim to create end customer value by aligning product features with market demands (Cooper, 2019; Krishnan & Ulrich, 2001). In the setting of this case study, this responsibility is distributed between the product- and component-level, each contributing in different but complementary ways. At the product level, teams must identify market needs for the end customers of the product and translate them into requirements. These requirements are the foundation for the strategic planning and defines what the final product should deliver to the end customer. At the component-level, it is crucial to understand the end-customers demand, however, it is not the main focus. Instead, the focus is to fulfill the product-level requirements, created from the market demand, through technically feasible and integrated components. While product-level teams work directly to meet market needs, component-level developers contribute more indirectly by focusing on technical and functional requirements set by their primary customer, the product-level. Component-level development is essential for enabling a functional product, but their ability to directly shape the user experience is limited. In essence, component-level contributes to end customer value in an indirect but still important way, by first delivering value to the product-level, who in turn translates that into a market-ready product that creates value for the end customer.

Cooper's (2019) framework for understanding the drivers of success in product development, emphasizing customer focus. These principles are often applied in the context of product-level firms that engage directly with customer markets. However, it remains relevant for firms operating at the component-level. In multi-level product development systems, where suppliers and integrators collaborate to bring complex products to market, the role of component-level actors becomes critical, although more indirect. Drawing on insights from both Cooper's framework and empirical findings from the case study, it becomes clear that customer focus manifests differently across organizational levels. While product-level teams are tasked with interpreting and responding directly to market signals, component-level developers play an important role in enabling these responses through technical execution and alignment with defined requirements. This structure of customer orientation reflects the interdependence between product- and component-level actors in achieving end customer value. Understanding these distinctions is essential for managing collaboration effectively and ensuring that customer-centricity is preserved throughout the entire product development process.

The time dependency between the two levels further illustrates the interdependent nature of product and component development. Since the final product cannot be completed without the timely delivery of its components, product development timelines require component development to deliver ahead of schedule. This introduces an additional layer of complexity, where coordination and strategic alignment become essential for ensuring that development flows smoothly across levels. This situation reflects a contextual adaptation similar to what Cooper (2008) describes as overlapping stages, where downstream work begins before upstream phases are fully completed. In this case, component-level development must often be finalized while product-level development is still ongoing. This highlights how structured models like Stage-Gate may need to be flexibly interpreted and adapted at the component-level, a notion raised in the theory chapter, where it remained unclear how such adaptations apply within component-level development. The case study findings provide empirical support for the idea that flexibility and contextual adjustments are necessary when managing the coordination between organizational levels.

5.1.2 Component- and Product-Level Development Flow

At the product-level, the development process follows a structured application of the Stage-Gate model, as conceptualized by Cooper (2008). The process is initiated through strategic planning, portfolio management, and the identification of market needs, aligning with Cooper's (2019) view of product development as a customer-focused and strategically driven activity. Product-level development is organized into three distinct stages, named *Create Ideas*, *Develop Product*, and *Enable Implementation*, each separated by formal decision gates, aligning with Cooper (2019) perspective of transforming an idea into a commercially viable product through a series of stages. These gates act as critical decision points, ensuring that only projects aligned with customer needs, market potential, and company strategy are allowed to progress. In contrast, at the component-level, development is typically initiated in response to a request from the product-level when a specific component is needed. Despite this more reactive nature, component-level development still follows the structural logic of the Stage-Gate model, encompassing the same stages as product-level. However, the purpose and function of the gates differ and at the component-level, they serve primarily to confirm technical feasibility and ensure integration compatibility with the product-level design parameters.

Although models as Stage-Gate provide a structured approach to product development visually, it is highlighted that planning and managing the work within the process remains challenging due to uncertainty. As noted, product development is characterized by uncertainty and interdependencies, requiring adaptability rather than strictly linear planning approaches (Krishnan & Ulrich, 2001; Barczak et al., 2009). The product-level development is no exception to this uncertainty. However, in this study, findings revealed that these challenges become even more pronounced at the component-level. That is because the product-level holds the authority to define and change project goals, set priorities, and structure the development process during the project. The component-level, by contrast, works under external requirements and must adapt to decisions made at the product-level, without direct influence over decisions. Another uncertainty lies in the variation of when component teams are involved in the process, which contributes to uncertainty and limits the ability to plan proactively. These conditions create an additional layer of complexity, where component-level must manage uncertainty not only within its own development work, but also as a consequence of upstream changes. When priorities change at the product-level, it can lead to rework, delays, and unclear expectations at the component-level. This highlights how existing theory, which addresses uncertainty in product development, falls short in accounting for the specific challenges that arise in the context of a component-developing firm operating within a multi-level development structure, particularly where component-level decisions are tightly coupled to directions set at the product-level.

5.1.3 Decision-Making Authority and Collaboration

This case study highlights a difference between product-level and component-level development concerning decision-making authority. At the product-level, process ownership entails the right to make final decisions, including those that affect component selection and implementation. In contrast, component-level operates with responsibility for developing components that fit within the product and has less authority over product decisions. This creates a dynamic where the product-level controls the process direction and component-level follows predefined requirements. Although there may be variation between projects, this distribution of authority appears to be a consistent pattern across development projects.

This finding differs from what Krishnan and Ulrich (2001) describe as a decision-centric perspective on product development. In their view, product development is shaped by a series of interdependent decisions that should be made by those with the most relevant knowledge. In contrast, the case study shows that component-decisions are not always influenced by those with the most relevant knowledge, instead, it tends to follow a structure where the product-level sets the direction and holds the authority on final decisions. While the component-level is involved and provides technical input recommendations, the product-level decides how to proceed. While Krishnan and Ulrich (2001) argue that decisions should be made by those with the most relevant knowledge, other perspectives suggest that centralized decision-making can be necessary in certain situations. Cooper (2008) highlights that in complex projects, formal processes and clear decision authority can help manage uncertainty and keep projects aligned with strategic goals. In this light, the product-levels role in making final decisions not only reflects a structural distribution of responsibility, but also a way to maintain control and coordination. This suggests that the observed differences in decision-making are not solely about influence or control but also reflect how organizations navigate complexity in development work.

Even though a structural authority exists, it is important to consider how collaboration and communication practices influence the actual decision-making process. Brown and Eisenhardt (1995) emphasize the importance of a strong communication web in successful product development, where ongoing interaction across organizational domains enables knowledge-sharing beyond formal lines of authority. Similarly, the case study reveals that continuous dialogue between product- and component-level actors allows technical expertise from the component-level to influence decisions, despite the lack of formal decision authority. This indicates that, although the product-level holds decision authority, the process is more inclusive in practice. Thus, while decision-making power is clearly differentiated, the interplay of formal structures and informal collaboration ensures that the divide is not absolute, and that component-level knowledge still plays a significant role in shaping outcomes. This inclusive decision-making dynamic may also reflect organizational and cultural factors. Since the product-level retains ownership of the final product, it is natural that it holds final decision authority. However, the fact that component-level can influence outcomes through dialogue likely also reflects the organizational context at the case company, characterized by a unified corporate structure and a collaborative, open culture that encourages cross-level collaboration.

In summary, the case study reveals structural differences in decision-making authority, where the product-level holds the formal right to make final decisions, particularly in relation to strategic direction and implementation. However, this formal structure does not operate in isolation. Continuous collaboration and communication between product- and component-level actors allow for the integration of technical expertise from the component-level, thereby balancing formal authority with knowledge-driven input in the decision-making process.

5.1.4 Synthesis of Findings and Theory

This section presents a synthesis of the empirical findings and their theoretical interpretation. The purpose is to provide a clear comparison between the product- and component-level development processes, highlighting how empirical findings align with, or challenge established theories. Table 5.1 summarizes the central dimensions identified in the study, along with the empirical insights and their theoretical interpretation.

Dimension	***Empirical Findings***	***Theoretical Interpretation***
Scope	Product-level is responsible for delivering the full product in line with market needs, while component-level contributes by ensuring feasible components that fit within defined constraints.	Supports Cooper's (2019) view but shows that in this context it is applied differently, product-level will contribute with direct end customer-value and component-level contributes with indirect end customer value.
Component- and Product-Level Development flow	Product-level initiates strategically via market needs; component-level is reactive to requests, still uses Stage-Gate, though they serve different functions.	Aligns with Cooper (2008) but shows adaptations at the component-level where gates confirm technical feasibility rather than market fit. Planning becomes more uncertain at the component-level, as its reactive nature and dependency limit control and increase variability, revealing limitations in linear development models (Krishnan & Ulrich, 2001).
Decision-Making Authority and Collaboration	The product-level leads the development process and holds authority over design decisions and priorities, component-level operates within these constraints but contributes valuable input through expertise.	Supports Cooper (2008) by showing that decision authority is retained at the product-level to ensure control and alignment. This challenges Krishnan & Ulrich's (2001) idea that decisions should be made by those possessing the most relevant knowledge. The findings align with Brown & Eisenhardt (1995) about the importance of continuous communication.

Table 5.1: *Theory-extended comparison table.*

5.2 What are the Challenges with Measuring Performance in Component-level Product Development?

While performance measurement is recognized as essential for evaluating and improving product development, its application at the component-level presents several specific challenges that became evident in this case study. The empirical findings indicate that these challenges do not originate from a single source but rather arise from distinct aspects of the component-level development context and the way performance is evaluated and used in practice. To better reflect the complexity of these issues and facilitate their analysis, the challenges have been organized into three overarching categories.

The first category, *Process-related Challenges*, consists of issues identified in the product development process and organizational practices, which shape the conditions under which component performance is measured. The second category, *Measurement System Design Challenges*, refers to limitations found in how evaluation models are structured and applied in component-level development. The third category, *Interpretation and the Strategic Use of*

Measurement, reflects difficulties related to how measurement outcomes are interpreted, acted upon, and aligned with organizational objectives and stakeholder needs.

This categorization provides a structured overview of performance measurement system challenges at the component-level and forms the basis for the following discussion, in which each category and its associated challenges are explored in detail. The challenges are summarized in Table 5.2.

Challenge 1	Isolated Component Evaluation
Challenge 2	Ambiguous Requirements & Late Involvement
Challenge 3	Subjectivity & Comparability
Challenge 4	Limitations with Scoring System
Challenge 5	Measurement Targets
Challenge 6	Misleading Measurements

Table 5.2: *Challenges in performance measurement at the component-level.*

5.2.1 Process-related Challenges

The first category of challenges identified in the case study stems from the product development process and organizational context. These challenges reflect how component-level development is influenced by factors such as integration within the product and the timing and clarity of requirements. Together, they create difficulties in defining and evaluating component performance.

Challenge 1: *Isolated Component Evaluation*

One of the central aspects identified in this study is the difficulty of evaluating component-level performance in isolation. As highlighted in the literature, components are often designed, not to serve a standalone purpose, but rather to fulfill a specific function within a larger system (Ulrich, 1995). At the same time, performance measurement, according to Neely et al. (1995), involves evaluating the effectiveness and efficiency with which an object fulfills its intended purpose. When applied to components, this creates a theoretical tension and a challenge with measuring performance in component-level development. If a component's purpose only emerges through integration, then measuring its performance independently becomes problematic. This issue was also reflected in the empirical findings. Interviewees emphasized that components, when viewed in isolation, may appear low-impact or even suboptimal on their own, despite enabling critical improvements in the overall product, such as easier assembly, reduced packaging costs, or improved performance. As the interviewees noted, it may look very simple, but for production and the entire product, it can make a huge difference.

This challenge aligns with and extends prior research. While Ulrich (1995) emphasizes the interdependence of components within a product, this study shows that this interdependence also has direct implications for performance measurement on the component-level. Performance measurements and indicators are usually designed to measure how well something performs on its own, for example, whether something is cheaper, lighter, or faster to produce than a previous version. However, in component-level development, these indicators can give a misleading picture, since the components true value becomes visible when it is combined with other parts in the final product. As a result, benefits that emerge at the product-level often fall outside the scope of component evaluations, leading to an incomplete or even misleading representation of value. While component-level evaluations may indicate good performance against isolated criteria, they fail to capture how the component affects the product. This points to a fundamental challenge in developing a performance measurement system that integrates both the isolated criteria of component-level evaluation and its broader impact on product-level outcomes.

From this perspective, it is useful to view this issue through the lens of the performance dimensions defined by Tatikonda and Montoya-Weiss (2001). While operational performance at the component-level can be evaluated independently, product performance, which reflects how the component contributes to the functionality and success of the final product, becomes fully evident only after integration. As a result, measuring components without considering their system-level impact risks underestimating product performance and misrepresenting the true contribution of component-level development. This observation is supported by Korhonen et al. (2023) who argue that performance measurement should not only quantify efficiency and effectiveness but also guide strategic alignment and support decision-making in complex, ambiguous environments. From that perspective, evaluating components without considering their role in the larger system risks overlooking or undervaluing critical contributions to product success.

This study confirms earlier research describing components as dependent on integration to create value. However, it also extends this theoretical understanding by showing that these characteristics lead to concrete challenges in performance measurement. The findings highlight that many theoretically grounded measurement systems are not well suited to capture the full value of component-level development, which has practical consequences for how performance is tracked and evaluated.

Challenge 2: ***Ambiguous Requirements & Late Involvement***

The findings highlighted that unclear requirements, late involvement, and frequent changes in projects create uncertainty and challenges for engineers working at the component-level. These issues directly affect how engineers understand project expectations, align their work with stakeholder needs, and adapt to shifting targets throughout the development process. These are aspects that affect the operational performance (Tatikonda and Montoya-Weiss, 2001), since they increase the risk of delays, rework, and inefficiencies in meeting cost, time, and technical objectives. Moreover, this uncertainty at the operational execution may also have implications for product performance, as unclear requirements increase the likelihood that components will fail to meet product-level needs and intended functions. In this way, ambiguity and late involvement create performance measurement challenges that span both operational execution and the components contribution to the final product.

From a performance measurement system perspective, this ambiguity introduces difficulties in defining what should be evaluated and against which criteria, both for operational and product performance. When expectations are unclear or change throughout the process, it becomes difficult to define which outcomes should be measured and what "success" is. As a result, evaluations risk being inconsistent, based on outdated or incomplete goals, or misaligned with actual stakeholder expectations. These findings support Hart et al. (2003) view that early-stage uncertainty and inconsistent expectations across development stages undermine performance consistency. Similarly, Hertenstein and Platt (2000) and Neely et al. (2005) emphasize that performance indicators must be strategically aligned, otherwise they may fail to reflect what truly matters to the organization. This case study extends those arguments by showing how misalignment is not always a design flaw in the performance measurement system itself, but can be rooted in the process execution, such as poor requirement communication and late involvement of key actors. At the component-level, where development is reactive to product-level expectations, this issue becomes especially expressed. The lack of early clarity not only complicates development efforts, but it also disrupts the basis for meaningful evaluation. This highlights a need for better integration of performance measurement systems with requirement-setting processes, especially in interdependent development environments like the one observed in this study.

5.2.2 Measurement System Design Challenges

The second category of challenges is related to limitations found in how evaluation models are structured and applied in component-level development. These challenges concern how well the system captures and evaluates performance, highlighting challenges related to subjectivity, comparability, and the rigidity of the scoring approach.

Challenge 3: *Subjectivity & Comparability*

The subjectivity and comparability issues identified reflect both case-specific and broader concerns in performance measurement practices. The findings described self-assessment practices which introduce subjectivity and bias into the evaluation process. This correlates with Franceschini et al. (2013) argument that performance measurements are not neutral tools, rather they influence and are influenced by human behavior and organizational culture. The fact that the engineers evaluate their own performance increases the risk that the evaluation reflects individual interpretations rather than objective results. However, subjectivity in evaluations is not always the result of intentional distortion. In some cases, the evaluation method is perceived as overly complex, to the point that those conducting the assessment do not fully understand what they are doing. This introduces an unintentional form of subjectivity, where the lack of necessary expertise leads to misinterpretation or confusion, despite good intentions. Thus, the reliability of the evaluation is undermined, not just because people may present themselves in a favorable way, but because the method itself is unclear to those expected to use it. When reliability is compromised, it becomes difficult to ensure that performance evaluations are consistent and fair across different engineers and projects. As a result, the measurement systems ability to support decision-making, learning, and the identification of improvement areas is weakened, reducing its overall effectiveness.

The challenge of comparability arises when engineers are required to benchmark newly developed components against existing ones. While this method may be appropriate when a clear reference exists, it becomes difficult when evaluating novel or innovative components that lack an obvious baseline. In those cases, interviewees noted that engineers are forced to select the “most similar” existing component to compare against, a decision that is itself subjective and may distort the evaluation outcome. This further undermines the reliability of the evaluation and makes it difficult to draw consistent conclusions across different projects. The challenges related to benchmarking questions Fortuin's (1988) criteria for performance indicators, which emphasize the importance of clear definitions, appropriate benchmarks, and indicators that are easy for users to interpret and act upon. The lack of suitable references, particularly for newly developed components, makes it difficult to establish reliable and consistent evaluation criteria. This raises an important question about whether Fortuin's principles are fully applicable in all contexts, where comparison to existing solutions may not be possible or even meaningful. This is further reflected in McGrath and Romeri's (1994) argument that there is no widely accepted measurement for evaluating product development success, which increases the risk of inconsistency and subjectivity across projects. At the case company, this was particularly evident in the use of comparison methods. While comparing a new component to an existing one provides a measurable result, it leaves unanswered the essential question of what this result actually says about the performance and value of the newly developed component itself. Consequently, evaluations may appear precise, yet fail to capture the true contribution of the component, especially when innovations are involved.

Bititci et al. (2012) further explain that this is not just a local issue, but part of a wider problem with how performance measurement systems are designed. Systems are often built on assumptions that work well in stable and predictable environments, such as repeatability and standardization. However, these assumptions do not hold in fast-changing settings. In such environments, benchmarking can miss important aspects of value, particularly when innovation is involved. Together, these insights suggest that traditional benchmarking may not be suitable for evaluating performance in cases where uncertainty and uniqueness are common. More flexible and context-aware evaluation methods may be needed to capture what really matters in these situations.

Challenge 4: ***Limitations with Scoring System***

Findings also highlighted concerns regarding limitations with scoring system, particularly the inability to record negative scores and its reliance on rigid evaluation structures. The case study performance measurement system assigns only positive or neutral scores, even in cases where a component performs worse than the previous version. This leads to a risk of misleading evaluations, where deteriorations in performance are not captured, and the true outcome of a development effort may be obscured. From a theoretical perspective, this contradicts the combined principle of Neely et al. (1995) and Blackburn and Valerdi (2009), who argue that performance indicators should provide a balanced view of results and serve as a meaningful basis for decision-making. By ignoring negative outcomes, the system may fail to provide relevant insights for decision-making, as it does not reflect the full performance of the component. While this issue may not be unique to component-level evaluation, it becomes particularly problematic in this context. Because the full impact of a component is often only revealed through integration into the final product, comparing it to a previous version is one of the few practical ways to assess performance during development. When negative changes cannot be captured, however, this comparison method loses much of its relevance and value. This highlights a limitation of the scoring model itself, rather than a characteristic of component-level development, and underscores the need for more nuanced and flexible measurement tools.

Another concern raised by the interviewees relates to the rigidity of the scoring criteria. For a component to be classified as a "successful" development, it must show improvements in at least two out of five predefined dimensions. However, some projects are intentionally narrow in scope, focusing on a single improvement area with high strategic value. With the current system, these target contributions are not valued. Neely et al. (1997) and Bishop (2018), emphasize that indicators must be both strategically relevant and aligned with project-specific goals. When performance is evaluated against general criteria rather than intended outcomes, evaluations may fail to reflect the actual value delivered.

These findings suggest that scoring systems of this type may lack the flexibility needed to accommodate the diversity of component-level projects. A more adaptive evaluation model that accounts for negative outcomes, project scope, and strategic intent, could provide a more accurate and meaningful reflection of performance. Without such flexibility, performance measurement risks misrepresenting outcomes and discouraging strategically valuable work that does not align with predefined scoring criteria. Ultimately, this highlights the need to rethink rigid and standardized approaches and instead adopt performance measurement systems that are sensitive to the unique context and contribution of each development project.

5.2.3 Interpretation and the Strategic Use of Measurement

The third category of challenges identified relates to how performance measurement outcomes are interpreted and used. Even when performance is systematically measured and data is collected, problems can arise if the measures drive undesirable behavior or fail to reflect strategic priorities and stakeholder needs. These challenges illustrate the gap between measurement and meaningful value creation.

Challenge 5: *Measurement Targets*

The target of achieving a set number of “successful” developments each year appears to influence decision-making and risks encouraging development work that fulfills measurement criteria rather than deliver meaningful value. Interviewees described how meeting annual performance targets can lead to modifications made to satisfy evaluation criteria. In some cases, changes are made to generate a positive result, and in other cases, changes are documented as a "successful" development but never implemented and used in the final product. This illustrates a risk in which performance measurement may emphasize activity or formal completion rather than actual impact or value realization.

These observations confirm concerns raised by Franceschini et al. (2013), who argue that performance indicators are not neutral tools, but actively shape organizational behavior by influencing what employees prioritize. Neely et al. (2005) similarly warn that when measurement is tied to predefined targets, there is a risk that employees focus on meeting numerical goals rather than pursuing truly valuable improvements. By making incremental adjustments, such as gradually reducing the thickness of a component, they can produce a series of developments, regardless of whether these changes deliver real value. In doing so, the measurement system risks being treated as a tool for fulfilling quotas, rather than a strategic tool for supporting meaningful improvements. Over time, such practices may undermine the credibility of the evaluation process and distort its role in guiding decision-making and long-term improvement.

In the case observed, measuring success based on the number of improvements may obscure whether those developments contribute real value. If developments are recorded as "successful" despite never being implemented, it raises a critical question about what the performance measurement system actually reflects.

Challenge 6: *Misleading Measurements*

The empirical findings revealed a disconnect between the performance measurement system and the value delivered to its primary stakeholder, the product-level. Although components are developed to fulfill product-level needs, the evaluation model does not assess whether these needs have been met. Instead, performance is evaluated based on a fixed set of internal criteria that apply across all projects, regardless of their individual goals or stakeholder expectations. This creates a risk of evaluating developments as "successful" even when they do not deliver meaningful value to the stakeholder. Such misalignment reflects what Neely et al. (2005) and Hertenstein & Platt (2000) describe as strategic misalignment. When performance indicators fail to capture stakeholder priorities, they lose relevance and weaken the connection between evaluation and actual success. Without evaluating whether requirements have been fulfilled, it becomes difficult to determine if the project has achieved its most important goals. If performance is evaluated solely based on predefined criteria, there is a risk that the evaluation overlooks whether the development delivered value to its stakeholder.

Korhonen et al. (2023) argue that performance measurement systems must be designed to function in multi-stakeholder environments. Internally focused measurements are not suited to contexts where stakeholder needs are evolving, and project goals vary. In these settings, indicators should enable alignment across organizational boundaries, not just internal consistency. When a system, by contrast, remains disconnected from the stakeholder perspective, limiting its ability to capture what defines success in a collaborative development process. Bishop (2018) similarly emphasizes that performance should reflect the intended outcomes of a project. Without such alignment, valuable contributions may be overlooked and performance measurement risks reinforcing a narrow definition of success that fails to support long-term value. This is particularly critical in component-level development, where success often depends on how well a component integrates into the overall product.

Disconnect is further illustrated by the exclusion of strategically valuable decisions, such as reuse, from performance evaluations. Interviewees questioned the definition of success, particularly the fact that the number of "successful" developments is used to indicate progress. This metric does not differentiate between improvements that are implemented and those that are not, nor does it recognize other valuable decisions, such as the reuse of existing components, a practice often seen as efficient and beneficial. Defining success in terms of the number of new developments risks creating a false sense of progress, rewarding activity over impact. This approach overlooks strategically important work that may be less visible but not less valuable. In component-level development, avoiding unnecessary work by reusing existing solutions can often deliver greater long-term benefit and support strategically important priorities for the company, such as cost-efficiency and standardization. However, when reuse is not recognized within performance measurement, engineers may feel pressured to create new components simply to demonstrate value. These concerns reflect a broader issue identified in theory, when performance measurements are misaligned with strategic goals, they can distort decision-making and reduce long-term value creation (Franceschini et al., 2013; Neely et al., 2005).

5.3 How Can the Specific Challenges of Measuring Performance at the Component-level be Overcome?

Building on the empirical findings presented in section 4.4, five areas of improvement have been proposed: *Identifying and Prioritizing Requirements*, *Early involvement*, *Independent Evaluation Group*, *Collective Evaluations*, and *Redefining Success*. All five aim to address the issues of measuring performance at the component-level, but do not target the same underlying challenges. A closer analysis reveals two distinct categories. The first includes overcomings that address contextual or organizational challenges, such as *early involvement*, the introduction of an *independent evaluation group*, and *collective evaluations* and are further discussed in section 5.3.1. These relate to the development environment and the organizational conditions that must be in place for performance measurement to function effectively.

The second category proposes improvements to overcome challenges that originate from the design of evaluation systems and the interpretation of measurements. The proposals are *identifying and prioritizing requirements* and *redefining success*, these are discussed in section 5.3.2. These proposed improvements aim to focus on how to improve the design and content of what is measured. This distinction is essential, to overcome these challenges, improvements must be made both to the measurement system itself and the conditions that surround and support its use.

5.3.1 Enabling Measurement to Work: Organizational Conditions and Usage

Early involvement

Although early involvement was not explicitly identified by interviewees as a direct solution to performance measurement challenges, it emerged repeatedly in discussions about improving the development process, particularly in relation to unclear and shifting requirements. While these issues were framed as process-related, they have clear implications for performance. By participating earlier in the requirement-setting phase, the component-level is better positioned to understand project goals, negotiate expectations, and contribute to defining what "success" should mean in each project context.

Early involvement can therefore be understood as a strategic enabler of a more effective and aligned development process. By participating in requirement-setting from the outset, component-level teams are better positioned to understand project objectives, negotiate expectations, and contribute proactively to solution development. This strengthens collaboration across levels and ensures shared ownership of project goals. In particular, jointly defined requirements reduce the likelihood of misunderstandings and late adjustments, while providing clear and stable targets for development teams to work towards. Being involved early also allows component-level actors to contribute to documenting and prioritizing requirements in partnership with product-level stakeholders. This creates transparency and fosters mutual understanding of what matters most in each project. In turn, such clarity and alignment lay the foundation for evaluating development outcomes in a fair and meaningful way, as they ensure that both teams are working towards the same objectives.

This builds on the theoretical distinction between operational and product performance proposed by Tatikonda and Montoya-Weiss (2001) and extends it by suggesting that improvements in operational performance, such as better alignment and clearer objectives, contribute to improved product performance. When operational performance improves through clearer requirements and fewer misunderstandings, development work becomes more efficient, predictable, and aligned with project goals. This, in turn, increases the likelihood that the developed components will meet stakeholder needs, function as intended, and enhance the overall product, thereby improving product performance. Regarding operational performance, this interpretation is also supported by Barczak et al. (2009), who emphasize the importance of cross-functional communication and iterative alignment in development work. The early involvement is one contribution to improved operational performance. Similarly, Keathley-Herring et al. (2024) emphasize the importance of aligning measurement with objectives, something that becomes easier when these objectives are collaboratively defined from the outset.

In summary, early involvement is not a direct overcoming to performance measurement practices but represents a critical organizational condition that improves development outcomes and creates better prerequisites for meaningful evaluation. By enabling component-level actors to define requirements from the beginning, early involvement enhances clarity, fosters alignment, and supports the establishment of relevant criteria for assessments. This becomes particularly important if an organization moves towards a project-specific and stakeholder-driven performance measurement approach, further discussed in section 5.3.2. Encouraging early involvement does not necessarily require major structural changes to the performance system itself, but it does depend on product-level stakeholders willingness to engage component-level actors early and to view this collaboration as a strategically important part of the development process, rather than as a purely technical interaction.

Independent Evaluation Group

At the case company, engineers evaluate their own development work, which introduces a level of subjectivity into the assessment process. This concern was recognized by several interviewees, who noted that self-assessments can easily lead to favorable scoring, whether consciously or unconsciously. In response, various practices have been adopted to mitigate bias, such as involving colleagues, managers, and applying the "four-eyes principle". However, as the interviews revealed, these practices are inconsistently applied. Some engineers actively seek second opinions, while others describe situations where evaluations are submitted without any form of peer review. This variation highlights a gap in the process of overcoming challenges with subjectivity, which suggests a desire for clarity and consistency to reduce subjectivity. A suggested way to address this is the introduction of an independent evaluation group, a team or function that conducts performance evaluations separately from those involved in the development work. This may reduce bias, ensure uniform application of performance measurements, and increase the perceived fairness of the evaluation. While Bourne et al. (2000) do not propose such a solution directly, their findings emphasize that the effectiveness of performance measurement systems depends not only on their technical design but also on having clearly defined roles and responsibilities in the evaluation process. An independent group supports this by clarifying who evaluates what and by ensuring that those assessing performance are not the same individuals responsible for delivering the work. The evaluation group could standardize the interpretation of measurements and avoid conflicts of interest or unclear accountability in the evaluation.

In addition to reducing subjectivity and bias, an independent evaluation group could also reduce the problems arising from the comparability process, particularly where suitable reference points exist. Today, engineers face challenges in applying consistent interpretations when selecting benchmarks for evaluation, especially in situations where there is flexibility in choosing what to compare against. A centralized team would be better positioned to apply uniform standards and ensure evaluations are more consistent across projects. However, it is important to note that this solution would not resolve the challenge of evaluating entirely new or innovative components when no relevant benchmarks exist. Addressing that challenge requires reconsideration of the evaluation approach itself, which is discussed further in following sections.

Beyond improving objectivity and comparability, an independent evaluation group could also support organizational learning by identifying patterns across projects, providing feedback to development teams, and contributing to continuous improvement of both the measurement process and the development work itself. This could elevate the role of performance measurement from a reporting mechanism to a tool for reflection and learning. In line with this, Bititci et al. (2012) emphasize that performance measurement systems should evolve alongside the activities they assess, serving not only to track outcomes but also to enable learning and drive continuous improvement. By identifying patterns across projects and integrating these insights into future development efforts, an independent evaluation group could fulfill this important role and strengthen the organization's capacity for ongoing development.

However, the feasibility of implementing a fully independent evaluation group is not without challenges. As interviewees noted, such a group would need to develop sufficient familiarity with individual projects to provide fair and contextually relevant evaluations. Without this project specific insight, there is a risk that evaluations become detached from the realities of development work, reducing both their relevance and acceptance. Given this tension, a hybrid approach may offer a more realistic solution. Involving a cross-functional peer group in the evaluation process could combine the benefits of objectivity with the necessary project-specific knowledge. This would maintain fairness and consistency, while ensuring that evaluations remain grounded in the practical challenges and objectives of each development project. Such an approach could provide a balanced and context-sensitive solution to the subjectivity challenges in component-level performance measurement.

Collective Evaluations

From empirical findings it is described that the developments classified as “successful” are used to demonstrate progress toward shared performance targets. However, this evaluation model applies the same logic to all roles, even though engineers work within different areas of responsibility. From interviews it is noted that some engineers work in areas with high frequency of new development, which makes it easier to achieve “successful” developments based on visible results. Others operate in stable areas where new development is less frequent and therefore have less opportunities to generate “successful” developments. This creates a potential imbalance, as new developments are easier to capture in the performance measurement than the less visible but equally important contributions linked to reuse and maintaining existing solutions.

While the case company's performance measurement approach is collective in nature, interviewees expressed concerns about potential risks if evaluations were to become more individually focused. They emphasized that such a shift could encourage competition and undermine the teamwork and openness that are critical for successful component-level development. Interviewees warned that if performance were judged on individual achievements, engineers may become less willing to share knowledge, collaborate, or support reuse strategies. Instead, they expressed a strong preference for maintaining team-oriented evaluation principles to avoid fostering competitive behaviors and protect the collaborative culture. At the same time, it is interesting to reflect that applying the same collective target to all engineers, regardless of their specific responsibilities, may overlook the diversity of contributions made across different roles. To ensure fairness and support collaboration, performance measurement should therefore not only continue applying collective targets, but also become more sensitive to the nature of different tasks and contributions. Recognizing both new developments and strategic reuse as equally important contributions would reduce the risk of unintentionally favoring novelty, and strengthen the ability of collective evaluations to fairly capture the full range of value-creating activities across different roles. This does not just imply continuing with the team-based evaluation. Instead, it means grounding evaluations in a broader recognition of diverse roles and shared organizational objectives. Recognizing both innovation and reuse as valid contributions could help ensure that engineers are not disadvantaged based on their area of work. It would also reduce the pressure to compete for recognition and support a culture of collaboration where engineers strive for the same strategy. This is consistent with research emphasizing that performance measurement systems must reflect the actual conditions and behaviors they aim to support (Bititci et al., 2012; Franceschini et al., 2013). Without such alignment, even well-intended systems can create unintended consequences.

In conclusion, while the risk of individualization exists even in collective evaluation, maintaining and strengthening a collective orientation will be essential to safeguard collaboration. This may not require structural changes, rather increase awareness of how evaluation practices influence team dynamics and the reinforcement of collective values to ensure performance measurement supports both collaboration and strategic decision-making.

5.3.2 Improving What is Measured: Design and Strategic Relevance

Identifying and Prioritizing Requirements

A proposal to mitigate misleading measurements, limitations with scoring systems and ambiguous and late involvement, would be for performance measurement systems at the component-level to be project-specific. Meaning that evaluation criterias should be prioritized based on requirements coming from stakeholders, the product-level, rather than relying on fixed, standardized evaluation criteria. This will enable the measurement to accurately reflect the expectations from the product-level, aligning with Neely et al. (1997) and Blackburn and Valerdi (2009) regarding the importance of capturing the purpose and objectives of development. This perspective also aligns with the Performance Prism (Neely et al., 2001), which emphasizes the importance of stakeholder requirements in designing effective performance measurement systems. According to the Performance Prism, understanding and integrating the needs of all relevant stakeholders, in this case the product-level, is fundamental to ensure that measurements reflect what is truly important in each context.

When components are evaluated using evaluation methods disconnected from this, regardless of what matters in the specific project, there is a risk that the evaluation appears successful without having delivered on the most critical needs. This issue reflects a challenge identified by Blackburn and Valerdi (2009), who argue that performance indicators are often selected based on availability and ease of measurement rather than their relevance or value contribution. Consequently, evaluations can become overly focused on what is easy to measure, at the expense of measuring what truly matters to stakeholders. Focusing evaluation on prioritized requirements helps address this disconnect by ensuring that components are evaluated based on the specific aspects they were intended to deliver. This reflects the shift toward value-driven evaluations discussed by Taylor and Ahmed-Kristensen (2018), which emphasize evaluating success not by what is produced, but by the significance and impact of what is delivered.

Moreover, tailoring the evaluations to prioritized, project-specific requirements can also help overcome limitations with rigid scoring systems. Standardized evaluation templates often prioritize consistency and comparability, but at the cost of contextual relevance. While consistency has benefits, it can lead to misalignment between what is measured and what drives success in a certain project. By integrating prioritized requirements into the scoring process, the system becomes more responsive to the unique demands and goals of each development project. This transforms the scoring system from a rigid, one-size-fits-all model into a more adaptive and context-sensitive tool. This aligns with Bititci et al's (2012) argument that performance measurement must reflect the dynamic nature of development work. Rather than evaluating all projects through a uniform lens, a requirements-based approach ensures that evaluations are tied to what stakeholders have identified as critical, enhancing both the fairness and strategic alignment of performance evaluations. For component-level development, this shift allows evaluations to better reflect the real contribution within their specific project context, rather than their ability to conform to internal success criteria.

While project-specific evaluations reflect how well a development has fulfilled the requirements of its primary stakeholder, their effectiveness depends on having clearly defined and agreed-upon requirements in place from the start. In this sense, early involvement becomes a critical organizational prerequisite for enabling requirement-based performance evaluations. When component-level is included early in the development process, they gain the opportunity to define and align requirements in collaboration with the product-level. This early alignment not only reduces uncertainty and misinterpretation but also lays a foundation for evaluating whether the component meets the expectations. Theory also argues that performance measurement should be controllable and capture the purpose and objective of the specific development (Neely et al., 1997; Blackburn & Valerdi, 2009; Bititci et al., 2012). However, for project-specific evaluations to fulfill these theoretical principles in practice, early involvement and ongoing collaboration between product- and component-level teams are essential. Through shared understanding and continuous communication, evaluations can remain aligned with what the development effort is intended to achieve.

Redefining Success

Redefining success in component-level performance measurement systems requires a shift in what is valued and tracked. Rather than focusing solely on the number of new developments, “good” performance should also reflect the actual implementation of developments, and alignment with strategic objectives. Measuring the actual usage of developed components or recognizing avoided developments through effective reuse of existing components, would provide a more grounded and outcome-oriented view of “success” that better reflects real contributions to the organization. This is an approach supported by Taylor and Ahmed-Kristensen (2018), who argue that success should be measured in terms of actual value delivered, not just output produced. Aligning performance measurements with actual value delivered rather than the number of developed components would ensure that the strategic contribution of component-level development is more accurately reflected. Without redefining success, there is a risk that the performance measurement system may reinforce unintended and undesirable behaviors. As Franceschini et al. (2013) argue, indicators are not neutral, they shape actions and decision-making. If success continues to be defined primarily by the number of new developments, engineers may feel incentivized to initiate unnecessary development-projects simply to meet targets, even when reuse would offer a more effective and strategically aligned alternative. Such tendencies could lead to inefficient resource use and a disruption of strategic coherence. Redefining success would therefore not only recognize the value of reuse but also enable engineers to make context-sensitive decisions that better serve organizational objectives.

While redefining success may appear simple, its practical implementation could be complex. Changing evaluation criteria not only requires adjustments to measurement tools, but also a broader organizational shift in how contribution and progress are perceived. In practical terms, this could involve integrating new indicators such as the proportion of reused components in new projects, tracking the implementation rate of newly developed components, and considering qualitative evaluations of alignment with strategic objectives. These measures would provide a more nuanced and balanced view of performance and make less visible contributions, such as reuse, more visible and valued. Recognizing reuse and actual implementation as success factors would require new routines for tracking outcomes over time. In the long term, redefining success to reflect outcomes such as implementation-rate and strategic reuse may be essential to ensure that performance measurement accurately captures contributions to component development.

5.3.3 Summary of how Proposed Improvements Overcomes Challenges

Figure 5.1 shows how the five proposed improvements address the specific challenges with performance measurement at the component-level. Some improvements focus directly on how the evaluation system is designed, while others work more as enablers by creating better conditions for fair and useful evaluations. These enablers do not change the system itself but help it work more effectively. Together, the improvements aim to strengthen strategic alignment, support collaboration, and ensure that performance measurement reflects the actual contributions of component-level development.

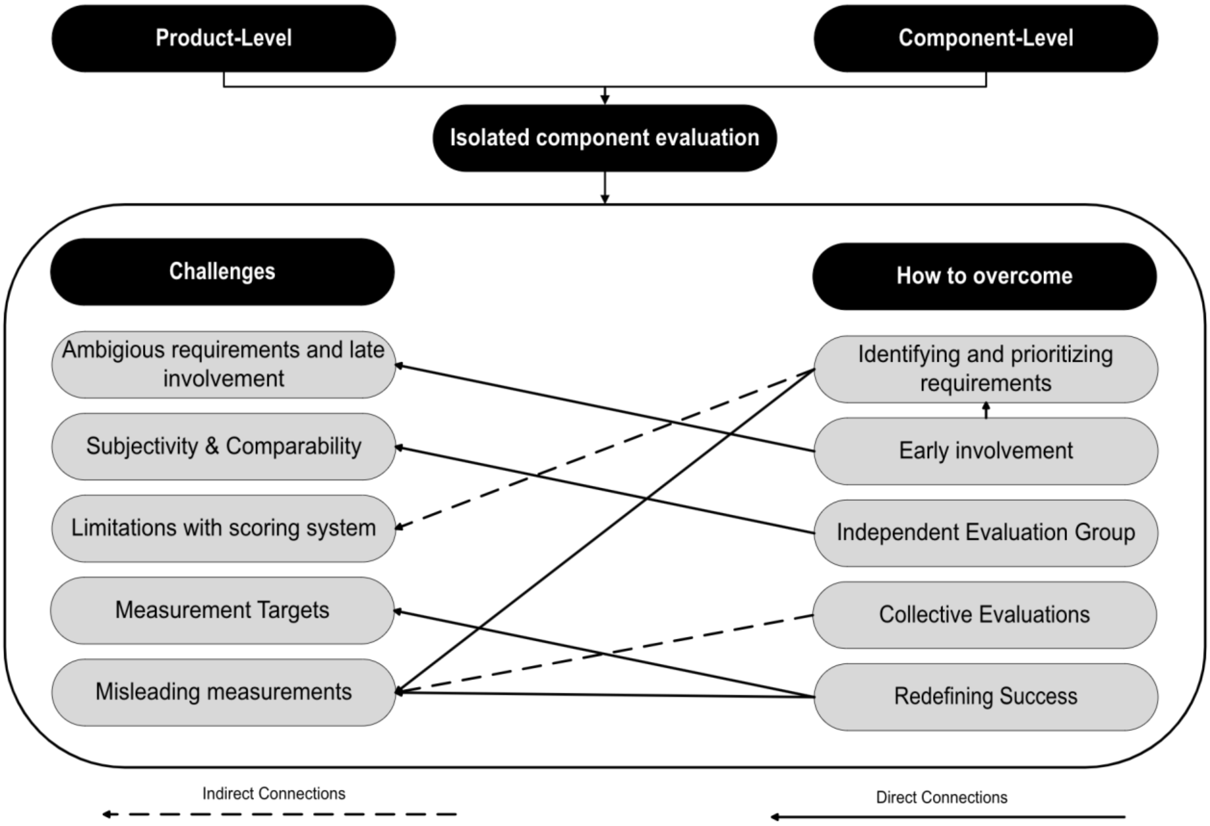

Figure 5.1: *Visual representation of the connection between identified challenges and ways to overcome these.*

The discussions and a closer examination of each proposed improvement reveal how they directly or indirectly address the challenges identified in component-level performance measurement. Early Involvement directly addresses ambiguous requirements and late involvement by enabling early alignment between product- and component-level. By participating in requirement-setting from the start, component developers gain clarity on expectations, laying the groundwork for evaluations. Identifying and Prioritizing Requirements builds on the foundation of early involvement and directly addresses misleading measurements by aligning evaluation criteria with project-specific goals. It also indirectly addresses limitations with the scoring system by shifting focus from predefined indicators to prioritized requirements, increasing contextual relevance.

The Independent Evaluation Group directly addresses the challenge of subjectivity by introducing an objective group responsible for performance evaluations, thereby promoting consistency, fairness, and reducing bias. Redefining Success deals with measurement targets and misleading measurements directly by encouraging a shift from counting only new developments to recognizing reuse and if the components are implemented and used. Collective Evaluations indirectly support misleading measurements by promoting fairer recognition of diverse contributions and collaborative work, especially in areas where new development is less common. Together, these improvements emphasize the importance of aligning both what is measured and the environment in which measurement takes place to ensure meaningful, fair, and strategically aligned evaluations to address the overarching challenge of isolated component evaluation.

5.4 Implications

This section summarizes the implications of the thesis by integrating insights from the empirical findings and positioning them within theoretical and practical contexts. It is structured in three sections. The Concluding Discussion consolidates the main insights derived from the case study. The Theoretical Implications section situates these findings within existing academic literature, identifying how the study extends, refines, or challenges current theoretical frameworks. The Managerial Implication section translates the study's findings into actionable recommendations for practitioners, with a particular focus on how managers can develop more meaningful, context-sensitive, and strategically aligned approaches to evaluating component-level performance. Together, these sections provide a reflection on the study's contributions.

5.4.1 Concluding Discussion

Measuring performance at the component-level is challenging, as the value a component provides becomes evident when it is integrated into a complete system, in this case study, a finished product. This helps explain why performance measurement systems designed to evaluate isolated outputs may fail to capture the actual contribution of component-level development. In the product and component development environment, value is not created in isolation but through coordination across teams, adaptation to evolving requirements, and alignment with broader strategic goals. A core challenge lies in the conceptual distinction between evaluating the execution of engineering development work, what this thesis refers to as *operational performance*, and evaluating the *product performance* of the component itself. While operational performance can be assessed by measuring how well the development work has been carried out, product performance on the component is more difficult to evaluate, as it depends on how effectively the component contributes value within the context of the final product. That value is not inherent to the component itself but emerges through integration and use.

However, one possible way to indirectly evaluate product performance is by evaluating how well the component meets the requirements set by its primary stakeholder, the product-level. These requirements define the conditions that must be met for the component to deliver its intended value within the final product. If the component meets those requirements, the necessary conditions for value contribution are in place. This provides a way to address the challenge of isolated evaluation. By measuring how well components meet the strategically defined requirements, it becomes possible to evaluate whether the component is capable of delivering its intended value contribution. Still, the practical application of this approach is challenging given by the realities of development work. At the case company, this complexity is further amplified by their role as a supplier to the product-level. Their contribution lies in delivering components that align with product-level requirements. In practice, however, these requirements are often vague, shifting, or communicated too late. This misalignment not only creates operational inefficiencies but also limits the potential for designing a meaningful performance measurement system that reflects component-levels true contribution.

Taken together, the findings from the three research questions highlight the complex and multidimensional nature of performance measurement in component-level development. By distinguishing between product-level and component-level conditions, identifying measurement challenges, and proposing targeted improvements, this study shows that effective performance measurement requires attention to both system design and organizational context. The findings from RQ1 show that component-level development differs from product-level in terms of scope, autonomy, and directness to the end-customer. While product-level teams operate strategically and directly toward market needs, component-level development contributes more indirectly, with performance emerging primarily through alignment and integration with product-level. This structural interdependence helps explain, as explored in RQ2, why measurement systems struggle to evaluate component-level performance in isolation. The challenge to account for integration-dependent value and contextual uncertainty results in misaligned or misleading metrics. In response, RQ3 identifies targeted improvements, including early involvement, project-specific requirements, and value-oriented definitions of success, that aim to bridge this gap. Together, these proposals emphasize that meaningful performance measurement at the component-level requires not only appropriate system design, but also enabling organizational conditions that support alignment, collaboration, and contextual relevance.

There is a need to view component-level performance measurements as integration-dependent, strategically aligned, and behaviorally influential. Recognizing that the value of a component is not intrinsic, but shaped by how it supports broader system performance, measurement systems must be designed to guide integration-focused behaviors and long-term decision-making. While the proposed improvements offer promising directions, their practical implementation is not without challenges. Organizations may encounter resistance in practices, difficulties in achieving cross-functional alignment, or the tendency to rely on easily quantifiable metrics. Overcoming these obstacles will require strong managerial support, clearly articulated strategic intent, and incremental purposeful shifts in routines, roles, and mindsets. Ultimately, this study encourages organizations to rethink component-level performance measurement not merely as a reporting mechanism, but as a strategic tool that shapes behavior, supports collaboration, and enhances alignment with long-term development goals.

5.4.2 Theoretical Implications

This section summarizes the theoretical contributions of the study in relation to existing literature on performance measurement and product development. Its purpose is to clarify how the findings extend, refine, and challenge theoretical understandings, particularly regarding performance measurement within component-level development.

Regarding development theories, this study contributes by revealing limitations in how different frameworks address uncertainty. While prior research acknowledges the importance of managing uncertainty in development processes (Krishnan & Ulrich, 2001; Barczak et al., 2009), it does not explicitly reflect the conditions faced by component-level actors. The findings show that in multi-level development structures, such as the case company, where component teams operate under external priorities and requirements set by the product-level, uncertainty is increased due to its lack of control. This exposes a theoretical gap where existing models underrepresent the structural dependency and reactive nature of component-level development, particularly where decision-making is tightly coupled to upstream directions.

In addition to its implications for development theory, this thesis also informs the literature on performance measurement. Existing literature on performance measurement focuses on organizational or product-level evaluation (Neely et al., 1995; Neely et al., 2005; Franceschini et al., 2013). Prior research underscores the importance of strategic alignment and contextual relevance in measurement systems. However, few studies have specifically explored how performance is measured at the component-level, where value creation is often indirect, delayed, or dependent on integration. This study contributes by identifying challenges that emerge at this level, as isolated evaluation, ambiguity in requirements, and misalignment with stakeholder expectations. Thus, it expands the theoretical framework of performance measurement into an underexplored, practically crucial dimension of product development.

Building upon Ulrich's (1995) concept of product architecture and interdependencies, this study highlights that the true value of components emerges only when integrated within broader product systems. Although product development often involves clearly divided responsibilities, the findings suggest that performance measurement systems have not adapted to account for this inherent complexity. The challenge of evaluating components in isolation reveals a theoretical gap. Current frameworks often presume that what is measured can be meaningfully evaluated independently. This study refines that assumption by illustrating how isolated performance data may be misleading in contexts where performance emerges through interaction and integration within systems.

This study also contributes to performance measurement theory by reinforcing the use of a stakeholder-oriented perspective such as Performance Prism (Neely et al., 2001). The findings demonstrate that standardized, output-focused evaluation criteria often fail to reflect what truly matters in component-level development, namely, the specific needs and priorities defined by the product-level. By highlighting the importance of aligning performance evaluation with project-specific requirements and stakeholder expectations, the study offers empirical support for the Performance Prism claim that performance measurement should be grounded in the value it creates for stakeholders. This perspective challenges the notion that success can be assessed through fixed internal indicators alone and instead promotes a more flexible and context-sensitive understanding of value, performance, and contribution. This reframing is particularly relevant in environments where performance emerges through integration and shared responsibility, such as component-level development.

Finally, the study contributes to the understanding of performance measurement as a behavioral system. In line with Franceschini et al. (2013), the findings demonstrate that how performance is measured affects how engineers prioritize their work, collaborate with others, and interpret organizational goals. Interviewees expressed concerns that measurement logic based on fixed quotas or scoring templates may unintentionally reduce collaboration, encourage symbolic improvements, and distort motivation. These observations underscore the importance of designing performance indicators that not only track outcomes, but also support desired behaviors and learning within complex development environments.

In summary, this study contributes to theory by advancing knowledge in five areas: (1) it highlights limitations in how development theory addresses uncertainty in multi-level structures (2) extending performance measurement to the component-level (3) clarifying the limitations of isolated evaluation (4) reinforces a stakeholder-oriented, value-driven view of success; and (5) emphasizing the behavioral effects of measurement systems. Together, these insights respond to the need for more context-sensitive, strategically aligned, and behaviorally informed approaches to performance measurement in product development.

5.4.3 Managerial Implications

In addition to the theoretical implications, this thesis offers several important insights for managers working with performance measurement in product development, particularly at the component-level. While performance measurement is widely used to support evaluation and strategic alignment, this study highlights challenges that limit its effectiveness in component-level contexts. These challenges, including isolated evaluation, unclear requirements, and symbolic use of metrics, span broader categories such as process-related issues, measurement system design limitations, and the interpretation and strategic use of performance data. To address this gap, this section outlines a set of practical recommendations. These have been shaped by both academic literature and insights gathered during interviews, where participants were asked to reflect on how performance measurement could better support their work. The resulting implications aim to guide managers in designing evaluation systems that are meaningful, aligned, and effective.

Shift from Counting to Contribution

An important thing to concern is when performance measurement system is standardized and static, focusing on the number of "successful" developments completed each year. While these measurements offer structure, they risk becoming routine checkboxes rather than meaningful reflections of performance. The underlying assumption that a development counted equals a successful contribution goes unquestioned. However, when performance is collected and reported without being used for learning, prioritization, or decision-making, its relevance becomes uncertain. Managers should critically examine the purpose of measurement: What is it intended to reflect? What behavior does it encourage? And what decisions do it support? If performance indicators are to drive decision-making, team learning, or strategic alignment, then the system must move beyond just counting and begin reflecting real contribution. This includes considering *why* something was developed, *how* it supports the product, and *whether* it meets expectations from both technical and product stakeholders.

Align Measurements with Product-level Requirements

Another important thing to consider is that component development is driven by requirements originating at the product-level. However, this interdependency is often absent from how performance is evaluated. According to interviewees, the case company's system applies fixed, standardized evaluations that fail to reflect the evolving and context-specific nature of component work, where requirements shift, trade-offs occur, and adaptation is often necessary. As a result, evaluations may miss the actual value delivered in terms of product integration, strategic alignment, or functional enhancement. To improve relevance, managers should consider tailoring performance evaluations to the specific goals and contributions of each project. This means asking: How well does the component meet its intended role within the product? What strategic or functional value has it added? Evaluations grounded in these questions are more likely to capture actual performance and support meaningful learning, alignment, and decision-making.

Foster Early Involvement and Cross-Level Collaboration

Another implication is that engineers receive unclear requirements or get involved too late in the development process, which undermines planning and makes evaluation difficult. However, when requirements are clearly defined early, they can serve as a meaningful basis for evaluating whether a development fulfilled its purpose. To enable this, managers play a crucial role in facilitating effective collaboration between product- and component-level. Ensuring interaction functions well is essential for aligning expectations, reducing ambiguity, and supporting both successful development and fair evaluation. Requirements should be co-developed between levels early in the process, and requirements should serve as the foundation for performance evaluation. This allows the measurement system to capture both technical delivery and the degree to which product needs have been met.

Clarify Purpose and Meaning of Measurement

The findings from this thesis have also highlighted a lack of shared understanding around what performance measures are meant to achieve. Several participants expressed uncertainty about the use and value of the measurements, which led to disengagement or skepticism. When performance data is collected, and employees do not understand why it is being collected or how it is used, it reinforces the perception that the system is symbolic rather than meaningful. In these situations, measurement is seen less as support for development and decision-making, and more as an administrative task with unclear relevance. Managers must ensure that everyone involved understands the intent behind performance measurements. What they are supposed to reflect, how they inform decisions, and why they are valuable. Creating this shared understanding builds trust in the system and enables employees to engage with it as a meaningful tool, rather than something to comply with.

Managerial Takeaways

For performance measurement systems to support meaningful and effective development at the component-level, it must reflect the realities of working within a product-driven structure. Component-level teams develop based on product-level requirements, still evaluated in isolation. To address this, it is important that measurement practices are aligned with product-level expectations, grounded in project conditions, and understood and valued by those being evaluated. By fostering early collaboration, clarifying the purpose behind performance measurements and indicators, and using stakeholder requirements as a shared reference point, managers can transform performance measurement from a symbolic routine into a tool for learning, decision-making, and strategic contribution. These implications highlight the importance of tailoring measurement practices to the unique context of component-level development, where interdependence, adaptation, and clarity are essential for creating value.

6 Conclusion

The aim of this thesis has been to advance the understanding of performance measurements in component-level product development, by conducting a qualitative case study. Specifically, the study aimed to explore how component-level development differs from product-level development, identify challenges with measuring performance at the component-level, and propose approaches for overcoming these challenges.

The first research question revealed key differences between component-level and product-level development, particularly in terms of process initiation, scope, and decision-making authority. Component-level development is typically reactive, triggered by product-level needs, and must adapt to upstream changes, resulting in higher uncertainty and reduced autonomy. Its scope is narrower, focused on delivering technically feasible solutions that integrate within predefined product-level requirements. While product-level teams work directly to fulfill end-customer needs, component-level teams contribute indirectly by meeting internal requirements set by the product-level. However, the study also revealed notable similarities. Both levels follow structured development processes, and face comparable challenges related to aligning goals, ensuring cross-functional collaboration, and navigating uncertainty. These shared features emphasize that while component-level development differs in critical ways, it still follows the same overarching structure as product-level development.

Building on identified differences, the second research question explores the challenges associated with measuring performance in component-level product development. The study identified six main challenges, grouped into three overarching categories. Process-related challenges include the difficulty of evaluating components in isolation and the impact of ambiguous requirements and late involvement. Measurement system design challenges cover challenges related to subjectivity and lack of comparability in self-assessments, as well as limitations in the scoring model. Thirdly, challenges related to the interpretation and use of performance measurement concern how evaluations influence behavior and how success is defined. Together, these challenges reflect both how performance is measured and the organizational environment in which measurements take place.

To overcome these challenges, the third research question guided the identification of five improvements: identifying and prioritizing requirements into the evaluations, involving component teams earlier in the development process, introducing independent evaluation groups, enabling collective evaluation practices and redefining success to better reflect the realities of the development. Together, these proposals aim to strengthen not only the structure of the performance measurement itself but also the organizational conditions necessary for its effective and meaningful application.

The key takeaway from this study is that effective performance measurement at the component level requires a nuanced, context-sensitive approach. While component development shares structural features with product-level development, its reactive nature, interdependence, and limited visibility demand tailored measurement practices. Organizations must move beyond standardized, output-driven evaluations and adopt systems that are strategically aligned, reflective of contextual demands, and capable of capturing integration-dependent value and long-term impact.

This thesis contributes to expanding the limited body of research on performance measurement in component-level product development. By identifying process differences, uncovering unique measurement challenges, and proposing targeted improvements, the study provides both theoretical insights and practical guidance for organizations managing multi-level development environments.

In summary, performance measurement at the component-level is best supported by systems that are objective, strategically relevant, and responsive to the integrative role of components within the broader product. For evaluations to be meaningful, they must reflect project-specific requirements and capture what truly defines success. By acknowledging both the distinct challenges and shared structures of component-level development, organizations can create performance measurement practices that not only assess outcomes, but also foster innovation, alignment, and informed decision-making. This study thus contributes to a more nuanced and actionable understanding of how performance can be measured in ways that reflect the complexity, interdependence, and strategic significance of component-level development.

6.1 Future Research

This thesis is based on a single case study within the furniture sector, an industry characterized by specific organizational structures, value chains, and development priorities. As such, the generalizability of the findings is limited. Future research could replicate this study in other industries where component-level development plays a central role, to determine whether the identified challenges and proposed improvements are industry-specific or more widely applicable. Comparative studies across sectors would offer valuable theoretical and practical insights into performance measurement systems at the component-level.

While this study examined the challenges of performance measurement at the component-level and proposed directions for improvement, a natural continuation would be the development of a structured framework, method, or model tailored to this context. Existing performance measurement systems are largely designed for product-level development and often fail to address the distinct characteristics of component-level work, such as its dependency on product integration, delayed feedback loops, and the difficulty of evaluating contribution in isolation.

Future research should aim to define a performance measurement framework that accounts for these challenges and is grounded in empirical evidence, such as the findings presented in this thesis. It would be particularly valuable to explore which dimensions, indicators, and measurement principles are most appropriate for this level of development, and how they can be translated into a practically applicable model. Further investigation could also examine the suitability of different types of indicators (e.g., leading versus lagging, qualitative versus quantitative), and how such a framework might be implemented in practice. This includes exploring how it aligns with existing development processes, supports decision-making, and interacts with organizational roles and structures.

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Appendix

A - Interview Guide

Interview guide 1 - used for Interviewees A, B, D, F-L

This guide served as the basis for semi-structured interviews conducted with engineers and designers at IKEA Components.

Background and Role

- Can you describe your current role and responsibilities?
- What kinds of development projects do you typically work on?

Project Involvement and Process Understanding

- How and when do you typically get involved in a development project?
- How would you describe the development process from your perspective?
- What does collaboration with IoS look like during a project?
- Do you work independently or collaborate with other teams at IKEA C?

Challenges in Component-Level Development

- What are some common challenges you face in development projects?
- Are there recurring problems or inefficiencies?

Performance Measurement Practices

- Is there a structured process for evaluating development work?
- What methods or tools are used?
- When and by whom is the evaluation carried out?
- What is the purpose of these evaluations?

Use and Impact of Measurement

- Are the evaluations used to inform future projects or learning?
- Who uses the results, and how?

Perceived Challenges with Current Measurement Practices

- What are the biggest challenges in evaluating component-level performance?
- Do current methods provide a fair and useful picture of performance?

Suggestions for Improvement

- How could the current evaluation methods be improved?
- Should measurement be more frequent, integrated, or focused differently?

- Are there organizational factors that could be improved to support better evaluation?

Final Reflections

- Do you think IKEA Components can improve how they collaborate with IoS?
- Is there anything else you would like to add?

Interview guide 2 - used for Interviewees C and E

This guide served as the basis for semi-structured interviews conducted with engineers and designers at IKEA of Sweden.

Background and Role

- What is your current title and responsibilities?
- What kinds of development projects do you typically work on?

Organizational Context and Development Processes

- How is the product development organization structured at IoS?
- Can you describe the DNP at IoS?
- Approximately how many people work within your department? How many are involved in DNP?
- What determines the length of a project at IoS? How long are projects typically?
- Who initiates projects at IoS, do you start them yourselves or receive assignments from other stakeholders?
- Who else is typically involved in development projects?

Collaboration with ICOMP

- Is IKEA C considered a supplier from your perspective?
- Do you always involve IKEA C, or are they one of several alternatives for component development?
- What determines which development partner you choose?
- Does IKEA C need to "sell in" their proposals to IoS? If so, how do they do that?
- When and how is IKEA C involved in the processes?
- What does the communication between IoS and IKEA C look like?
- Are there standard criteria that a component must fulfill, or is it project-specific?
- How is a brief formulated and delivered to IKEA C?
- Are you involved in how component development progresses, or do you rely on IKEA C to manage that independently?

Roles and Responsibilities in DNP Projects

- In a recent DNP project, what roles were involved and what tasks did you carry out?

- What responsibilities fall under IoS during a development project?

Improvement Areas

- Do you see areas where IKEA C could improve to better meet your expectations?

- Can you provide any concrete examples?

Final Reflections

- Who at IoS would you recommend we speak to for a holistic understanding of the product development process?

- Is there anything else you'd like to add?

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