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How industrial equipment manufacturers survive commoditization

A dynamic capabilities approach

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ABSTRACT:
This thesis examines the commoditization challenge faced by industrial equipment manufacturers, where product and service offerings lose distinctiveness leading to price-based competition and diminishing margins. This issue is particularly critical for mature and capital-intensive sectors like industrial equipment manufacturing. While prior research has explored market-level drivers and generic strategies, a gap exists in understanding the specific internal organizational capabilities required for firms to survive these pressures. This study aims to fill this knowledge gap by answering the following research question: How can industrial equipment manufacturers leverage dynamic capabilities to survive commoditization and sustain competitive advantage?

A qualitative, inductive research strategy employing a multiple-case study design was selected to gather contextual insights. Empirical evidence were collected through semi-structured interviews with industry experts across three relevant incumbents actively engaged in combating commoditization. The data were systematically analyzed using qualitative methods, involving coding, theme development linked to the microfoundations of dynamic capabilities, and a cross-case analysis focused on how these firms utilize dynamic capabilities through the framework of sensing commoditization drivers, seizing opportunities to respond, and reconfiguring to escape from commodity traps.

Key findings reveal that effective sensing relies heavily on customer intimacy along with formal environmental scanning, yet significant challenges exist in internally synthesizing and utilizing this information. Companies pursued differentiation through innovation, technology leadership, and servitization, but frequently face a disconnect between strategic intent and successful commercial execution. Modular product architectures were identified as critical enablers for agility and customization. However, they face substantial barriers caused by organizational inertia, path dependencies, and portfolio complexity. The findings highlight the crucial interplay between dynamic capabilities and identifies a “commoditization dilemma,” where rational short-term actions, may paradoxically accelerate long-term commoditization.

This thesis provides empirical evidence on the practical application of dynamic capabilities in countering commoditization within the industrial equipment sector. Successfully surviving commoditization requires developing individual capabilities and managing their integration by actively overcoming internal rigidities. The research contributes to dynamic capability theory through contextualized insights into microfoundations and interplay challenges, and to commoditization literature by highlighting the paradoxical effects of certain strategic responses, emphasizing the need for a long-term perspective in capability deployment.

KEYWORDS: Commoditization, dynamic capabilities, industrial equipment manufacturers, firm-level adaptation

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Johtamisen akateeminen yksikkö

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TIIVISTELMÄ:
Tämä pro gradu -tutkielma tarkastelee teollisten laitevalmistajien kohtaamaa hyödykkeistymishaastetta, jossa tuote- ja palvelutarjoamat menettävät erottuvuuttaan, johtaen hintakilpailuun ja kannattavuuden heikkenemiseen. Tämä on merkittävä haaste erityisesti kypsillä ja pääomavaltaisilla toimialoilla. Aikaisempi tutkimus on käsitellyt toimiympäristöstä aiheutuvia hyödykkeistymisajureita, sekä yleisiä strategioita vastata niiden aiheuttamiin haasteisiin. Kirjallisuuskatsaus osoitti, että yritystason kyvykkyysperustainen näkökulma muodostaa merkittävän tutkimusaukon. Tämän tutkimuksen tavoitteena on täyttää tämä tutkimusaukko, vastaamalla seuraavaan tutkimuskysymykseen: Miten teolliset laitevalmistajat voivat hyödyntää dynaamisia kyvykkyyksiä selviytyäkseen hyödykkeistymisestä ja säilyttääkseen kilpailuetunsa?

Tutkimus oli muodoltaan laadullinen vertaileva monitapaustutkimus, joka hyödynsi induktiivista päättelyä kontekstisidonnaisten löydöksien tunnistamiseksi. Empiirinen aineisto kerättiin puolistrukturoiduilla teemahaastatteluilla, joissa haastateltiin alan asiantuntijoita kolmesta merkittävästä toimialaa johtavasta yrityksestä. Haastatteluaineistoa analysoitiin systemaattisesti laadullisilla tutkimusmenetelmillä, kuten aineiston koodauksella, dynaamisten kyvykkyyksien mikroelementtitason teemoittelulla sekä vertailemalla, miten tapausyritykset hyödyntävät dynaamisia kyvykkyyksiä tunnistaessaan hyödykkeistymisajureita, tarttuakseen torjumismahdollisuuksiin ja uudelleen määrittääkseen resurssejaan paetakseen hyödykkeistymisloukuista.

Tutkimuksen päälöydökset osoittivat, että tehokas tunnistamiskyvykkyys perustuu vahvaan asiakasläheisyyteen sekä suunnitelmalliseen toimiympäristön seurantaan. Tunnistettujen tietojen käsittely ja hyödyntäminen yrityksen sisäisesti osoittautui merkittäväksi haasteeksi. Tapausyritykset pyrkivät pääasiassa erilaistumaan innovaatioiden, teknologiajohtajuuden ja palvelullistamisen kautta, mutta kohtasivat usein kuilun strategisten tavoitteiden ja onnistuneen kaupallistamisen välillä. Modulaariset tuoterakenteet tunnistettiin kriittiseksi ketteryyden ja räätälöinnin mahdollistajaksi. Merkittävinä haasteina tunnistettiin yritysten sisäinen kitka, polkuriippuvuudet, ja tarjoamien monimutkaisuus. Tulokset korostavat dynaamisten kyvykkyyksien välisen vuorovaikutuksen merkittävyyttä ja tunnistavat ”hyödykkeistymis dilemman”, jossa rationaaliset lyhyen aikavälin päätökset paradoksaalisesti kiihdyttävät pitkän aikavälin hyödykkeistymistä.

Tämä tutkielma tarjoaa empiiristä näyttöä dynaamisten kyvykkyyksien käytännön soveltamisesta hyödykkeistymisen torjunnassa. Hyödykkeistymisestä selviytyminen edellyttää yksittäisten kyvykkyyksien kehittämistä ja niiden integraation hallintaa. Tutkimus edistää dynaamisten kyvykkyyksien teoriaa, tarjoamalla kontekstisidonnaisia löydöksiä niiden mikroelementeistä ja vuorovaikutuksen haasteista. Tutkimuksessa edistettiin lisäksi hyödykkeistymiskirjallisuutta tunnistamalla tiettyjen strategisten ratkaisujen paradoksaalisia vaikutuksia, sekä tarvetta pitkän aikavälin näkemykselle kyvykkyyksien hyödyntämisessä.

AVAINSANAT: Hyödykkeistyminen, dynaamiset kyvykkyydet, teolliset laitevalmistajat, yritysten uusiutuminen

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1 Introduction

Imagine a leading manufacturing company that used to be known for its innovative products and strong reputation now facing difficulty in staying competitive as its offerings start to blend in with those of their low-cost competitors. This common scenario in today's global competition illustrates the challenge of commoditization, a phenomenon where products and services lose their distinctiveness resulting in price competition and diminishing profit margins (D'Aveni 2014; Enke et al., 2022; Wagner et al., 2023). How traditional manufacturing companies can survive this challenge and stay ahead in competitive industries such as industrial equipment? This thesis examines this question through the lens of dynamic capabilities to understand how firms can develop and leverage their competencies when adjusting to evolving market demands. (Teece et al., 1997; Eisenhardt & Martin 2000; and Helfat, 2007). This thesis utilizes a multiple case study approach to investigate how three industrial equipment manufacturers operating in the Nordic region develop capabilities and processes to combat commoditization and achieve successful outcomes.

The manufacturing of industrial equipment is vital for advanced economies and holds particular importance for the Nordic region. It faces growing challenges due to commoditization as technological advancements increase and global competition grows fiercer. Manufacturers are finding it harder to distinguish their products and maintain premium pricing (D'Aveni 2014; Enke et al., 2022; Wagner et al., 2023). Therefore, it is essential to research how companies in this industry can effectively adjust their strategies to ensure success for themselves and for the overall economic health and competitiveness of countries such as Finland. The findings of this thesis provide insights into both academic research and practical guidance for managers aiming to thrive when facing this fundamental industry challenge.

1.1 Motivation for the study

Commoditization makes products and services increasingly like competitor's offerings, forcing firms to operate under price competition and leading to narrower profit margins (D'Aveni, 2014; Enke et al., 2022; Wagner et al., 2023). A good example is the decline of General Motors during the pre-bailout era, when the company failed to distinguish itself from low-cost competitors and lost its previously market leading position in the automotive industry (Helper & Henderson, 2014). This challenge is not only affecting low tech sectors, as even producers of complex and technologically advanced products, such as industrial equipment, are exposed to this risk (Anderson & Narus, 2004; Mudambi, 2002).

The manufacturing sector of Finland has a higher concentration of multinational manufacturers than other Nordic countries offering a relevant context for studying how firms navigate commoditization pressures (Huikkola, 2017). This sector, producing equipment for industries like construction, mining, logistics and manufacturing is characterized by high capital intensity, long product life cycles and strong B2B relationships (Korkeamäki et al., 2021; Möller & Rajala, 2007; Uuskoski et al., 2023). The sector faces increasing commoditization pressures due to e.g., rapid technological advancements enabling product replication (Reimann et al., 2010; Wagner et al., 2023), globalization and competition from emerging economies with lower labor costs (Dimova, 2019), increased market transparency through e-commerce (Wagner et al., 2023) and the increasing need for standardized solutions (Closs et al., 2008).

As the industrial equipment manufacturing sector continues to become increasingly commoditized, firms must develop strategies to sustain profitability. Porter (1980) identified the three generic strategies of cost leadership, differentiation and focus, which firms can use to navigate different competitive environments. However, as eroded profit margins, which are often a symptom of commoditization, limit a firm's ability to invest in R&D, which is often needed to succeed with differentiation, firms are left with less than favourable options to choose from. This can result in a loss of market share, declining competitiveness, and eventually threaten the viability of firms and the economic contributions they make (D'Aveni, 2014).

Thus, without identifying and understanding the strategies that can be used to fight commoditization, it is impossible to guarantee a firm's profitability, growth or even in some cases its existence. For nations like Finland, it is important to sustain a competitive industrial sector and to promote innovation and broader economic prosperity. This calls for moving away from the purely defensive and reactive approaches of cost-cutting and more importantly developing organizational capabilities for sensing, seizing, and transforming resources to generate and maintain competitive advantage in a fast-changing world (Matthyssens & Vandenbempt, 2008; Teece, 2007).

While the existing literature focuses on different aspects of commoditization and potential responses, there is still a significant gap in the literature regarding the specific capabilities and processes that firms need to possess to prevent themselves from being commoditized and to be initiative-taking about maintaining their competitive position. This thesis aims to contribute to the gap in the literature by exploring how dynamic capabilities can be used by industrial equipment manufacturers to deal with the challenges of commoditization. This is both a core contribution to the broader academic literature on dynamic capabilities, as it provides empirical evidence of their role in a less explored context and a niche contribution, which provides specific insights into the strategies and capabilities of Nordic industrial equipment manufacturers, a sector which is experiencing significant commoditization.

1.2 Research gap

Numerous studies have been conducted to analyze the commoditization process and organizational strategies for dealing with it. However, this phenomenon is important, and yet, very few studies have been conducted to identify which specific organizational capabilities are most effective for de-commoditization. The existing theoretical contributions on commoditization can be broadly divided into two streams. The first, in marketing, focuses on explaining the market level causes of commoditization, such as increased price sensitivity, product homogeneity, and ease of switching (Enke et al., 2022; Wagner et al., 2023; Reimann et al., 2010). This research stream gives useful insights into how markets change with commoditization but offers limited advice on how firms can proactively respond. The second stream answers to this need with contributions from strategic management scholars which have been normative in nature offering prescriptive advice for managers on avoiding commoditization with e.g., product feature differentiation, servitization or cost leadership (Matthyssens & Vandenbempt, 2008; Homburg et al., 2009).

The two streams have contributed to important findings, but they do not address the internal firm-specific capabilities that are necessary for successfully surviving commoditization. Reimann et al. (2010) state that previous studies have not examined the connection between a firm's resources and capabilities and the effectiveness of different strategic responses. Moreover, while recognizing the need for capabilities to sense market information (Wagner et al., 2023), very few papers develop a theoretical lens to explain the development, deployment, and integration of these capabilities over time. Furthermore, most of the existing empirical work relies on unidimensional measures and does not provide a multi-dimensional view (Wagner et al., 2023).

The dynamic capabilities (DC) framework will serve as the solution to address this knowledge gap. The framework based on sensing, seizing, and transforming organizational resources and capabilities will be used as a method to understand how firms can actively shape and align with growing commoditization (Teece et al., 1997; Eisenhardt & Martin, 2000; Helfat, 2007). This research extends past sensing focused research (Wagner et al., 2023) to analyze capability interactions that influence de-commoditization strategy effectiveness. Additionally, this thesis investigates the microfoundations of these capabilities (Teece, 2007) to provide organizations with practical advice for building capabilities to fight commoditization.

1.3 Research problem and theoretical contribution

Previous research has identified various drivers and responses but fails to explain which organizational capabilities allow companies to proactively resist commoditization while maintaining competitive advantage. This research fills this knowledge gap by analyzing it through the lens of dynamic capabilities and its microfoundations (Teece et al., 1997; Teece, 2007). There is currently insufficient knowledge about how Nordic industrial equipment manufacturers can leverage dynamic capabilities and their processes to fight commoditization effectively. Therefore, this thesis addresses this with the following research question:

RQ: *How can industrial equipment manufacturers leverage dynamic capabilities to survive commoditization and sustain competitive advantage?*

The research is grounded on the dynamic capabilities framework which states that sustained competitive advantage in dynamic environments depends on a firm's ability to integrate, build, and reconfigure competences (Teece et al., 1997; Eisenhardt & Martin, 2000; Helfat, 2007; Teece, 2007). The study uses the sensing, seizing, and transforming framework (Teece, 2007) to analyze proactive market adaptation for commoditized markets.

The research contributes to two important gaps in current knowledge identified by Enke et al. (2022) and Luther (2022) by providing empirical evidence about the antecedents of commoditization and evaluations of commoditization responses. Additionally, it investigates the interplay between dynamic capabilities within the industrial equipment manufacturing context to provide insights for firms that want to maintain competitive advantage against competitive pressures.

This study produces both theoretical and practical contributions from its findings by adding to the strategic management and dynamic capabilities literature through empirical evidence demonstrating how dynamic capabilities and their microfoundations can be used to fight commoditization. Additionally, it investigates how sensing, seizing, and transforming capabilities interact through an in-depth analysis of their practical implementation. The research provides industrial equipment manufacturers with practical insights by identifying essential capabilities and processes to combat commoditization. This guidance will assist organizations in developing resilience while improving competitiveness and sustaining profitability.

1.4 Thesis structure

This thesis consists of five chapters. The first chapter introduces the research subject by explaining the motivation behind the study, research gap, research problem and question and finally presents the theoretical framework together with expected contributions. The second chapter contains an extensive review of existing literature about commoditization and dynamic capabilities. Specifically focusing on the antecedents, responses, processes, and mechanisms of commoditization along with the foundations and operational mechanisms of dynamic capabilities. The chapter concludes with a synthesis between these two research streams that establishes a theoretical base for the following empirical research.

The latter part of this thesis consists of the research methodology section as the third chapter, case study findings as the fourth and finally the discussion section as the final chapter. In the methodology chapter the qualitative research approach and the multiple-case study design are justified along with how the cases were chosen, which data collection methods and analysis procedures were used. In the findings section individual case analyses are presented, leading to a comparative analysis that reveals the identified patterns and themes. Finally in the discussion chapter, theoretical and managerial implications of the research findings are discussed and the avenues for future research and the limitations of this study are disclosed.

2 Literature review

The literature review section of this thesis provides a comprehensive synthesis of two relevant theoretical streams essential for understanding how industrial equipment manufacturers adapt to survive the threat of commoditization. The first segment explores the phenomenon of commoditization by investigating its conceptualization, underlying processes and mechanisms, key antecedents, and strategic responses. Then in the second chapter, the dynamic capabilities (DC) framework is covered by discussing its conceptual development, key processes, and mechanisms (i.e., sensing, seizing, and reconfiguring), and their underlying microfoundations. Lastly, the two streams are synthesized by applying the dynamic capabilities lens to the context of commoditization. This creates a theoretical framework that serves as the foundation for empirical exploration in the findings section. This framework is visually presented in the end of the literature review chapter as an “empty” framework that is then filled with empirical evidence at the end of the findings section.

2.1 Commoditization

The following section examines the multifaceted nature of commoditization by first conceptualizing the phenomenon, processes and mechanisms related to it, and then analyzing the theoretical foundations of its antecedents and responses. The review synthesizes strategic management and marketing literature to create a complete picture of the commoditization process and its effects on firm competitiveness. The central prior studies drawn in this thesis are listed in table 1.

Enke et al. (2022) provides relevant consolidation of both the drivers and responses to commoditization, which is utilized in this thesis as a platform to lay the dynamic capabilities lens and review empirical evidence against. Reimann et al. (2010) is the second most cited paper from these selected contributions with 98 citations found through Scopus and cite by both Enke et al. (2022) and Wagner et al. (2023). According to Wagner et al. (2023) the scale proposed by Reimann et al. (2010) is the only other scale along with theirs that does not adopt a unidimensional view of commoditization. The proposed dimensions of “industry stability, switching costs, price sensitivity, and product homogeneity” (Reimann et al., 2010), were adapted following the product level commoditization scale developed by Wagner et al. (2023) and included in the analysis. Wagner et al. (2023) offers a valuable literature review that was based on a novel comprehensive bibliometric review of commoditization literature. Matthyssens and Vandenbempt (2008) is the most cited paper from these selected contributions with 316 citations found from Scopus as well as being cited be Enke et al. (2022) and Reimann et al. (2010). D’Aveni (2014) is the sequel to D’Aveni’s work on the so-called hypercompetition theory, which saw some popularity in the late 90’s. However, this thesis does not adopt the hypercompetition perspective but rather acknowledges the contribution in incorporating the product maturity viewpoint to commoditization research and coming up with the term “commodity trap.”

Author(s)	Study focus	Data/methodology	Main contribution
Enke et al., 2022	Commodity marketing, commodity types, commoditization and de-commoditization phenomenon, the drivers of and responses to counter commoditization.	Categorizes commodity types, explains, and summarizes drivers of commoditization, and de-commoditization approaches qualitatively.	Commodity offering differentiation matrix (objective and subjective), overview of commoditization drivers, and a consolidation of response approaches.
Reimann et al., 2010	Industry-level commoditization and its impact to the development of marketing competition.	Combines survey data from 141 companies in ten industries and field interview findings to assess an industries commoditization level.	A framework for measuring industry commoditization. Suggests that higher commoditization levels force companies to adopt customer intimacy as the main performance driver.
Wagner et al., 2023	Measuring product-level commoditization from the customer perspective.	A multi-study approach of four studies to establish the reliability and validity of the product commoditization scale developed.	A novel 13-item self-assessment scale to measure product commoditization following the proposed dimensions.
Matthyssens & Vandenbempt, 2008	Establish differentiation through service-based solutions in commoditized markets.	A longitudinal qualitative study in the electro technical industry with interviews conducted throughout multiple years.	How companies can evolve from basic products into solutions as well as the obstacles they face in this transition.
D’Aveni, 2014	How markets commoditize over time through hypercompetition and how to escape from commodity traps.	Verifying and quantifying commoditization patterns through authors consulting work and research in different thirty industries.	Three commodity traps: deterioration, proliferation, and escalation.

Table 1. Central prior studies on commoditization.

The review follows a structure that includes four sub chapters. First defining commodities through their characteristics while exploring various levels of commodity offerings and explaining the difference between product-level and industry-level commoditization. (Enke et al., 2022; Reimann et al., 2010; Wagner et al., 2023). Then how commoditization occurs as a process and by showing how businesses shift from differentiating to competing on price and how the de-commoditization loop can occur in cyclical patterns (Greenstein, 2004; Matthyssens & Vandenbempt, 2008).

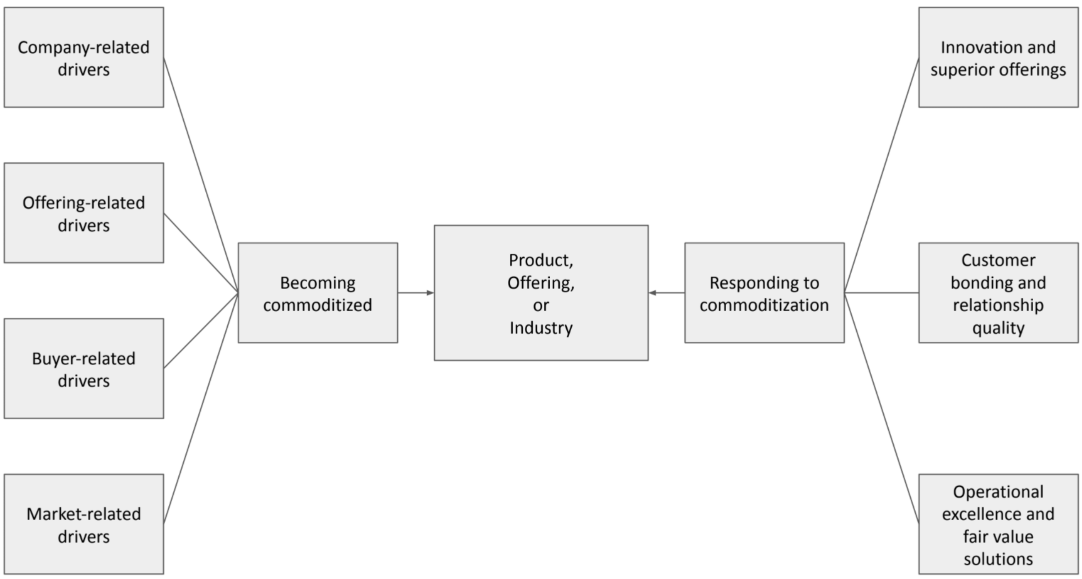

Figure 1. Driver and response categories adapted from Enke et al. (2022).

After that, the factors leading to commoditization are reviewed through a consolidation of drivers into four main categories as presented by Enke et al. (2022), which include company, offering, buyer, and market related factors that accelerate commoditization. The last section investigates managerial responses to commoditization by drawing on research on commoditization that has its roots in the strategic management literature e.g., (Barney, 2002; Mintzberg, 1988; Porter, 1980, 1985). This review of responses adopted a consolidated list of categories including innovation and superior offerings, customer bonding and relationship quality, and operational excellence and fair value solutions (Matthyssens & Vandenbempt, 2008). This categorization is presented in the picture above.

2.1.1 Conceptualizing commodities

The concept of commodities is central to understanding commoditization. A commodity represents a standardized product which can be interchangeably traded because it does not contain any distinguishing characteristics (Greenstein, 2004). Whereas, the market positioning of differentiated products depends on e.g., branding and innovation, commodity markets compete through cost-efficiency and price leadership (Porter, 1980).

According to Enke et al. (2022) commodities were originally perceived as specific agricultural products like corn, wheat and coffee aligning with other early attempts to establish a classification system of goods based on product characteristics. However, the perception of competing offerings evolves over time in a way that products from different categories can begin to seem similar. The changing perception of commodities has resulted in a more complex definition of what constitutes a commodity (Enke et al., 2022).

While the earlier definitions of commodities were centered around industrial and consumer goods, modern interpretations include digital products and services. Which demonstrates that perceived standardization and homogeneity can occur to both tangible and intangible goods and services. This leads to competition moving from distinctive features to emphasizing cost efficiency and price competitiveness (Ferrell et al., 2022).

Enke et al. (2022) proposes a categorization of commodity offerings looking at two dimensions as illustrated in the picture below. First the objectively existing differentiation, through inherent and measurable attributes of a product or service and then subjectively perceived differentiation. This framework yields four types of commodity offerings. Born commodities which are inherently undifferentiated and perceived as homogeneous by buyers. Then new commodities which have some unique features that over time become unrecognizable and then perceived as similar. Then the differentiated offerings either through pseudo-differentiation by creating an illusion of uniqueness through branding and marketing, even though the objective differences are minimal, while truly differentiated offerings combine both clear objective differences and distinct consumer perceptions (Enke et al., 2022).

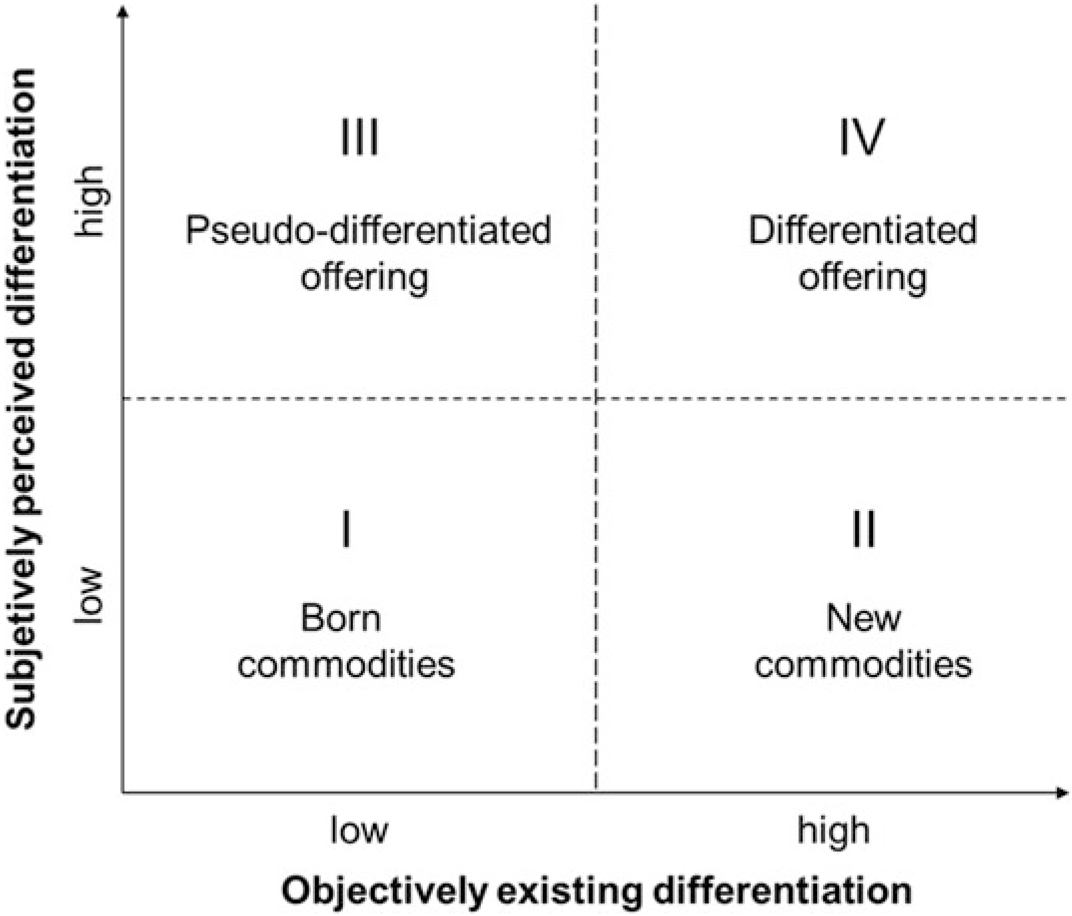

Figure 2. Types of commodity offerings (Enke et., 2022).

According to Enke et al. (2022), firms offering either born or new commodities must concentrate on cost efficiency and economies of scale as their products or services are mostly viewed as interchangeable. Whereas the firms that have pseudo-differentiated or genuinely differentiated offerings can leverage perceived uniqueness to command higher prices and foster customer loyalty. It is crucial for firms to align their strategic initiatives with the type of commodity offering they offer, to sustain competitive advantages in markets where differentiation may quickly wear down.

2.1.2 The commoditization phenomenon

The process of commoditization makes both subjective and objective perceptions of products and services more similar which creates intense price competition and reduces profit margins (D'Aveni, 2014). This phenomenon is more common in mature industries where established companies struggle to maintain differentiation due to technological diffusion and globalization along with changing buyer expectations (Shih, 2018). The homogenization of offerings leads to a decrease in the significance of unique attributes which feeds into companies having to compete primarily on price (Anderson et al., 2009; Enke et al., 2022).

Stronger commoditization intensifies the challenge of differentiation. The loss of perceived differentiation allows buyers to get similar goods and services from alternative sellers, which increases price sensitivity, decreases switching costs, and diminishes brand loyalty (Mudambi, 2002; Reimann et al., 2010; Stanko & Olleros, 2013). Firms often use de-commoditization strategies to counteract these effects through e.g., brand differentiation, enhanced customer experiences and value-added services to create imaginary distinctions that persuade buyers to see similar offerings as differentiated products (Enke et al., 2022). Reinforcing perceived uniqueness allows firms to regain competitive advantage and helps shift buyers' perception away from price-based decisions (Weil, 1996).

Although often perceived as inevitable, some scholars such as Rangan and Bowman (1992), argue that commoditization is not inevitable as it can be strategically managed through differentiation and resource reconfiguration. Similarly, Schrage (2007) disputes the notion that "eventually everything becomes a commodity", pointing to examples such as toasters and bottled water, which have been reinvented many times over. Further stating that firms embracing innovation and maintaining customer intimacy can sustain differentiation even in industries that have been commoditized (Schrage, 2007).

2.1.3 Commoditization of products and industries

The process of commoditization has different characteristics when occurring at the industry and product levels thus requiring separate analytical approaches to understand. Wagner et al. (2023) define product commoditization through four buyer driven dimensions which include brand importance, ease of switching, price sensitivity and product homogeneity. The interchangeability of products leads to reduced brand significance and lower switching barriers which makes price the essential purchasing criterion. The market competition intensifies price battles which results in decreased profitability (Anderson et al., 2009).

At the industry level commoditization demonstrates certain structural market mechanisms. Reimann et al. (2010) created a four-dimensional scale to assess industry commoditization which includes product homogeneity, price sensitivity, low switching costs and high industry stability. Characteristically commoditized industries are stable in nature which creates an environment where disruptive innovations are scarce and differentiation challenging for firms. This results in intensified market competition and simultaneously reduced profit margins (Hambrick, 1983; Pelham, 1997; Rangan & Bowman, 1992).

According to Luther (2022), industry commoditization is a result of high product-level commoditization. Consumers may view products as interchangeable even when they differ in design or branding if their performance and quality are similar. This is in line with the procedural view of commoditization where competitive pressures drive offerings towards homogeneity and, therefore, shift consumer decisions to price (Enke et al., 2022).

Reimann et al. (2010) state that industry commoditization is a managerial and strategic challenge. Firms in highly commoditized industries have fewer opportunities for differentiation, customers with higher price sensitivity, and lower switching costs, which makes it difficult to sustain competitive advantage. Their scale remains one of the few comprehensive empirical frameworks for assessing the impact of industry level commoditization on firm performance.

2.1.4 The commodity trap

D'Aveni (2014) expanded the understanding of commoditization with contribution that enhanced the knowledge on how the competitive environment of a company effects the development of commoditization, by identifying three distinct commodity traps that firms may encounter which are presented in the picture below.

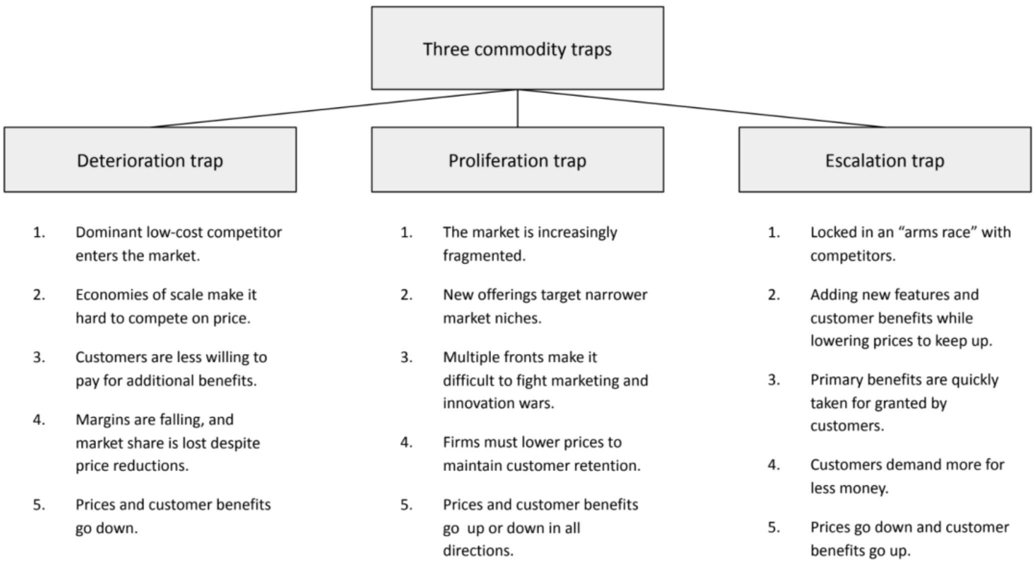

Figure 3. Commodity traps adapted from D'Aveni (2014).

First the deterioration trap which occurs when a dominant low-cost competitor emerges, undercutting industry incumbents by offering reduced prices and fewer product benefits. This forces firms to reduce their costs and quality, which creates an industry-wide race to the bottom. Companies that are caught in this trap experience declining profit margins as they struggle to compete with cost leaders (D'Aveni, 2014).

Then the proliferation trap that occurs when competitors launch multiple niche offerings which divide the market and reduce the customer base of established companies. This results in a decline of market demand instead of direct price competition as buyers switch to specialized alternatives (D'Aveni, 2014).

Lastly the escalation trap occurs when companies continuously increase features while cutting prices, which produces self-destructive competition. Companies that continuously pursue better specifications at lower costs typically lose their pricing power which makes sustained profitability challenging (D'Aveni, 2014).

2.1.5 Processes and mechanisms of commoditization

The process of commoditization develops progressively as firms shift from differentiated offerings to competing on prices (D'Aveni, 2014). Market forces together with technological diffusion and competitive pressures determine the progression of the transition stages (Reimann et al., 2010; Wagner et al., 2023). Many scholars have identified the various stages of this progression and the influence of industry characteristics and market competition patterns on that progression. (Greenstein, 2004; Shih, 2018). The progression along with its related steps is demonstrated in the below picture.

Every new product that starts its existence by delivering a distinct value proposition to the market draws follower products as competitors start to replicate, leading to decreasing customer interest and triggering price competition. Companies struggling with rising price competition should adopt de-commoditization strategies to maintain their market differentiation and prevent price wars. The reduced profitability from price pressures creates a challenging situation as firms typically do not have sufficient funds to execute the required differentiation initiatives (Enke et al., 2022).

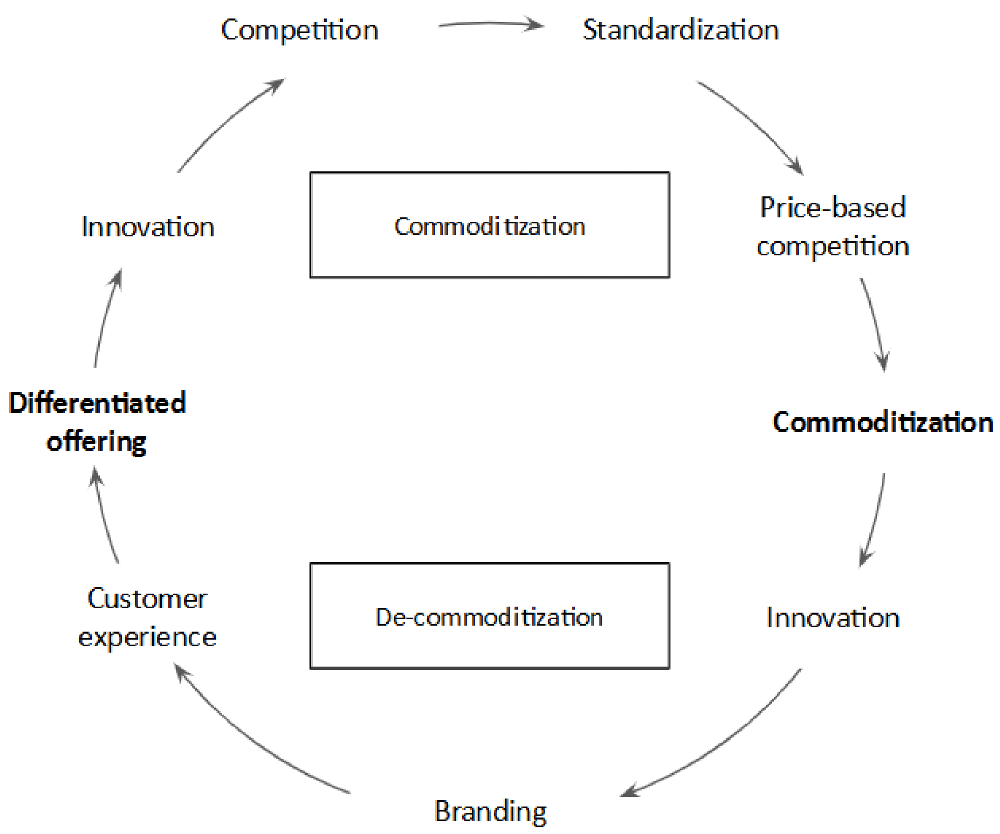

Figure 4. Commoditization loop.

Companies achieve competitive advantages, for example from innovation, branding and unique value propositions which allow them to charge premium prices as customers perceive their offerings as superior (Slater & Narver, 1994). The process does not happen immediately as market forces, technological diffusion and competitive pressures can influence how much competitive advantage a firm can achieve (Yu, 2011). Once an industry experiences successful innovation which attracts competition, it can potentially lead to product standardization and reduced differentiation which decreases performance differences between companies (Enke et al., 2022).

According to Guiltinan and Gundlach (1996) firms eventually must move from differentiation to cost efficiency and price competition when an industry faces increasing market transparency and competitive intensity. Once the offerings of firms start to seem abundantly similar, buyers will choose affordable options as the cost of switching between suppliers becomes lower (Wagner et al., 2023). During this transition price competition takes over as the dominant force for entire industries (Reimann et al., 2010). Along with transparency and cost efficiency, industries may face regulatory and competitive pressures that lead to further standardization of structures, offerings and processes that is known as institutional isomorphism (Luther, 2022). Aligning with the framework of DiMaggio and Powell (1983) which shows how firms adopt standardized practices because of external pressures, uncertainty and professional norms as explained by Meyer and Rowan (1977).

The process of commoditization follows a cyclical pattern as companies periodically recover their differentiation before returning to price competition (Matthyssens & Vandenbempt, 2008). The consumer electronics industry where firms develop proprietary innovations and ecosystem-based lock-in strategies to maintain differentiation demonstrates this pattern (Yu, 2011). Greenstein (2004) elaborates this by stating that even advanced technology markets will experience commoditization as differentiation loses its effectiveness. Innovations together with proprietary integrations and service-oriented differentiation enable firms to delay or reverse commoditization if they can recognize these cyclical patterns. For example, software firms have many of their core functions commoditized, yet they achieve differentiation through user experience innovations, proprietary integrations, and subscription-based services (Greenstein, 2004).

This together with Rangan and Bowman (1992), Weil (1996), and Schrage (2007) suggests that commoditization is a manageable strategic challenge instead of an inescapable state. Companies that modify their resources and value propositions can prevent commoditization from occurring or reverse it by identifying the critical inflection points from the cyclical patterns to maintain competitive differentiation in markets that are becoming more commoditized. The inflection points indicate when firms transition to full price-based competition although some industries can move back and forth between commoditization and differentiation (Reimann et al., 2010).

Reimann et al. (2010) states that when the inflection point is reached, differentiation becomes impossible, and price competition takes over. The conditions of product standardization, price-consciousness of buyers and low barriers to switching between competing offerings cause this transition. The rising intensity of these conditions makes firms move away from differentiation and focus on cost leadership. Furthermore, institutional factors like regulations and norms can increase these pressures (Luther, 2022).

Wagner et al. (2023) created a product commoditization scale to identify this inflection point where price sensitivity and switching costs decrease brand loyalty. Confirming that a systematic method can be used to observe this change. Further stating that traditional brand advantages become ineffective at this point as buyers no longer detect any differences between products leading to a price-driven market.

Organizations need to detect these critical inflection points to maintain competitive advantage. The commoditization process creates price-based competition in some industries, but companies can prevent it through resource reallocation, market positioning and complementary service offerings (Matthyssens & Vandenbempt, 2008; Reimann et al., 2010). Organizations can build resilience through time by understanding these stages and identifying re-differentiation opportunities.

2.1.6 Antecedents of commoditization

The research on the antecedents of commoditization has led scholars to identify multiple key drivers that accelerate its impact. Competitive intensity, external investors, globalization, rapid technological advancements, shorter time-to-market cycles, reduced market regulations, shorter product and industry life cycles, product maturity, and the increasing ease of information exchange via e-commerce platforms are among the most widely recognized factors (Wagner et al., 2023).

Enke et al. (2022) propose a classification that consolidates drivers of commoditization into four categories which include company, offering, buyer and market related factors. The framework offers a holistic way to understand the commoditization process. A listing of these factors is found in the table below, where the different drivers found from literature are categorized according to the classification system. Additionally, secondary drivers resulting from the main drivers are highlighted in the cells with grey background.

Company-related	Offering-related	Buyer-related	Market-related
Standardization	Shorter product life cycles	Increase in price-based evaluation	Competitive intensity
Imitation	Rapid technological advancements	Increase in buyers' experience and familiarity	Globalization
Prioritizing of operational efficiency	Modularity of product designs	Perceptions of interchangeability	Deregulation
Product homogeneity	Simplified product architectures	Heightened price sensitivity	Financialization
Erosion of first-mover advantages	Lower perceived performance risk	Reduced perceived value of unique features	Intensified price wars
	Competitors introducing similar offerings	Negative spillover effects	Shift in industry focus to price efficiency
	Increased product interchangeability	The erosion of brand loyalty	Diminished pricing power
	Lower imitation barriers		Industry-wide standardization
	Weakening of proprietary advantages		Self-destructive competition
	Evolving market expectations		

Table 2. Consolidated list of commoditization drivers.

Company-related factors such as decisions on standardization and imitation have a central role in driving commoditization. As pursuing economies of scale through standardization results in increasingly homogeneous products that diminishes opportunities to differentiate (Brownell & Merchant, 1990; Perera et al., 1999). Firms often aim to increase their operational efficiency through modular product designs with interchangeable components which lowers costs, yet these decisions tend to result in even more standardized offerings and less unique value propositions (John et al., 1999; Reimann et al., 2010).

Imitation further accelerates the commoditization process, especially in mature markets which experience more incremental innovations than disruptive changes (Hax, 2005; Lieberman & Montgomery, 1998). This is further stimulated by new entrants that replicate established business models to lower their entry barriers and to reduce risks, thus creating even more uniform products (Lieberman & Asaba, 2006). The decreasing differences between competitors in mature markets lead buyers to focus on cost-effectiveness instead of brand loyalty (Homburg et al., 2009). As a result, mature product categories exhibit higher price sensitivity and reduced differentiation as markets become saturated and products standardized (Reimann et al., 2010; Wagner et al., 2023). Leading companies to focus on operational efficiency and compromise on their ability to maintain sustained differentiation (D'Aveni, 2014; Weil, 1996).

Standardization and imitation as cost-saving and scaling measures produce short-term benefits but lead to long-term loss of competitive differentiation (Brownell & Merchant, 1990; Perera et al., 1999; Reimann et al., 2010). An effective strategy to prevent commoditization risks requires a balanced approach between efficiency and differentiation through e.g., brand positioning, service integration and investments in technological innovation (Hax, 2005; John et al., 1999; Lieberman & Montgomery, 1998). Firms that do not invest continuously in differentiation strategies face the risk of drifting into price-based competition as imitation reduces first-mover advantages and creates homogeneous products (Homburg et al., 2009; Lieberman & Asaba, 2006).

To maintain differentiation, organizations need to create proprietary capabilities while following through with long-term innovation cycles (Hax, 2005; Lieberman & Montgomery, 1998). Companies that invest in research and development, offer unique services, and implement process innovations can sustain competitive differentiation within intense market competition (Brownell & Merchant, 1990; Perera et al., 1999). Strategic alliances and vertical integration help organizations strengthen their supply chain while building competitive advantages through value-added differentiation (John et al., 1999; Reimann et al., 2010). The absence of proactive differentiation leads businesses into cost-reduction cycles which weaken their profitability and future market positioning capabilities (Homburg et al., 2009; Lieberman & Asaba, 2006).

Offering-related factors such as age, complexity and performance of products significantly influence the level of commoditization. Along with rapid advancement of technology and decreasing product life cycles which create a perpetual cycle of commoditization resulting from industries continuously transforming. According to Olson and Sharma (2008) the introduction of similar offerings by competitors leads to reduced differentiation and product maturity. Standardization and modularity of product designs while increasing efficiency simultaneously increases interchangeability which eventually reduces barriers of imitation (Closs et al., 2008).

Technological advancements initially contribute to differentiation but can eventually lead to imitation by competitors and shorter time-to-market cycles (Olson & Sharma, 2008). According to Enke et al. (2022) technological diffusion removes proprietary advantages by converting innovations into standard industry components. Modular product architectures further stimulate this by helping companies to reduce production costs, speed up time-to-market and enhance operational flexibility (Yu, 2011). However, it increases product interchangeability and leads to reduced opportunities for distinctive value propositions. The simplified architecture of products creates lower barriers to imitation according to Closs et al. (2008) imitators need less R&D investment to replicate innovations. Under these conditions, firms must continuously develop enhancements to product features to prevent commoditization.

In industries with high levels of technological stability, along with growing market knowledge buyers start to focus more on price as they perceive less performance risk. Contrarily in industries with high perceived performance risk, firms are typically encouraged to differentiate their products through quality features such as reliability and functionality (Grewal et al., 1994). As industries mature, performance risks diminish, which inhibits firms from using reliability as a value lever to command price premiums (Enke et al., 2022; Homburg et al., 2009). Additionally, with increasing industry maturity the expectations of the market evolve as buyers typically gain more knowledge about product offerings and characteristics which leads them to view previously unique features as standard (Reimann et al., 2010).

Buyer-related factors such as involvement, experience and expectations drive rapid commoditization by altering how buyers make decisions and perceive product value. For example, the emergence of E-commerce platforms has revolutionized the transparency of product information thus driving buyers further toward price-conscious comparisons. Wagner et al. (2023) highlight that digital marketplaces enable users to compare prices more easily while lowering barriers to switching products and providing personalized recommendation algorithms which reduce firms' ability to maintain differentiation. The algorithmic recommendations strengthen this pattern by grouping together related products for easier comparisons thus reinforcing consumer perceptions of product interchangeability (Huang et al., 2021). Buyers that use price as their primary evaluation criteria shift toward cost-effective options, exhibit less brand loyalty, and have a worse perception of unique product features (Alba & Hutchinson, 1987).

The formation of product similarity networks produces negative spillover effects which decrease the demand for premium products as buyers switch to lower-cost highly rated alternatives (Huang et al., 2021). Expectations about price and value among experienced buyers create additional challenges for differentiation strategies (Mooi & Frambach, 2012). Research shows that consumer willingness to pay for differentiation decreases when they become more familiar with product categories (Albert, 2003; Hill, 1990). Buyers who develop digital marketplace skills start to view unique product attributes as ordinary industry standards which diminishes product distinction according to Homburg et al. (2009).

To fight against these pressures companies should place customer-centricity at the forefront to make prices harder to compare while creating better value perceptions (Albert, 2003). To do this companies can, for example, provide customized after-sales services and develop subscription plans with tailored warranty options to build enduring customer relationships (Homburg et al., 2009). In this age of digital marketplaces and informed buyers, firms must proactively manage customer expectations through effective communication of product benefits and continuous innovation as otherwise, distinctive factors will become viewed as standard industry practices (Mooi & Frambach, 2012). Communication of benefits together with controlled innovation diffusion can help organizations preserve their market differentiation (Zaichkowsky, 1985). Companies can maintain their profit margins through value-based pricing and bundling complementary services even when customers have access to complete pricing information (Enke et al., 2022).

Market-related factors are the primary drivers for both competition and the development of commoditization in an industry. Forces affecting the increase of competition stem from a combination of globalization and deregulation. As weaker regulatory protection and rising competition pushes companies to compete on price and thus fueling industry-wide product standardization (Enke et al., 2022).

There is a substantial body of knowledge on how competitive pressure affects the development of commoditization. According to Jaworski and Kohli (1993) Consumer price sensitivity grows stronger when markets become more competitive because it creates conditions for aggressive price competition that weakens brand loyalty. Additionally, new market entrants as well as the increasing amount of similar products push companies to neglect uniqueness over cost efficiency. Industries with low entry barriers are more vulnerable to these pressures as firms are depending more on cost-based competition (D'Aveni, 2014).

Price wars accelerate commoditization by diminishing differentiation while strengthening consumer price sensitivity (Heil & Helsen, 2001; Homburg et al., 2009). According to Wagner et al. (2023) firms operating in highly competitive markets tend to adopt price-driven competition at a faster rate. Overreliance on cost cutting measures through e.g., outsourcing and automation accelerates commoditization because it destroys the ability to sustain differentiation (Matthyssens & Vandenbempt, 2008; Reimann et al., 2010).

Research has extensively studied how globalization together with financialization affects markets. Technology diffusion across the globe speeds up through globalization because emerging economies benefit from cost-effective production systems (D'Aveni, 2014). Chinese, Indian and Southeast Asian low-cost manufacturers have lowered traditional market barriers leading to many industries focus on price competitiveness instead of technology development (Wagner et al., 2023).

Financialization reshapes market behavior through volatility that affects previously stable industries. The movement of institutional capital inflows into assets increases price correlations between asset classes thus reducing companies pricing power and leading to market convergence (Büyükşahin & Robe, 2014; Cheng & Xiong, 2014). Additionally, capital inflows increase market volatility which add to the weaker ability to control prices (Mensi et al., 2013; Reimann et al., 2010).

Deregulation creates an environment which drives industries toward commoditization especially when it affects industries that were previously protected by governments. According to Homburg et al. (2009) by removing the previously government-controlled entry barriers to an industry, firms experience reduced ability to differentiate products. Telecommunications, energy, and finance sectors demonstrate the effect of liberalization through which new competitors entered the market to produce intense price competition (Weil, 1996). Along with the lower entry barriers, deregulation decreases protection for proprietary advantages (Reimann et al., 2010). As the relaxation of regulations leads to increasing standardization across industries (Wagner et al., 2023).

2.1.7 Responses to commoditization

The following consolidation of responses is adapted from Matthyssens & Vandenbempt (2008), as described by Enke et al. (2022). The chapter differs from the antecedents of commoditization which relied heavily on the work of marketing scholars as it was built around the research of Matthyssens and Vandenbempt (2008) who in turn draw from strategic management literature. The authors propose that responding to commoditization can be done through innovation and superior offerings, customer bonding and relationship quality or operational excellence and fair value solutions. Two of these approaches focus on differentiation without price competition but the third approach includes price in relation to perceived value. A common way out of commoditization is for companies to use a combination of the responses (Matthyssens & Vandenbempt, 2008).

Wagner et al. (2023) categorize the ways in which firms respond to commoditization into either escaping or accepting the commodity trap as proposed by Schallmo et al. (2018). Within the escaping category, firms concentrate on differentiation through branding, product customization, innovation, and service improvements. Matthyssens & Vandenbempt (2008) as described by Enke et al. (2022), also supports this view by highlighting servitization and branding as the key tools that allow companies to maintain competitive advantage in commoditized markets. The first of the three approaches, innovation, and superior offerings, revolves around achieving this with strategic initiatives that promote servitization and branding.

A holistic framework of the different processes and mechanisms of these responses as identified from the literature is listed in the table below. The cells with grey backgrounds indicate different responses belonging to each of the categories and the white cells underneath those represent the different mechanisms through which they work.

Innovation and superior offerings	Customer bonding and relationship quality	Operational excellence and fair value solutions
Servitization	Developing strong customer relationships	Cost leadership
Smoothing services	Enhancing customer relationships to defend against demand cycles	Understanding cost structures and drivers
Adapting services	Segmentation and customer-tailored communication	Achieving process efficiencies
Substituting services	Targeting specific customer segments	Leveraging economies of scale
Digital servitization	Adopting a strong customer focus	Expanding production to spread fixed costs across a larger output reducing per-unit costs
Leveraging IOT	Continuously creating superior customer value	Systematic efficiency enhancements
Predictive maintenance	Aligning strategic focus with evolving market demands	Cost engineering
Data analytics for service delivery	Actively integrating customer preferences	Smart manufacturing
Digital twins	Implementing customer-focused selling	Automation and robotics
Smart services	Implementing a CRM system	Data analytics
Branding	Integrate customer data	Cyber-physical systems
Strategic positioning	Customize service and interactions	Predictive maintenance
Value communication	Foster enduring relationships	Digital supply chains
Customer branding	Enhance customer interactions and market understanding	Component innovation
	Create switching costs and barriers to entry	Portfolio streamlining
	Focusing on customer experience	Eliminating unprofitable product lines
	Managing all customer touchpoints	Focusing on high-margin offerings
	Effective customer journey design	Prioritizing core competencies
		Re-allocating resources to R&D

Table 3. Consolidated responses to commoditization.

Innovation and superior offerings include servitization, as a response to commoditization, which means manufacturers adding value enhancing services to their traditional product offerings (Oliva & Kallenberg, 2003). These additions create differentiation by leveraging product-service bundles to promote long-term customer relationships. Cusumano et al. (2015) categorize servitization into three types. First to smoothing services, which are for example warranties, maintenance, and technical support. Then to adapting services which include customization, solution provision and advanced consulting to tailor offerings. Lastly, substituting services which are substituting traditional ownership with service-based alternatives such as SaaS.

Servitization is also enhanced by digitalization, which opens new ways of differentiation. Digital servitization uses IoT, predictive maintenance and data analytics to improve service delivery and allows manufacturers to provide proactive, usage-based services that enhance performance and customer value (Gebauer et al., 2021; Mosch et al., 2021). Digital twins are virtual replicas of physical products that enable real time monitoring, predictive maintenance, and performance optimization (Grieves, 2019). This leads to lower operational costs, higher service efficiency and bespoke solutions which strengthen market differentiation. Smart services which are powered by IoT, AI and data analytics further allow firms to offer real time, personalized solutions (Gebauer et al., 2021). Service-based differentiation requires firms to realign their internal capabilities with market demands, redesign their business models, update their learning processes, and rebuild their overall capabilities (Forkmann et al., 2017; Parida et al., 2014).

B2B markets benefit from digital servitization as it creates a foundation for value-based differentiation. The implementation of technological integration combined with customer relationship management and service enhancements allows firms to establish competitive advantages in industries that are heavily commoditized. The adoption of digital-driven value propositions creates better conditions for businesses to protect their essential supplier position and financial stability (Ulaga & Eggert, 2006).

A powerful brand enables companies to set higher prices along with increasing customer commitment and establishing market distinction (McQuiston, 2004). As demonstrated by McQuiston (2004), commodity products can achieve successful branding through strategic positioning combined with value communication. Pennington and Ball (2009) describe customer branding as a method to establish unique brand identities based on customer requirements.

Customer bonding and relationship quality have a central role in mitigating commoditization as they establish lasting ties that create distinct value for clients beyond price (Matthyssens & Vandenbempt, 2008). By establishing deep connections with customers firms gain resistance to price wars and market standardization since they become integral to the customer experience. The approach works optimally in markets with fluctuating demand since firms can use relationship-based approaches to mitigate instability. Firms in the fine paper industry as studied by Alajoutsijärvi et al. (2001) established long-term customer relationships to absorb fluctuations in market demand which sustained their operations as they achieved better demand forecasting and production planning which minimized their exposure to market fluctuations. Albert (2003) supports the approach of micro-segmentation combined with customer-tailored communication as a method for companies to maintain customer retention while personalizing their value offerings in standard products.

According to Narver & Slater (1990) customer orientation allows firms to achieve superior customer value through continuous innovation and strategic alignment with the direction of market requirements. Customer-oriented firms systematically achieve higher performance through their ability to detect market shifts and their proactive response capability which enables them to develop adaptive business models that counteract commoditization (Frambach et al., 2016). Furthermore, firms implementing customer focused selling strategies have better financial results and durable product differentiation beyond mere feature comparisons (Leischnig & Kasper-Brauer, 2016).

The implementation of CRM systems enables these customer-oriented business models that help firms break free from commoditization by focusing on long-term relationships instead of price. The CRM tool integrates customer information with customized services and individualized communication to build lasting connections between a company and its clients (Payne & Frow, 2005; Reinartz et al., 2004). The implementation of CRM enables organizations to improve their customer interactions while building a detailed understanding of market needs that allows them to adjust proactively. According to Ernst et al. (2011) companies that implement a robust CRM system enhance their product performance by integrating market intelligence with customer insights which leads to better satisfaction and loyalty rates. The implementation of CRM acts as an industry differentiator in standardized markets since it creates switching costs and barriers to entry by making companies fundamental components of customer business processes (Reimann et al., 2010).

Firms increasingly understand the importance of delivering consistent and personalized interactions through all customer touchpoints (Verhoef et al., 2009; Lemon & Verhoef, 2016). Organizations that execute their customer experience well through the pre-purchase, purchase, and post-purchase stages build brand loyalty and maintain market position (Homburg et al., 2017). Companies that develop effective customer journey maps through straightforward and convenient interactions or exciting unpredictable experiences improve brand image while extending customer relationships (Siebert et al., 2020; Kuehnl et al., 2019).

Operational excellence and fair value solutions focus on cost leadership together with efficiency improvements and portfolio optimization which recognizes price as a determining factor for customer perceived value (Enke et al., 2022). Matthyssens and Vandenbempt (2008) state that that firms must achieve superior cost efficiency without engaging in a "race to the bottom" in pricing. Companies achieve this through economies of scale, digital transformation, and process innovations to create sustainable market advantages for profitability even in price-sensitive markets. A core element of this approach is to establish cost leadership with lowest production costs among industry competitors (Porter, 1980).

Expanding production enables firms to achieve cost leadership by leveraging economies of scale. Higher production volumes distribute fixed costs across more units which decreases the per-unit costs (Porter, 1980). However, these cost reduction strategies need to be accompanied by systematic efficiency improvements (Schallmo et al., 2018). One way to achieve this is through smart manufacturing utilizing automation combined with robots and data analytics, as this reduces costs without compromising quality (Kusiak, 2018).

According to Parhi et al. (2021) firms can further reduce operational downtimes and enhance resource utilization by integrating cyber-physical systems together with predictive maintenance and digital supply chains. The importance of this strategy is highlighted in high-technology industries where cost control directly affects competitive performance (Rangan & Bowman, 1992). Semiconductors, consumer electronics, and telecommunications which have rapidly fluctuating cost environments due to technological advancements are an example of such industries. According to Kusiak (2018) firms operating in those industries can use component innovation and smart manufacturing to achieve superior performance-to-price ratios and compete with aggressive pricing without eroding profitability.

Portfolio streamlining as a compression strategy enhances profitability by itself. This involves the company getting rid of unprofitable product lines and focusing on the profitable ones while prioritizing core competencies to optimize resource allocation. Product compression helps organizations to avoid destructive price wars because it allows companies to eliminate unprofitable products which enables more investment in R&D across the remaining product lines. However, to successfully execute a portfolio compression firms need to prevent losing customers and their presence in their market, setting demands for customer relationships and communication of strategic intent (Rangan & Bowman, 1992).

2.2 Dynamic capabilities

This chapter explores the theoretical foundations of dynamic capabilities and explores how they can be used as a framework for understanding how firms achieve and sustain competitive advantage. Building an argument that supports dynamic capabilities as a valuable lens to exploring how firms can adapt to survive commoditization. First by looking at the foundations of dynamic capabilities, and their origins as a solution to address the weaknesses of previous strategic management frameworks. Then by distinguishing them from ordinary and core capabilities as well as introducing Teece's (2007) influential tripartite model of sensing, seizing, and transforming. Additionally, this chapter reviews the key debates within DC literature including the nature of DCs as either routinized or improvisational and the firm specific or ecosystem level of analysis debate. Finally, the foundations section concludes with an exploration of the microfoundations of DC.

The second part of the chapter focuses on explaining what existing literature knows about the different processes and mechanisms that dynamic capabilities work through. Exploring the processes behind sensing, seizing, and transforming along with the necessary support mechanisms and the microfoundations that enable these processes. Additionally, this chapter sheds light on how the deployment and effectiveness of DCs depend on both internal and external conditions by addressing both lifecycle and contextual factors. Altogether, building a solid theoretical base for how to view dynamic capabilities as a strategic response to commoditization challenges. The most central and relevant DC theory contributions drawn in this thesis are listed in the table below.

The relevant key contributions to the DC literature listed in Table 4 below were utilized to ground the analysis. These studies were selected due to their impact on the development of DC theory. Teece et al. (1997) seminal paper, currently cited over 21 thousand times according to Scopus, established the core DC framework as a firm's ability to "integrate, build, and reconfigure competencies". Ten years later, published Teece (2007) builds on the earlier work by exploring the microfoundations of the sensing, seizing, and reconfiguring capabilities. A complementary perspective into the nature of dynamic capabilities is attained from Eisenhardt & Martin (2000), another widely cited paper with over ten thousand citations found from Scopus. Further expanding the understanding of how DCs are developed, Zollo & Winter (2002) offer insights into critical learning mechanisms. Finally, O'Reilly & Tushman (2008), provided a link between DCs and organizational adaptation by conceptualizing ambidexterity as simultaneous exploration and exploitation.

Author(s)	Study focus	Data/methodology	Main contribution
Teece et al., 1997	How firms achieve and sustain competitive advantage in rapidly changing markets.	A synthesis and critique of strategic management theories to develop the DC framework.	The ability to sense and seize opportunities has more utility in changing environments than traditional strategic planning approaches.
Teece, D. J., 2007	Nature and microfoundations of dynamic capabilities.	Combines social and behavioral sciences to identify microfoundations of DCs and integrates strategy and innovation literature into a framework.	DCs enables to establish, deploy and protect intangible assets crucial for superior long-term performance.
Eisenhardt & Martin, 2000	Nature of dynamic capabilities and development of market dynamism to advance the resource-based view (RBV).	Adopts an empirical approach to view dynamic capabilities as embedded firm processes.	DCs are distinct organizational processes that have similar characteristics among high-performing organizations.
Zollo & Winter, 2002	Development of dynamic capabilities through routinized activities.	Develops a framework that links behavioral and cognitive organizational learning theories to the evolution of dynamic capabilities.	DCs develop from tacit experiences which co-evolves with the process of articulating and codifying explicit knowledge.
O'Reilly & Tushman, 2008	Synthesis of DC and ambidexterity theory to explain how firms sustain competitive advantage through exploration and exploitation.	Reviews and integrates research on DCs and ambidexterity to identify propositions and examples of ambidexterity as a dynamic capability.	How ambidexterity functions as a dynamic capability for organizational adaptation through time. Efficiency and innovation are not necessarily trade-offs.

Table 4. Central prior studies on dynamic capabilities.

2.2.1 Conceptualizing dynamic capabilities.

Dynamic capabilities were developed to address the limitations found in earlier frameworks such as five forces (Porter, 1979) which did not properly define firms and their internal capabilities (Teece, 2009). Drawing from the entrepreneurship, behavioral theory of the firm, transaction cost economics and the evolutionary view of the firm (Cyert

& March, 1963; Williamson, 1991; Nelson & Winter, 1982) to create a framework that enables firms to maintain superior performance in dynamic environments.

Firm capabilities are a central concept of strategic management as they describe an organization's ability to deploy and coordinate resources to achieve its strategic targets (Teece, 2014). However, not all capabilities have a similar impact on strategic outcomes. The main distinction lies between ordinary capabilities which concentrate on operational efficiency and DCs that enable firms to adapt and transform their resource base (Winter, 2003; Teece, 2014). Ordinary capabilities also known as operational capabilities are utilized to execute established business processes efficiently enabling firms to sustain their regular daily operations (Winter, 2003). They are essential for firms but lack in terms of inherent adaptability, although some scholars like Helfat and Winter (2011) note that firms can use them for dynamic purposes as some level of change always exists.

Additionally, there are core capabilities which are the fundamental embedded competencies forming the basis of a firm's strategic positioning and competitive differentiation (Prahalad & Hamel, 1990). If not modified according to changes happening in the markets, they can become core rigidities (Leonard-Barton, 1992). Enabling this modification are DCs which allow firms to maintain their existing core capabilities while continuously learning and adapting to change.

Since their inception, DCs have been defined as the mechanisms of resource base adaptation aiming for sustained competitive advantage (Schilke et al., 2018). According to the definition by Teece et al. (1997) they are "the firm's ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments". The term "dynamic" is used to emphasize the changing nature of the environment and the term "capability" as adapting, integrating, and transforming organizational skills and resources (Teece et al., 1997).

Eisenhardt & Martin's (2000) definition of DCs as "specific, identifiable processes (e.g. product development and strategic decision-making) that create value in dynamic markets", emphasizes that they are repeatable yet flexible processes. Helfat (2007) further defined DCs as "the capacity to purposefully create, extend, or modify the resource base", emphasizing their deliberate and goal-oriented nature. However, a major debate remains regarding whether DCs are necessarily unique and inimitable (Teece, 2014), or whether they can be treated as "best practices" that are comparable across firms (Eisenhardt & Martin, 2000).

Teece (2007) expanded the framework by proposing a tripartite scheme of sensing, seizing, and transforming. He emphasized the microfoundations of DCs, pointing out that they are not only found in the organizational processes but also in managerial cognition which is affected by firm structures and the bounded rationality concept of the behavioral theory of the firm (March et al., 1993; Arndt & Pierce, 2018). It is important to note that DCs cannot be bought as they must be developed through learning, experience, and deliberate investment (Teece & Al-Aali, 2012).

The tripartite framework offers a structured understanding of dynamic capabilities as an integrated process. The foundations of sensing capabilities are influenced by organizational goals and bounded rationality. Whereas the seizing capabilities capture the "choice and control" aspects of the behavioral theory of the firm (March et al., 1993; Arndt & Pierce, 2018). Lastly, transforming capabilities mitigate the risk of firms falling into competency traps where their existing core capabilities become core rigidities (Leonard-Barton, 1992).

Several key debates remain. One of the issues is the level of routinization as opposed to improvisation in DCs. Teece (2007) stated that DCs are a systematic process that can be systematically developed. For example, a firm might have a structured approach to new product development. Whereas, Eisenhardt & Martin (2000) had argued that in high-velocity markets, DCs are often more of an emergent and experimental process requiring real-time adaptation. Suggesting that the most appropriate approach may be contingent on the industry context.

A second remaining issue is the level of analysis. While Teece (2007) focuses on firm-specific capabilities, Adner (2016) on the other hand emphasizes that DCs often involve exchanges within ecosystems and extend beyond firm boundaries. For instance, the ability of a manufacturer to innovate may not only depend on its internal R&D but also on its ties with suppliers.

The RBV theory (Wernerfelt, 1984; Barney, 1991) a direct predecessor to DC theory states that firms can gain superior performance through possessing resources that are valuable, rare, inimitable, and non-substitutable (VRIN). The theory has been criticized for being static, and thus, not fully capturing how firms respond to changing environments. DC theory addresses this limitation by describing how firms change, reconfigure, and develop resources to stay relevant in the future. Organisations with strong DCs can continuously adapt their resource base to address disruptions (Helfat, 2007).

2.2.2 Processes and mechanisms of dynamic capabilities

This chapter explores the processes and mechanisms that enable firm adaptation as discussed in the foundations of dynamic capabilities chapter. Additionally, positioning them within the strategic management literature and critically assessing their contributions. Although there is a consensus on the strategic role of DCs, there is still much debate on their nature and how they should be implemented.

One of the most widely used frameworks is Teece’s (2007) tripartite framework (Linde et al., 2021). Its mechanisms ensure that firms can identify changes in their environment, align resources accordingly, and redesign their capabilities to remain competitive. Importantly, DCs provide firms with a set of strategic decisions that can improve their performance (Eisenhardt & Martin, 2000; Teece, 2007). This chapter will discuss each of these processes in detail and then examine the microfoundations of each of them.

Sensing is the ability through which a firm identifies, understands, and anticipates changes taking place in its environment. This entails proactively gathering market intelligence, investing in R&D, and stimulating knowledge-sharing mechanisms (Teece et al., 1997). Organizational learning is critical in this regard, making sure that firms are open to identifying market changes (Zollo and Winter, 2002). However, a debate exists on whether sensing has more to do with being proactive or reactive. According to Teece (2007), firms should proactively explore emerging trends while Eisenhardt and Martin (2000) propose that firms tend to use more adaptive incremental sensing. The assumption of the proactive approach is that firms can accurately forecast future trends, while the reactive approach acknowledges the impact of volatility in different environments. Managerial cognition is also very relevant as biases and cognitive heuristics affect the interpretation of market signals (Barreto, 2010).

Seizing entails the exploitation of opportunities previously identified through the sensing capabilities. This involves re-allocation of resources, business model innovation and purposeful investments (Helfat, 2007). As discussed by Bingham and Eisenhardt (2011) these activities are closely related to the different decision-making processes, organizational flexibility and the coordination of complementary assets conducted by firms. One of the central questions raised concerning seizing capabilities is the extent to which dynamic managerial capabilities play a role (Adner & Helfat, 2003). Some scholars have pointed out that the role of management expertise in coping with uncertainty is crucial, while others have argued that the structure and procedures of the firm are also important (Teece, 2007). Another issue is the question of speed versus strategic consistency. Eisenhardt and Martin (2000) has recommended quick decision-making in dynamic markets while Teece (2007) has warned against making hurried decisions.

Reconfiguring involves adapting an organization’s assets to maintain competitiveness. Involving the reallocation of resources, process innovation and change management (O’Reilly & Tushman, 2008; Teece, 2007). It is an especially crucial capability when facing disruptions in technology, regulations, or competitive dynamics (Helfat, 2007). However, to remain on course strategically, firms must balance this flexibility with stability. Therefore, organizational ambidexterity, which is the process of aligning the optimization of existing competencies with the creation of new ones, becomes essential (O'Reilly & Tushman, 2008).

The development of DCs is enabled by several mechanisms. Crucial for all of them is organizational learning including both experimentation through trial and error, as well as deliberate learning by codifying best practices (Zollo & Winter, 2002). On top of the ability to absorb external market information (Cohen & Levinthal, 1990). Typically, DCs are embedded in the different organizational routines and managerial decision-making processes to enhance predictability and adaptation (Eisenhardt & Martin, 2000). Additionally, the different leadership behaviors, company culture and cognitive capabilities influence how firms navigate change (Teece, 2007).

2.2.3 Microfoundations of dynamic capabilities

Microfoundations of DCs are critical for capturing the full picture of DC processes and mechanisms. According to Teece (2007) they are the "distinct skills, processes, procedures, organizational structures, decision rules, and disciplines" behind those processes. The research on microfoundations examines higher-level phenomena through lower-level elements, consisting of main effects I.e., individuals, processes, and structures along with interaction effects I.e., the relationships of these elements, leading into dynamic capabilities (Felin et al., 2012).

Microfoundations of sensing capabilities include collection of market intelligence, interpretation of external developments, identification of target market segments, understanding customer needs and creating new business models (Conboy et al., 2020). Furthermore, and most importantly nurturing an internal culture of awareness to external changes (Teece, 2007; Kump et al., 2019).

Microfoundations of seizing capabilities include e.g., evaluating decision-making practices, partnerships, distribution channels, product development initiatives and resource mobilization activities to choose from to capture the identified opportunities (Conboy et al., 2020). Additionally, they include the routines a firm establishes for decision-making under uncertainty involving reallocating resources, adapting business models and fostering close relationships with key stakeholders (Kump et al., 2019; Teece, 2007).

Microfoundations of reconfiguring capabilities include different re-engineering processes, reconfiguring capabilities, knowledge management, co-specializing assets, and dynamic asset alignment (Conboy et al., 2020). Additionally, they include processes for organizational restructuring, process development routines, leadership development programs and knowledge management and transferring capabilities (Kump et al., 2019; Teece, 2007).

2.3 Applying the dynamic capabilities lens to commoditization

This chapter integrates the two streams of literature and proposes a framework that can help firms to survive commoditization. Commoditization poses a major challenge to sustain competitive advantage and firm profitability (D'Aveni, 2014; Enke et al., 2022). However, traditional static frameworks do not offer much guidance on how to address rapidly changing and commoditized markets (Teece, 2009), whereas the DC approach offers a useful way of understanding how firms can adapt, innovate and reconfigure their resources to avoid getting stuck in price competition (Teece et al., 1997).

This thesis argues that the utilization of sensing, seizing, and transforming capabilities (Teece, 2007), and their underlying microfoundations (Felin et al., 2012; Teece, 2007), is essential for achieving differentiation, long lasting customer relationships and operational excellence when trying to survive commoditization (Matthyssens & Vandenbempt, 2008). The chapter begins by linking the drivers of commoditization (Enke et al., 2022) with sensing capabilities essential to understanding market change. Then moving to analyzing how seizing capabilities (Teece, 2007) can help firms to deploy responses such as servitization (Oliva & Kallenberg, 2003), branding (McQuiston, 2004) and cost leadership (Porter, 1980; Matthyssens & Vandenbempt, 2008) to answer commoditization. Then lastly, exploring how transforming capabilities (Teece, 2007) enable firms to build long-term resilience and avoid commodity traps (D'Aveni, 2014).

2.3.1 Sensing the drivers of commoditization

Despite commoditization influencing products and industries differently (Reimann et al., 2010; Luther, 2022; Wagner et al., 2023) the result is eventually the same. Firms' ability to charge premium prices and remain profitable is drastically affected (D'Aveni, 2014; Enke et al., 2022). Traditional strategic frameworks which are useful for analyzing industry structures are not very helpful when it comes to adapting to dynamic markets (Teece, 2009). From this perspective, the DC framework becomes a valuable lens for analyzing how firms can survive and even excel when experiencing commoditization (Teece et al., 1997).

One of the most important factors in fighting commoditization is the ability to detect changes occurring in the market. Sensing capabilities, as described by Teece (2007) in his tripartite model, offer a perspective into what the different processes and mechanisms related to this capability are. To avoid falling into the commodity trap (D'Aveni, 2014) it is not enough to just respond to market changes, instead a capability is needed to proactively anticipate and interpret how different changes in the market can potentially develop into challenges like commoditization (Teece, 2007).

The antecedents of commoditization discussed in existing literature e.g. (Enke et al., 2022), help companies to direct their sensing efforts into commoditization drivers with the most relevance for their specific circumstances. For instance, rapidly advancing disruption to technology (Enke et al., 2022; Olson & Sharma, 2008) can make existing products obsolete and lead to more affordable options for buyers. Companies that have the needed sensing capabilities, supported by adequate R&D spending and a systematic way of tracking technological advancements (Teece, 2007; Kump et al., 2019) are in a better position to detect these disruptions.

In the same way, growing market transparency stemming from e.g., e-commerce platforms (Wagner et al., 2023) requires adequate sensing capabilities and mechanisms to monitor competitor prices, product attributes and customer feedback in real time (Teece, 2007). This includes gathering data, but more importantly the ability to interpret it to produce meaningful insights to recognize emerging threats and opportunities (Conboy et al., 2020; Teece, 2007). In addition, sensing capabilities need to be developed to understand changes in customer expectations, and price sensitivity (Mooi & Frambach, 2012; Teece, 2007). Utilization of CRM systems could be a viable option for this (Payne & Frow, 2005; Reinartz et al., 2004) along with market research and a culture of customer intimacy embedded into the company (Teece, 2007; Reimann et al., 2010).

The debate between proactive and reactive sensing (Teece, 2007; Eisenhardt & Martin, 2000) is especially important for this perspective. Proactive sensing in most situations is preferred (Teece, 2007), but firms operating in industries experiencing rapid changes may have no other options but to rely on developing agile and responsive sensing mechanisms to cope with unexpected changes (Eisenhardt & Martin, 2000). However, what really determines if a firm can anticipate and interpret the drivers of commoditization is the microfoundations of sensing regarding how well they gather market intelligence, understand it, and create a culture of external awareness (Conboy et al., 2020; Kump et al., 2019; Teece 2007).

2.3.2 Seizing the opportunities to respond

After identifying the possibility of future commoditization or its current impact, firms must be able to capture opportunities to differentiate themselves or reduce negative impacts. This means utilizing the seizing capabilities in the DC framework which entails making strategic choices and backing those decisions by committing to investing resources (Helfat, 2007; Teece, 2007).

Such choices are directly related to the following strategies that firms can use to respond to commoditization. For example, firms can use the seizing capabilities to employ servitization strategies that imply the deployment of value-added services to products and thus changing the competitive focus away from price (Matthyssens & Vandenbempt, 2008; Oliva & Kallenberg, 2003). Requiring the ability to change business models, develop new service offerings and harmonize services to product offerings (Cusumano et al., 2015; Forkmann et al., 2017).

Another key response to commoditization is strong branding (McQuiston, 2004) which as well depends on seizing capabilities (Teece, 2007) to e.g., capture opportunities to build customer loyalty and create perceived differentiation on factors not relating to price. This requires committing to spending on marketing, creating distinct brand identities (McQuiston, 2004) and developing strong customer relationships (Matthyssens & Vandenbempt, 2008; Pennington & Ball, 2009; Stanton & Herbst, 2005).

Even the responses focused on operational excellence and fair value solutions (Matthyssens & Vandenbempt, 2008) cannot be implemented without seizing capabilities (Teece, 2007). As they require firms to have the capability to implement the cost-cutting initiatives (Enke et al., 2022), process efficiency improvements (Schallmo et al., 2018) and portfolio optimization (Rangan & Bowman, 1992) without diminishing the perceived value of their offerings. Necessitating the capability to make the right decisions concerning reallocating resources (Teece, 2007), adopting new technologies such as smart manufacturing (Kusiak, 2018) and process innovation (Teece, 2007; Kump et al., 2019).

Hence, the microfoundations of seizing, for instance, decision-making routines, resource allocation processes, and partnerships with other firms (Conboy et al., 2020; Kump et al., 2019; Teece, 2007) are essential to the effective implementation of any commoditization response. The debate on the appropriate tradeoff between the speed of decision making and strategic consistency (Eisenhardt & Martin, 2000; Teece, 2007) becomes especially relevant when seizing opportunities in environments where responses to competition must be made fast.

2.3.3 Reconfiguring to escape the commodity trap

Responding to commoditization is not a one-time occurrence, as to be truly resilient over the long-term and to prevent getting caught in any of the commodity traps identified by D'Aveni (2014), firms need to have the ability to transform. The reconfiguring capabilities enable firms to adapt their resource base according to changes happening in the markets and therefore stay ahead of competition (Teece, 2007).

The deterioration trap (D'Aveni, 2014) which is a price war, can be combatted with reconfiguring capabilities that enable operational excellence through process innovation (Matthyssens & Vandenbempt, 2008; Teece, 2007) or alternatively by introducing a disruptive innovation that creates entirely new value propositions.

To escape from the proliferation trap (D'Aveni, 2014) which leads to market fragmentation through niche offerings firms need transforming capabilities to alter their product portfolio (Rangan & Bowman, 1992; Teece 2007) focus on specific customer segments (Albert, 2003) or create new business models to e.g. aggregate demand (Teece, 2007).

The escalation trap (D'Aveni, 2014) entails unsustainable price reductions simultaneously to increasing product feature enhancements, necessitates transforming capabilities that can change the basis of competition (Teece, 2007), for instance, through customer experience (Lemon & Verhoef, 2016), service integration (Olivia & Kallenberg, 2003) or creating a strong brand ecosystem (McQuiston, 2004).

The microfoundations of the reconfiguring capabilities which include the routines associated with organizational restructuring processes, process innovation, leadership development and effective knowledge management (Conboy et al., 2020; Kump et al., 2019;

Teece, 2007) play an essential role when escaping any of these traps. Organizational ambidexterity which enables companies to maintain cost leadership alongside differentiation becomes vital for transforming capabilities (O'Reilly & Tushman, 2008). Aligning with the cyclical view of commoditization (Greenstein, 2004; Matthyssens & Vandenbempt, 2008) as companies alternate between phases of price competition and differentiation.

2.4 Theoretical framework: Surviving commoditization

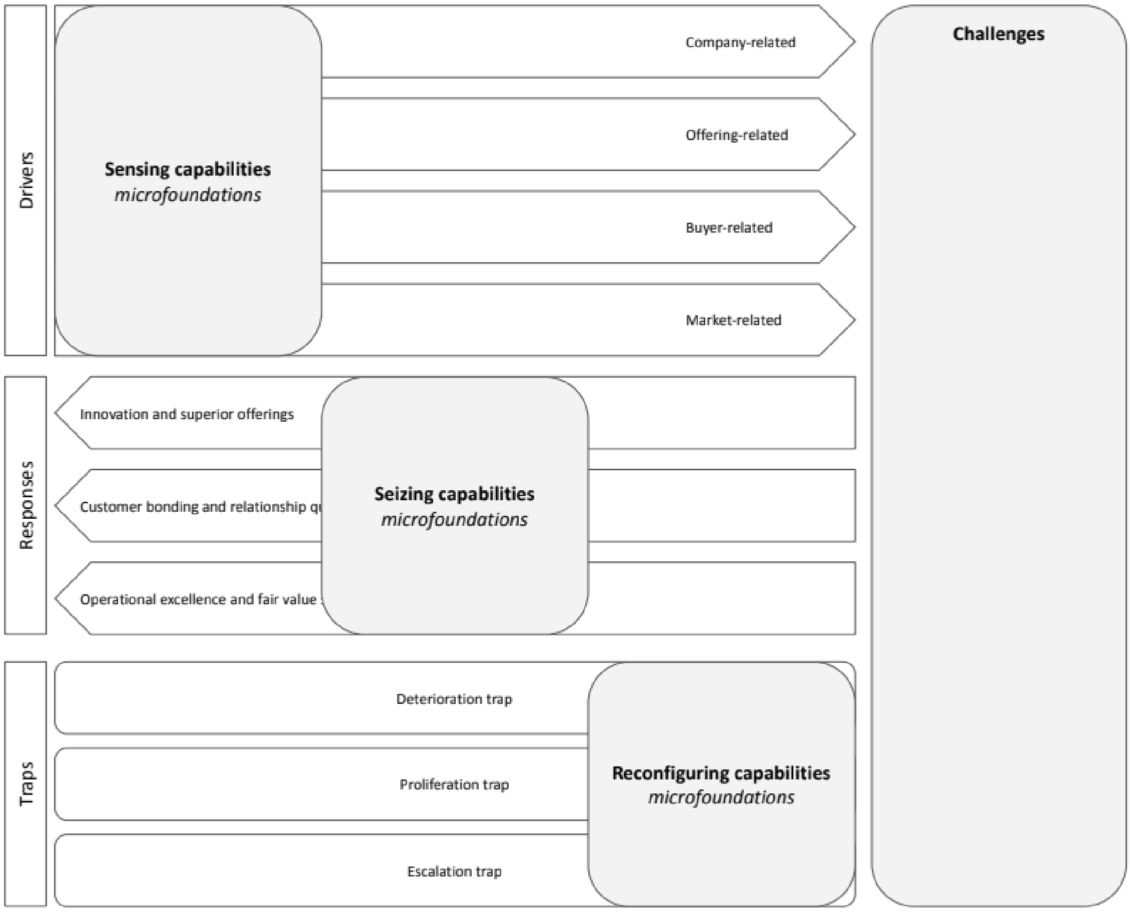

Figure 5. Theoretical framework.

3 Methodology

This chapter introduces the methodological approach adopted in this thesis by defining the research strategy and specific methods employed, to facilitate a systematic exploration of this fundamental industry challenge. The chapter justifies the selection of a qualitative inductive research strategy and the multiple-case study design. Furthermore, it describes the purposeful sampling process used for selecting the case companies. Then the process of data collection, through semi-structured interviews with key informants. Finally, the chapter details the systematic data analysis techniques utilized, such as the Gioia methodology for coding and theme development, for the within-case and cross-case analyses.

3.1 Research strategy and method

This thesis utilizes a qualitative inductive research method to examine the research question: *How do industrial equipment manufacturers leverage dynamic capabilities to survive commoditization and sustain competitive advantage?* Answering this research question requires a qualitative approach because of the depth of analysis needed to understand such complex organizational processes, subjective experiences of managers in decision-making situations and to synthesize dynamic capabilities with strategic responses to market pressures (Pratt, 2009; Gehman et al., 2018; Creswell & Creswell, 2018). Compared to quantitative approaches which are more suitable for measuring the frequency or correlation of variables (Pratt, 2009), qualitative approaches are better at exploring the how and why questions behind organizational actions and their results.

The argumentation line of this thesis follows inductive logic by developing theory from patterns and themes identified from empirical data, instead of trying to validate an already existing hypothesis. As the thesis is exploratory in nature and proposes a novel synthesis of dynamic capabilities and commoditization research in the context of industrial equipment manufacturing, the inductive approach is appropriate as there is minimal existing research to draw hypotheses from (Saunders et al., 2019).

A substantial body of knowledge exists on dynamic capabilities (Teece et al., 1997; Eisenhardt & Martin, 2000; Helfat, 2007), and commoditization has seen an increase in popularity among marketing scholars (Enke et al., 2022; Wagner et al., 2023), however the empirical evidence of the specific mechanisms used to deploy dynamic capabilities to survive commoditization lacks thorough investigation especially in this specific industry context. This study addresses this under-explored area by building grounded theory (Glaser & Strauss, 1967; Suddaby, 2006) using an iterative process of data collection and analysis through active categorization, which emphasizes the researcher's active role in constructing, refining, and relating categories to build theory from data (Grodal et al., 2021).

A multiple-case study design was selected to analyze the phenomenon in multiple organizational settings for richer comparison as it enables to discover both common patterns and isolated variations in how companies develop their dynamic capabilities to fight commoditization pressures (Yin, 2018; Eisenhardt, 1989). Additionally, it enhances the external validity and generalizability of the findings compared to a single case study and increases the confidence that the observed patterns are not specific to a single organization (Yin, 2018). The study design allows for a better foundation to theoretical development through cross-case analysis as it identifies contrasting outcomes from different approaches to deploying dynamic capabilities (Eisenhardt, 1989).

The research design follows the theory-method fit principle by maintaining proper alignment between the research question, theoretical framework, data collection and analytical methods (Gehman et al., 2018). Active categorization is utilized to integrate an exploratory research question about unfolding processes, dynamic capabilities as a theoretical lens, semi-structured interviews, and inductive logic to achieve this alignment. This ensures a coherent and rigorous research approach to study the complexities of commoditization. Additionally, this study follows best practices for qualitative data presentation and analysis (Pratt, 2009).

3.2 Case selection process

To facilitate the research synthesis, the case selection process followed the principle of purposeful sampling (Patton, 2015), which was adapted for case selection based on the recommendations by Suri (2011). Purposeful sampling focuses on the selection of cases that provide a wealth of information about issues of central importance to the research question (Patton, 2015). Aiming to achieve a comprehensive understanding and to generate transferable theoretical insights instead of statistical generalization to a larger population (Patton, 2015; Yin, 2018).

Determining sample size and selecting case companies was further guided by the concept of information power (Malterud et al., 2016), which suggests that the more relevant information a sample has, the fewer cases are required. Even though the concept of saturation is often used to justify sample size in qualitative research, this study has chosen information power as the guiding principle, as Malterud et al. (2016) and Saunders et al. (2018) point out that the application of saturation is often vague and inconsistent, especially outside of grounded theory. However, saturation is considered as a secondary indicator within the larger framework of information power (Malterud et al., 2016).

According to Malterud et al. (2016), there are five key elements that influence information power. The first element and its application to this thesis is study aim, which in this case is focused, examining empirically the utilization of dynamic capabilities to survive commoditization inside defined industry boundaries. Then sample specificity is achieved by selecting only cases that are industrial equipment manufacturers and currently implementing de-commoditization strategies. Then the use of theory by drawing on existing theories of dynamic capabilities (Teece et al., 1997; Eisenhardt & Martin, 2000; Helfat, 2007) and commoditization (D'Aveni, 2014; Enke et al., 2022; Wagner et al., 2023). Then the quality of dialogue, which was ensured by question design, piloting the interview protocol and establishing rapport with interviewees. Finally, the analysis strategy, which in this case was a multiple-case study design with a cross-case analysis that generally would require a larger sample size to capture variation but given the high specificity of the cases and the utilization of the Gioia methodology (Gioia et al., 2013), this need is partially mitigated.

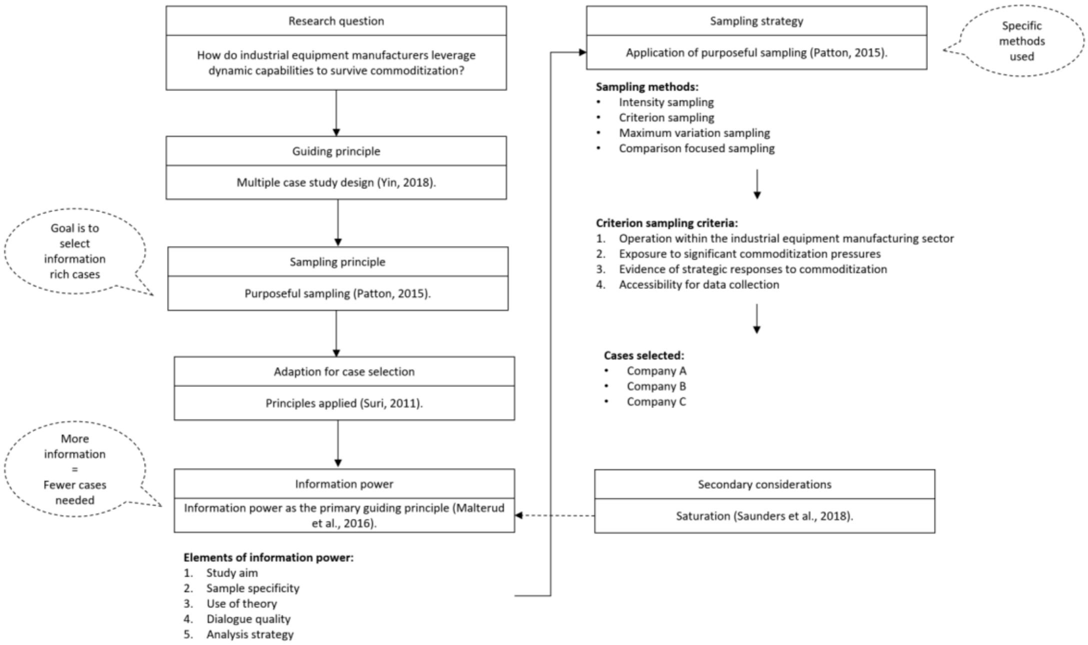

Figure 6. Case selection process.

More specifically, this study combined intensity sampling, criterion sampling, maximum variation sampling and comparison-focused sampling (Patton, 2015). Intensity sampling was used to select companies that are currently fighting commoditization and are considered industry leaders and thus are intensely affected by the phenomenon of interest. Criterion sampling ensured that all case companies were operating in the industrial equipment manufacturing sector, exposed to significant commoditization pressures, have shown strategic responses to commoditization and available for data collection by interviews. Maximum variation sampling was used to ensure variance in the approaches within the industrial equipment sector, by choosing cases that had differing product markets, drivers of commoditization and strategic responses. Finally, the selection allows for meaningful comparisons across cases (Patton, 2015), highlighting both the identical patterns I.e., literal replication and different approaches I.e., theoretical replication in the use of dynamic capabilities (Yin, 2018).

The chosen cases deliver valuable insights but do not represent an exhaustive exploration of all the different possible manufacturing companies facing commoditization. Additionally, the findings of this research are not intendent to achieve statistical generalizability but instead produce empirical evidence to enhance theoretical insights (Patton, 2015). The qualitative data collection process ran iteratively which assisted in evaluating information power throughout the data collection process, and to decide potential sample modifications according to Malterud et al. (2016) and Saunders et al. (2019). The collection of data reached informational redundancy, after which new interviews offered fewer novel insights about the research question (Gentles et al., 2015; Saunders et al., 2018), despite saturation in its strict grounded theory sense was not aimed for.

3.3 Data collection

This study involved three industrial equipment manufacturers anonymized as company a, b, and a. The research strategy and case selection methods directed the data collection to acquire detailed information about how these manufacturers use dynamic capabilities to combat commoditization and maintain competitive advantage. Throughout the data collection process, methodological rigor concerning construct validity and reliability were emphasized by including multiple data sources and systematic data collection procedures (Gibbert et al., 2008; Yin, 2018).

The chosen research design relied primarily on semi-structured interviews. This method was chosen to deliver both depth and contextual findings. The interviews allowed to explore how and why strategic actions and capability development happened, by shedding light on to the thoughts and experiences of key managers who sensed market changes, seized opportunities and re-configured resources (Eisenhardt & Graebner, 2007;

Gioia et al., 2013). Additionally, the interviews aimed to reveal tacit information and processes underlying dynamic capabilities within the organizations.

The primary empirical data was collected through nine semi-structured interviews in the three case companies, three at company a, two at company b and four at company c. The participants for the study were selected using the principles of purposeful sampling to include people who are most knowledgeable about and directly involved in corporate functions that deploy dynamic capabilities when responding to commoditization (Patton, 2015). These interviewees can be considered as information rich informants (Malterud et al., 2016) who are well placed to give insight into the phenomenon given the use of intensity sampling in case selection.

Participants included corporate strategy, business development, M&A, market intelligence, product management and sales roles. Their positions ranged from senior vice president, director, senior manager, manager, and senior analyst in the corporate and divisional levels. Exact roles are generalized in table 5 below, to protect interviewee anonymity. The interviews enabled to capture different perspectives, from the broad strategic level to the operational level of implementation (Eisenhardt & Graebner, 2007). Contact and identification were conducted through existing professional contacts and networking.

Interviewee	**Profile of interviewee**	**Length**	**Date**
1	Senior Leadership, Corporate (Strategy)	56 min	23.01.2025
2	Analyst (Strategy)	59 min	29.01.2025
3	Manager (Product Management)	51 min	05.02.2025
4	Manager (Business Development)	58 min	21.03.2025
5	Manager (Strategy)	64 min	28.03.2025
6	Senior Leadership, Division (Product Line)	61 min	07.04.2025
7	Director (Strategy/Business Development)	55 min	09.04.2025
8	Director (Technology/R&D)	54 min	09.04.2025
9	Senior Leadership, Division (Product Line)	53 min	15.04.2025

Table 5. Summary of interviews.

An interview guide which included seven core questions was sent to the participants before the interview which was flexible enough to allow probing and adapting to emergent themes, which is important in inductive inquiry (Gioia et al., 2013). Two main versions of the guide were developed for different functions, one for strategy and business development roles and another for product management and sales roles, with minor adjustments for corporate and division level participants as well as for the specific company context. The guide focused on areas of interest such as perceptions of commoditization, sensing of market information, specific strategic responses, differentiation efforts, the role of innovation, explicit perceptions of dynamic capabilities, operational trade-offs, and general reflections. Consistent with rigorous practice (Pratt, 2009; Gibbert et al., 2008), the guide was pretested with a knowledgeable industry respondent, and some minor changes in wording and sequencing were made.

3.4 Data analysis

The data analysis for this thesis employed an inductive process to develop a grounded theoretical framework to understand how the case companies implement dynamic capabilities to survive commoditization. Before applying the Gioia methodology (Gioia et al., 2013), the complete dataset of interview transcripts and detailed interview notes when recordings were not used, were manually organized and familiarized. The core analysis method chosen provided a structured framework that increased the rigor of the interpretive research.

A within-case analysis for each of the companies started with open coding the interview data to generate 1st-order concepts that maintained interviewee language and meaning. These where then grouped into more abstract 2nd-order themes through comparison and interpretation. The 2nd-order themes were constructed corresponding to relevant microfoundations of dynamic capabilities following the research framework. Lastly, the microfoundations as 2nd-order themes fell under the aggregate dimensions of dynamic capabilities as derived from the theoretical framework i.e., sensing drivers of commoditization, seizing opportunities to respond and reconfiguring to escape the commodity trap. The within-case analysis resulted in comprehensive data structure tables presented below, providing a clear chain of evidence (Gibbert et al., 2008).

The within-case data structures formed the basis for the cross-case analysis, which included systematic evaluation to identify both similar patterns I.e., literal replication and theoretically meaningful variations I.e., theoretical replication between the three companies (Yin, 2018). Rigor was maintained by using the Gioia methodology (Gioia et al., 2013) data structures transparently, while conducting comparative cross-case analysis to support the methods used during collection to enhance study trustworthiness (Lincoln et al., 1985).

Aggregate dimensions *Dynamic capabilities*	**2nd Order themes** *Microfoundations*	**1st Order concepts** *Open coding of single statements*
Sensing *drivers of commoditization*	**Competitor and market intelligence (MI)**	▪ Market intelligence function ▪ Continuous monitoring ▪ Following competitors ▪ Tracking macroeconomic indicators ▪ Monitoring adjacent industries ▪ Monitoring end customer segments ▪ Attending trade shows ▪ Strategic foresight projects ▪ Competitor benchmarking
	Gathering insights on customers and partners	▪ Identifying customer problems ▪ Anticipating customer problems ▪ Scanning customer requirements ▪ Customer interfacing feedback ▪ Observing equipment operators ▪ User forums for prototypes ▪ Talking to customers ▪ Surveys ▪ Sales team feedback ▪ Customer intimacy ▪ Co-operating with OEMs
	Scanning technology trends	▪ R&D inputs of technology development ▪ Utilizing data from connectivity sensors ▪ Internal expertise on customers operations ▪ Monitoring OEMs technology development

		▪ Anticipating future megatrends ▪ Ramping up IPR and patents ▪ Staying current on AI
	Challenges in sensing	▪ Balancing customer needs and efficiency ▪ Need for gate keeping protocol ▪ Challenging to gather data on customers ▪ Developing a library of customer information ▪ Information in Silo's ▪ Limitations on sensor data ▪ Potential short-term bias of MI focus on core markets
Seizing *opportunities to respond*	**Positioning offering to premium segment**	▪ Strong brand positioning as "Premium player" ▪ Technology leader ▪ Market leadership in niche segments ▪ Focusing on non-price related factors e.g., reliability and quality ▪ Driving the direction of the industry ▪ Purposefully avoiding price competitions
	Leveraging market leadership	▪ Driving pricing to premium ▪ Best in class profitability ▪ Attractive partner in M&A ▪ Acquiring only market leaders ▪ Reactive pricing to protect market share from new entrants aggressive pricing
	Directing investments to innovations and R&D	▪ Innovations as the winning formula ▪ Continuous renewal through innovations ▪ R&D as the "life insurance" of the company ▪ Doubling R&D investments ▪ Shift cost from overheads to R&D ▪ High margins enabling R&D spending ▪ Focus on superior reliability and profitability outcomes
	Developing servitization solutions	▪ Digitalization to solutions ▪ Digital control solutions ▪ Connectivity insights ▪ Service focus ▪ Improving customer stickiness ▪ Exploring as-a-service business models ▪ Lifecycle value of data ▪ Step-by-step approach
	Challenges in seizing	▪ Gap between planning and execution ▪ Seizing as a weak point ▪ Execution is demanding ▪ Commercialization challenge ▪ Acquiring a bigger picture of customers perspective ▪ Timing of innovations is difficult ▪ Impact of decency on OEMs

		▪ Short-term viewpoint of management ▪ Complexity of NPD process ▪ Challenging to prioritize in NPD ▪ As-a-service business model hurdles
Reconfiguring *to escape the commodity trap*	**Structure and agility of organization**	▪ Divisional structure ▪ Flat organizational structure that enables execution and responsiveness ▪ Decision making close to customers ▪ P&L responsibility driving action ▪ Less corporate bureaucracy ▪ Divisional product management capability
	Portfolio management	▪ Premium vs value segment management ▪ Avoiding low-value segments ▪ Trimming offering for efficiency ▪ Modular product design for standardization and efficiency ▪ Differentiation from innovations offered on top of a modular base ▪ Hiding standardization from customers
	Capability development	▪ Need for continuous training ▪ Ramping up patenting and IPR ▪ Integrating business processes to product management responsibilities ▪ Aligning product management with sales ▪ Shifting resources (Costs from overheads to R&D) ▪ Co-operating with OEMs
	Challenges in reconfiguring	▪ Courage and a long-term view needed from management ▪ Balancing pressures to generate profits and investments ▪ Combating siloing ▪ Aligning interests ▪ Using common sense

Table 6. Comprehensive Gioia data structure (Company A).

Aggregate dimensions *Dynamic capabilities*	**2nd Order themes** *Microfoundations*	**1st Order concepts** *Open coding of single statements*
Sensing *drivers of commoditization*	**Understanding customers**	▪ Knowing customers' problems and operations ▪ Partnership approach in customer relationships ▪ Developing solutions co-operatively ▪ Holistic picture of unique customer situations ▪ Being close to customers ▪ Constant contact with customers for up-to-date feedback

		▪ Understanding how customers buy ▪ Focus on delivering added value
	Monitoring customer and market trends	▪ Anticipating shifts in the market ▪ Monitoring competitor's technology offerings ▪ Awareness of trends in standardization ▪ Awareness of customers cost pressures ▪ Tracking technology trends in adjacent industries (EV) ▪ Assessing competitor strategies ▪ Awareness of regional differences (Emerging economies)
	Structured foresight process	▪ Detailed strategic vision for 5 years ahead ▪ Commonly agreed situational diagnosis ▪ Need for documented insight flow ▪ Learning from failures ▪ Formal strategy process
Seizing *opportunities to respond*	**Focus on executing strategy by prioritizing**	▪ Seizing as the most critical capability for strategy execution ▪ Converting customer needs into sellable and supportable offerings ▪ Prioritizing best ideas ▪ Saying no to some ideas. (Trade-offs) ▪ Systematic execution towards vision ▪ OKR framework for execution ▪ Importance of good strategy
	Technology leadership for value creation	▪ Heavy in-house R&D capability ▪ Technology leadership approach to competition, differentiation, and positioning ▪ Focus on productivity (TCO, Cost per X) ▪ Constant innovation and productizing of technology ▪ Automation as a key differentiator ▪ Innovation from customer needs ▪ Need for strong value arguments
	Developing technology-based differentiators	▪ Automation systems (OEM specific advantage) ▪ Remote operations capability ▪ Electrification offering (Hybrid, BaaS, Swapping) ▪ Building support processes for automation and EV offering ▪ Tailored local services ▪ Global remote support processes
	Aggressive M&A for competency gaps and market control	▪ M&A in competency white spots ▪ Acquiring adjacent capabilities (Batteries, analytics) ▪ Acquiring potentially competing technology (OEM agnostic automation) ▪ Aggressive scanning and acquiring

	Challenges in seizing	▪ Converting ideas to viable offering is challenging ▪ Change management required for customers to adapt automation ▪ Slow market adoption (Electrification) ▪ Need for local references ▪ Complexity of high-technology solutions
Reconfiguring *to escape the commodity trap*	**Adaptability through modularity**	▪ Modular product architectures increasing responsiveness ▪ Modularity enabling quick adoption of new technology ▪ Standardized offerings and processes exist along tailored offerings ▪ Balancing standardization and customization (Ongoing strategy question) ▪ Premium positioning leads to more customization
	Building capabilities for future alignment	▪ Building service capabilities ahead of demand ▪ Competence development programs ▪ Aligning offerings with customer's current competencies ▪ Understanding history and don't sacrifice on the cornerstones
	Cultural enablers of adaptation	▪ Collaborative culture ▪ Information sharing rather than siloing ▪ Leveraging non-hierarchical structure and psychological safety ▪ Company culture as a competitive advantage (Hard to copy)
	Challenges in reconfiguring	▪ Large company size slows change ▪ Customization requires a skilled workforce ▪ Balancing efficiency and differentiation

Table 7. Comprehensive Gioia data structure (Company B).

Aggregate dimensions *Dynamic capabilities*	**2nd Order themes** *Microfoundations*	**1st Order concepts** *Open coding of single statements*
Sensing *drivers of commoditization*	**Customer intimacy**	▪ Understanding customer problems thoroughly ▪ Listening to customers ▪ Gathering tacit knowledge from frontlines ▪ Close customer relationships to foster trust ▪ Scale advantage in collecting insights globally ▪ Scanning for signals from indirect markets ▪ Need for honest customer opinions

	Market intelligence (MI)	▪ Benchmarking competitor offerings ▪ Monitoring key accounts to influence ▪ Tracking the prevalence of tendering business ▪ Ramping up foresight capabilities ▪ Following trends in developing technologies (e.g., AI) ▪ Sensing regulatory impacts on competition and demand ▪ Creating technology roadmaps to identify key technologies
	Awareness of competitive environment	▪ Decreasing gap between competitor's offerings ▪ Threat of falling into the proliferation trap due to focused competitors capturing niche segments ▪ Recognizing the increasing quality of Chinese competitors ▪ Avoiding a "race to the bottom" price competition ▪ Awareness for competitors' patenting
Seizing *opportunities to respond*	**Strategic positioning (non-price differentiation)**	▪ Differentiation through technology ▪ Differentiation through service capabilities as a protective moat ▪ Differentiation through reliability, trust, and brand ▪ Differentiation through customization ▪ Avoiding low-price segments and some developing markets ▪ Focusing on equipment that's a key enabler of customer operations
	Implementing responses	▪ Early and full commitment to chosen emerging technologies ▪ Capturing first mover advantages ▪ Developing required technology ecosystems ▪ Offering specific solutions ▪ Leveraging commercialization models ▪ Value-based selling type approach
	Prioritization in resource allocation	▪ Technology roadmaps as a guide for resource allocation ▪ Prioritizing opportunities is a crucial capability ▪ Prioritizing challenge with large portfolio ▪ R&D investment seen as a critical component ▪ Focusing investments into differentiators ▪ Focusing on generating results from R&D investments
	Challenges in seizing	▪ Transition period in technologies may disrupt competitive environment ▪ Slow time-to-market times ▪ Challenge of commercialization ▪ Risk-averse decision-making culture

		▪ Difficulty of seizing with imperfect information ▪ Competitive environment hinders capability to make trade-offs ▪ Potential short-term perspective driven by financial pressures
Reconfiguring *to escape the commodity trap*	**Adapting offering**	▪ Modularity as an enabler of differentiation through customization ▪ Balancing customization with efficiency ▪ Varying levels of customization between product lines ▪ Challenge of pricing customization correctly ▪ Increasing portfolio complexity
	Adapting organizational processes	▪ Organization not adjusting to "new setup" ▪ Structure adjusted to past, not current transition ▪ Consensus culture slowing decision in transitions ▪ Slow to restructure dynamically ▪ R&D has good collaboration with product lines
	Capability reconfiguration	▪ Need to reconfigure workforce skills to new technologies ▪ Need to adapt processes for new technologies ▪ Evolution of new technological solutions renders old capabilities obsolete ▪ Complexity of portfolio strains R&D resources
	Cultural perspective of adaptation	▪ Leveraging customer relationships and trust as a moat ▪ Perceiving competition with humility rather than arrogance ▪ Understanding the impact of risk-averse culture on the agility of seizing and reconfiguring

Table 8. Comprehensive Gioia data structure (Company C).

4 Findings

This chapter presents the empirical findings of the multiple-case study, collected from interview data. First, a detailed within-case description and analysis of context specific factors for each of the companies is presented. Then, following with a cross-case analysis that identified common patterns and themes between the case companies. Concluding with a synthesis and interpretation of emerging themes, such as the identified commoditization dilemma, role of path dependency, and practical interplay between dynamic capabilities. At the end of the section, an empirically grounded framework is presented to demonstrate the contribution of this thesis to the academic discussion on dynamic capabilities and commoditization.

4.1 Within-case description and analysis

The empirical analysis drew its conclusions from interview data collected through the exploratory multiple-case study of three relevant industrial equipment manufacturers who remained anonymous under the names company a, b, and c. The three major industry incumbents lead their respective markets and address commoditization challenges through active engagement, thus enabling to investigate the interplay between the microfoundations of dynamic capabilities at three different commoditization environments. The companies operate under the same broad industrial equipment segment however their market positions, strategic directions and internal capabilities create individual profiles despite facing similar industry pressures.

Company a leads the market within its chosen niches and achieves differentiation primarily by developing technological innovations and digital service solutions. The company demonstrates advanced sensing and seizing capabilities but appears to struggle at times to translate its strategic intentions into consistent market execution and commercial success, especially when forced to rely on internal processes and commercialization capabilities.

Company b is strategically positioned as a technology leader in its chosen market, it maintains strong execution discipline while differentiating itself through achieving superior productivity and total cost of ownership benefits for its customers. The company captures complementary capabilities with their aggressive M&A activity while maintaining formal strategic processes to balance standardization and efficiency with customer-focused customization.

Company c is a historical leader in most of its segments, currently leveraging its extensive service resources and strong customer relationships to create a “moat” against competitors and the pressures of commoditization caused by an emergence of lower-cost competitors. The company has made and committed to some strategically bold moves concerning a change in its technological landscape but appears to be facing challenges with managing the complexity of its offering and organizational inertia affecting necessary reconfiguration activities.

Dimension	**Company A**	**Company B**	**Company C**
Strategic orientation	“Premium” innovator focusing on technological solutions.	Technology leader focuses on productivity and TCO.	Defending historical leadership position by focusing on reliability and service moat.
Key sensing capabilities	Anticipating customer problems.	Deep customer partnerships and structured foresight process.	Customer intimacy and leveraging tacit knowledge gathered over a lengthy period.
Key seizing capabilities	Strong R&D capabilities in digital connectivity solutions and selective M&A.	Strong R&D capabilities in automation, electrification, and aggressive M&A.	Strong service and reliability capabilities. Full commitment to transitions.
Main reconfiguring challenge	Execution gaps in commercialization and prioritizing due to offering complexity.	Organizational scale limiting agility and balancing standardization with customization.	Organizational inertia and portfolio complexity straining R&D resources.
Differentiator(s)	Perceived technological edge and user experience focus.	Superior productivity and TCO and customer partnerships for product development.	Strong reliability, service, and customization capabilities increasing customer’s trust.
Internal constraints	Strategy execution gap, potential short-term focus of	Need for agility hindered by organizational inertia due to	Risk-averse decision-making culture in situations requiring bold moves, complexity

	management and position in value system.	company size, NPD complexity and balancing internal R&D with M&A.	of portfolio impacting R&D focus and balancing historical strengths with emerging technological requirements.

Table 9. Case comparison table.

4.1.1 Company A

Company a demonstrates proactive sensing capabilities beyond standard market intelligence processes to anticipate the future impact of commoditization drivers through deeply understanding customer problems even before they occur. This process of uncovering latent customer requirements is driven by the corporate level product management function, which helps to prevent buyer related commoditization drivers like shifting customer expectations or increasing price sensitivity based on existing product features. However, the company has experienced a persistent challenge in utilizing this valuable customer information across all levels of the organization, which may potentially obstruct their complete understanding of new market threats and opportunities.

> *"Our aim is to understand the customer's potential problems even before they themselves can articulate that they have said problem. That is a challenging proposition, but we have succeeded in that pretty well." (Interviewee 3, corporate function)*
>
> *"Systematic gathering of customer data is always a challenge... My responsibility as the global process owner is to try to develop this. For example, by developing templates and a library of customer feedback..." (Interviewee 3, corporate function)*
>
> *"Previously we worked more siloed... We have emphasized a new process to avoid doing unnecessary work and to bring down the workload in our country's organizations." (Interviewee 2, corporate function)*

Company a seizes opportunities to respond to commoditization through its declared innovation leadership strategy funded by its best-in-class profitability and market positioning. The company demonstrates its dedication through substantial R&D investments, which maintain technological differentiation while preventing price competition thus clearly demonstrating a decision made to reject the deterioration trap. However, the interviews revealed a major issue for the company, which is the difficulty of converting the sensed opportunities and strategic intentions at large into successful market execution and commercialization, pointing to weaknesses in seizing microfoundations related to decision-making under uncertainty. Additionally, the short-term focused financial management style of the organization creates an execution gap that erodes more ambitious long-term seizing initiatives, including full-scale servitization.

> *"...positioned as the premium player in the industry, focusing on aspects such as quality, reliability... rather than fighting with price..." (Interviewee 2, corporate function)*
>
> *"Invest into product development as much as you can, and your margins allow... it has always been in a straight correlation to how much resources we have invested into securing our products' competitiveness." (Interviewee 1, corporate function)*
>
> *"...the connection disappears between good planning and execution. It is the most demanding part..." (Interviewee 1, corporate function)*
>
> *"I noticed pretty quickly that our management just focused on what is the market size or profit pools. Essentially, they had a really short-term viewpoint... And I fear that this leads to our management losing their focus on the long-term picture." (Interviewee 2, corporate function)*
>
> *"...yes, we have thought about the as-a-service business model, so far the results are low, but the work is continuing." (Interviewee 1, corporate function)*

Company a deploys reconfiguration capabilities primarily by leveraging its organizational structure and portfolio strategy to develop the necessary means to escape from commodity traps. The organization structured around a decentralized divisional model enhances their speed and agility of execution in customer proximity. Similarly, the utilization of modular product architectures not only to achieve efficiency but differentiation and innovations “on top of” baseline products, allows for easier adaptation to market changes without the massive costs and disruption of completely redesigning non-modular products. These structural enablers do not guarantee successful transformation, as fundamental execution barriers caused by internal siloing, misaligned interests, and potentially insufficient use of “common sense” prevents necessary changes. The company needs structural choices and leadership courage to support long-term adaptation above immediate results to overcome these challenges thus indicating that cultural and managerial mindset reconfiguration is equally important as structural changes.

> *"The divisional structure model is the best solution as the ability to react remains close to the customers... it bites you in the ass immediately if you do anything unwise." (Interviewee 1, corporate function)*
>
> *"With modularity we can achieve standardization, without it being visible or affecting our customers... the innovations can be delivered 'on top' of the baseline products." (Interviewee 3, corporate function)*
>
> *"We had to change our system as we had misaligned interests and siloed thinking going on. The use of common sense seems to diminish in organizations at times." (Interviewee 1, corporate function)*
>
> *"It requires exceptional leadership skills to have the courage needed to not maximize profits now because I know that I can do something that can be significant for us in the future." (Interviewee 1, corporate function)*

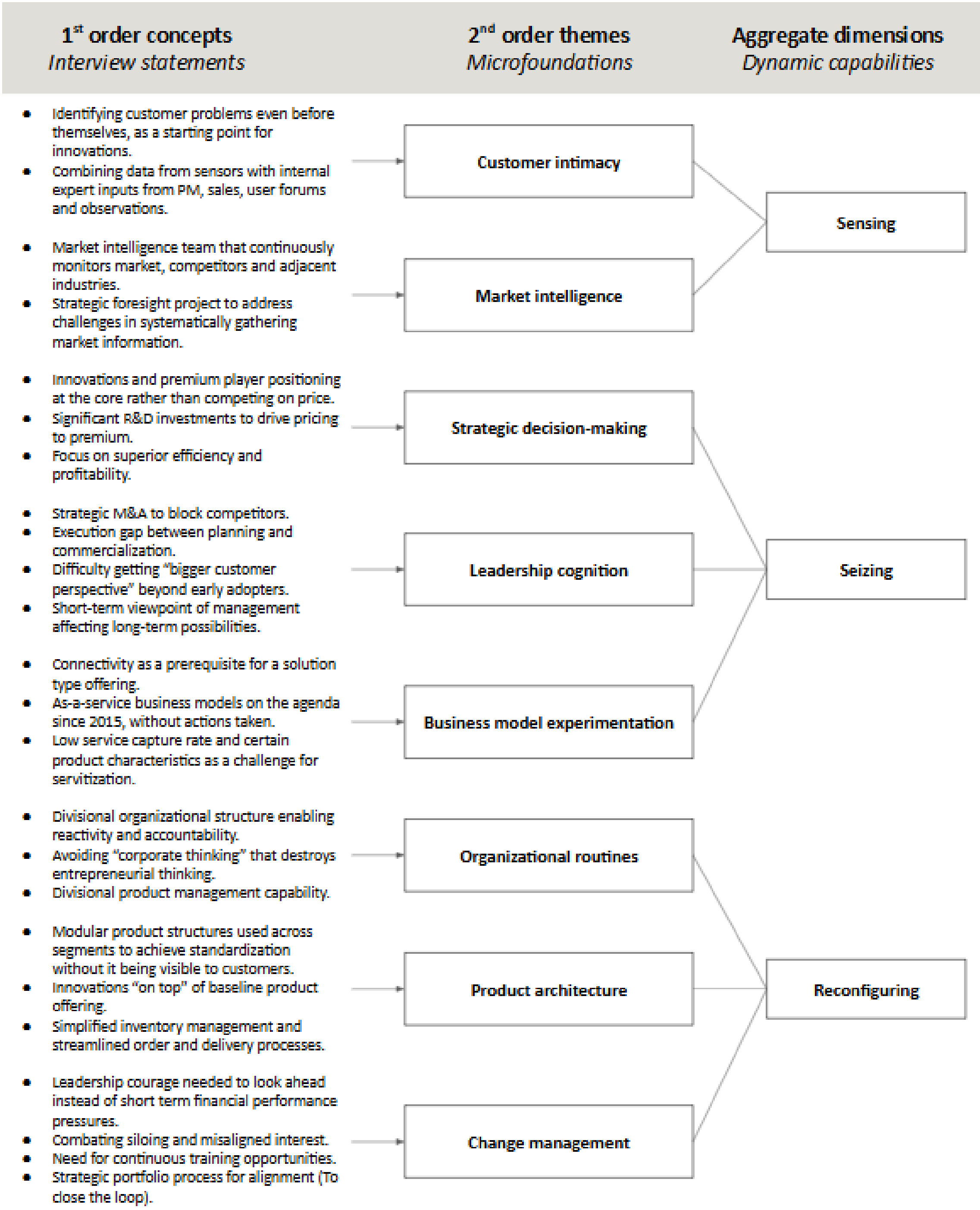

Figure 7. Summary of key findings (Company A).

4.1.2 Company B

Company b considers deep customer understanding together with partnerships as a priority for identifying buyer-related commoditization drivers and application-specific needs beyond broad market scanning alone. This core sensing capability requires them to gain a deep understanding of their customers' problems along with their operations through collaboration to develop solutions together. This partnership strategy stands as an essential element especially for complex offerings such as automation as it enables them to understand unique contexts needed to create value and forecast changing customer needs that could lead to commoditization if neglected.

> *"Knowing your customers' problems and operations. Essentially, what is the challenge you need to solve to bring value to your customer." (Interviewee 5, division function)*

> *"Automation requires partnership to be successful with our customers. Equipment can be shipped and forgotten, but automation systems need constant care." (Interviewee 4, division function)*

> *"Ideally and often, we like to work closely with our customers and develop solutions together." (Interviewee 5, division function)*

The company recognizes seizing capabilities as the most critical while demanding dynamic capability. The main response to commoditization at Company b involves technological leadership through product innovation that reduce customers' total cost of ownership and cost per specific equipment movement, instead of price competition to sustain its premium value proposition. This requires the company to have the capability to convert the sensed opportunities into viable and supported offerings along with having an effective strategy execution framework like OKRs. This ensures the critical prioritization and implementation of ideas to avoid the deterioration trap price wars. Company b uses strategic acquisitions to seize important competencies and to control vital innovation areas including automation and battery technology.

> *"The most important thing is the ability to convert the sensed customer needs into something that the company can sell and support,*

> *and customer can actually buy... saying no to some ideas, prioritizing and organizing so that the best ideas get executed is challenging but essential." (Interviewee 4, division function)*

> *"Our main approach is to be a technology leader... we measure success by impact on the TCO and Cost per X... The added value comes from productivity." (Interviewee 5, divisional function)*

> *"If you're more expensive you need to be able to argument why (i.e. understanding the customer value proposition you have)." (Interviewee 4, division function)*

> *"Acquisition of... Battery swapping and battery analytics companies, is an example of our acquisition strategy anticipating future market expectations by expanding to adjacent industries." (Interviewee 4 and 5, divisional function)*

Company b implements reconfiguration approaches to ensure needed adaptability in the long-term to escape from commodity traps. Modularity in addition to efficiency, functions as a purposeful approach to increase organizational agility while enhancing response times for new technology adoption across current platforms. Through modularity, they harmonize standardization and customization to maintain their premium positioning and avoid both the cost focused deterioration trap and the excessive amount of niche offerings associated with proliferation trap. Their proactive development of service networks along with electrification expertise before significant demand appears represents a major reconfiguration investment that secures future competitive advantage. Company culture that fosters information sharing over siloing, collaborative environment leading to more agility is seen as a difficult-to-imitate capability that protects from some major competitors. However, they recognize that due to their size, they may not allow for the needed reconfiguration speed in some situations.

> *"Modularity, which we have used to increase our agility and responsiveness to quickly be able to adopt and implement new technology through the modular structure." (Interviewee 5, division function)*

> *"It is really critical for us to already have the needed capabilities for electrification, to promise our customers that we have knowledgeable*

service technicians and the right spare parts available" (Interviewee 5, division function)

"...sharing information and a collaboration culture is superior... I believe that is a competitive advantage for us. You can't copy culture" (Interviewee 4, division function)

"Company B being such a huge company... we still are a 'big ship' that takes time to change course." (Interviewee 5, division function)

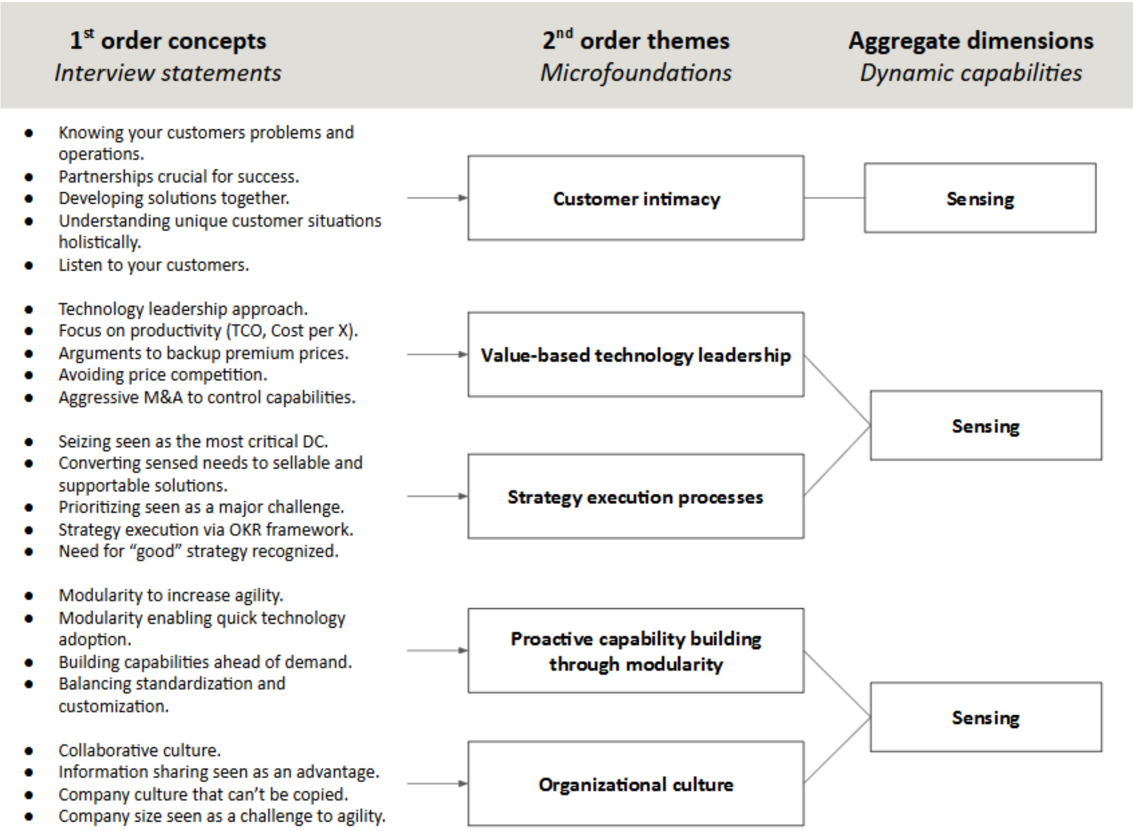

Figure 8. Summary of key findings (Company B).

4.1.3 Company C

The sensing capabilities of Company c are focused around customer intimacy and leveraging of its global footprint to detect buyer related commoditization drivers such as evolving customer needs and perception of value in their customer's specific applications. There is a strong conviction within the organization that truly listening to your customers and understanding their specific operational requirements is the foundation of differentiating and identifying avenues towards it. Company c has recently ramped up its foresight capabilities and built technology roadmaps to scan for offering related drivers caused by e.g., technological developments and market related drivers such as competitor moves. The organization admits its competitors, especially Chinese companies, are closing the technological gap quickly and thus not approaching emerging competition with negligence and focusing on honestly sensing its competitive position.

> *"Listening to your customers is really important. Especially, the tacit knowledge we gather from our divisions and frontline operators..." (Interviewee 7, corporate function)*
>
> *"...it is important that we know our customers, that we are close to our customers, and use data-based approaches to convince our customers of our solutions value" (Interviewee 7, corporate function)*
>
> *"We use technology roadmaps to identify and choose the technologies that we are going to positively differentiate ourselves." (Interviewee 8, corporate function)*
>
> *"Many companies have rapidly advanced their technological capabilities. We should just be humble enough to really ask our customers honest opinions on where we stand." (Interviewee 7&8, corporate function)*

The company emphasizes acting by seizing opportunities through customer bonding, innovations, and superior offerings over the more price-based operational excellence approaches to avoid falling into a deterioration trap. Their extensive service resources and reputation for reliability serves as a competitive advantage and a protective moat around competitors. Leading to strong customer relationships and high switching barriers, especially for equipment directly serving customers critical revenue generating operations where equipment availability is essential. The company has made decisive moves to differentiate itself from its competitors through technological applications and has shown strong commitment to capture first-mover advantages in their chosen markets during the transition period. Additionally, they have demonstrated the ability to make strategic trade-offs in situations where the potential for differentiation has eroded and profitability declined into a “race to the bottom” environment. However, due to a complex portfolio of offerings, effectively seizing sensed opportunities becomes constrained as it makes prioritization difficult and strains R&D resources despite strategic intent.

> *"Our service resources are a clear competitive advantage for us that generates a ”moat” for us actually." (Interviewee 7, corporate function)*
>
> *"The first move from our point of view was to make the decision to pursue leadership in this developing technology... fully committed... The decision was made at a really early stage and enabled us to pursue first mover advantages..." (Interviewee 7, corporate function)*
>
> *"...we exited from that business. It was easily imitated technology, there really was no smart way to differentiate, margins had eroded..." (Interviewee 7, corporate function)*
>
> *"Prioritizing on an offering level is a huge undertaking and very difficult." (Interviewee 6, division function)*
>
> *"If your portfolio has expanded significantly and the level of investment into R&D has stayed the same, there is a decrease in how much can be allocated into developing something new." (Interviewee 8, corporate function)*

The most challenging dynamic capability for Company c is the reconfiguring of its resources along with its processes to execute selected responses while escaping commodity traps, especially those driven by offering related technological disruption. While adaptation of product offerings through modularity is seen as a key strength and an enabler of cost-effective differentiation, the organization has recognized challenges with organizational transformation. For example, because of emerging technologies, there has been an increasing demand for reconfiguring previously competitive advantage providing workforce skills into the new requirements. Different perspectives arose from the interview findings, indicating a demand for organizational inertia. One interviewee pointed out that the organization might be "structured around something that happened 20 years ago" and not as future proof as preferable. Potentially burdened by their risk avoiding consensus culture, preventing rapid adaptation needed during technological transitions where experience becomes irrelevant thus putting its ability to escape traps at risk.

> *"Modularity is actually the enabler of differentiation for us. It allows for us to tailor our products according to customers' needs and to do that in a reasonable cost to us." (Interviewee 8, corporate function)*
>
> *"(Concerning a specific emerging technology) we have to hire those experts or to train the existing workforce" (Interviewee 8, corporate function)*
>
> *"I would say most of our challenges are linked to reconfiguring. Our organization is not adjusting to the new setup... it is more adjusted to something that happened 20 years ago." (Interviewee 6, division function)*
>
> *"...when you are in the middle of a transition, consensus is also taking up a lot of time..." (Interviewee 6, division function)*
>
> *"Due to technological disruptions our experience in... is losing its value as everyone starts from nothing. These are really dangerous situations for more established players like us." (Interviewee 7, corporate function)*

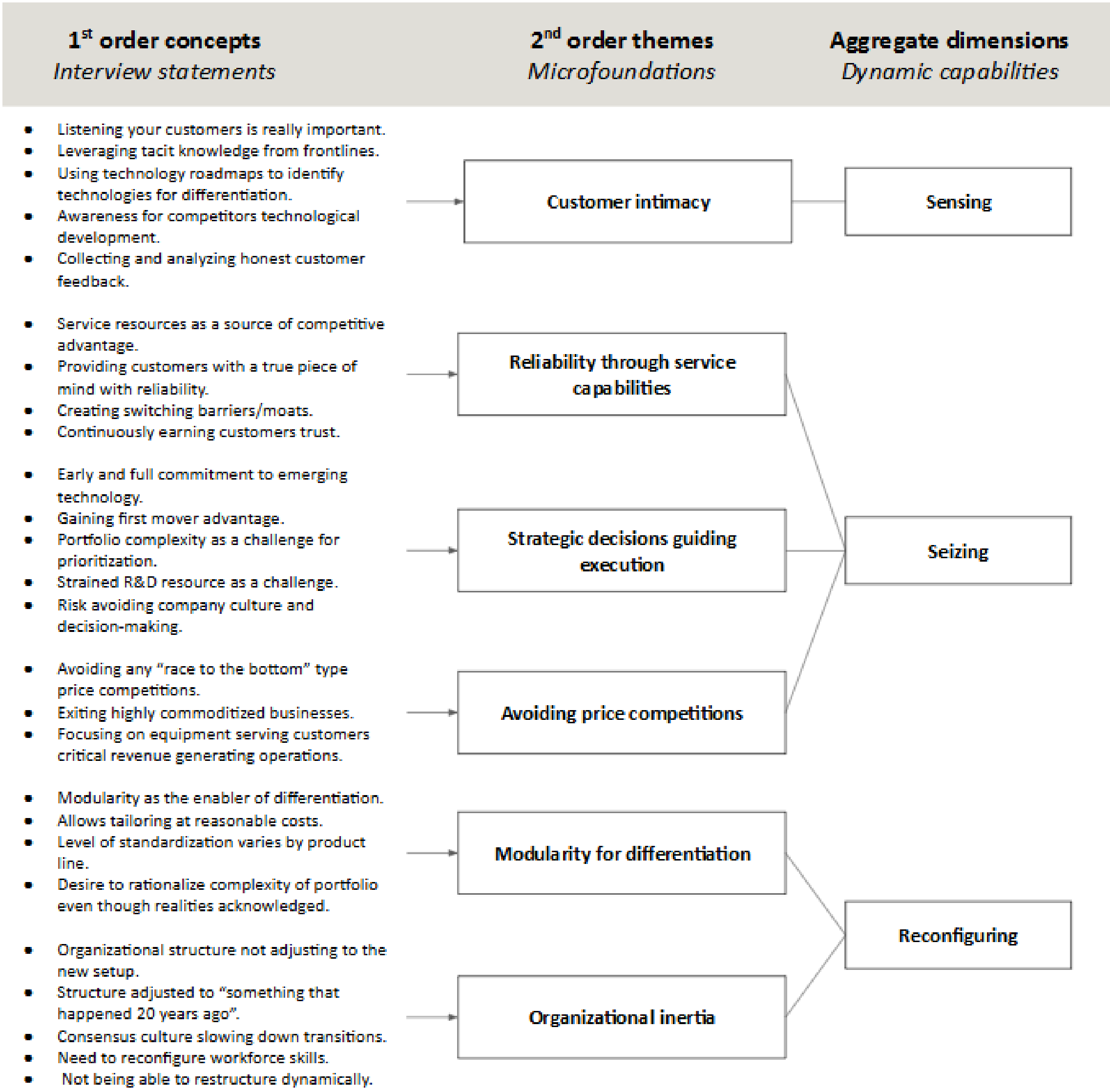

Figure 9. Summary of key findings (Company C).

4.2 Cross case analysis

This synthesis connects the empirical findings from three different organizational settings to identify common patterns, significant variations, and overarching themes in the deployment of dynamic capabilities for industrial equipment manufacturers beyond the single-case differences.

A systematic comparative analysis of the three case companies is used to detect similarities by indicating potential literal replication and differences by indicating potential context based theoretical replication. The cross-case analysis produces more generalizable analytical insights about industrial equipment manufacturers sensing, seizing and reconfiguring capabilities, when facing commoditization.

The analysis follows the three fundamental dynamic capabilities, which form the core of this thesis's theoretical framework presented as empty in the literature review. Sensing capabilities are interpreted though the lens of identifying commoditization drivers, seizing through examining the implementation of strategic responses and reconfiguring through exploring the resource reconfiguration requirements to escaping the commoditization trap.

4.2.1 Patterns in sensing

Comparing sensing capabilities between the case companies reveals that all three organizations have adopted similar structured efforts to understand buyer related and to monitor market and offering related commoditization drivers, as well as faced similar challenges with utilizing the gathered information. The main theme identified was the critical role of customer intimacy and in-house expertise on the pain points of customer operations. All the companies drew insights from multiple sources, including their internal product management functions, frontline sales interactions, and direct customer collaboration to sense specific customer and solution level insights. Close customer relationships were an essential approach for mitigating buyers' increased price sensitivity and reduced perceptions of offering interchangeability as they allow for tailored value creation opportunities directly answering unique customer pain points and shifting the competitive focus away from easily comparable attributes.

> ***Company A:*** *"Our aim is to understand the customer's potential problems even before they themselves can articulate that they have said problem." (Interviewee 3, corporate function)*

> ***Company B:*** *"Knowing your customers' problems and operations. Essentially, what is the challenge you need to solve to bring value to your customer?" (Interviewee 5, division function)*
>
> ***Company C:*** *"Listening to your customers is really important in this. Especially, the tacit knowledge we gather from our divisions and frontline operators..." (Interviewee 7, corporate function)*
>
> ***Company C:*** *"...important that we know our customers, that we are close to our customers and use data-based approaches to convince them of our solutions' value..." (Interviewee 7, corporate function)*

All the case companies utilized formal mechanisms more than direct customer engagement for scanning their business environment to detect market and offering related drivers of commoditization. These included dedicated market intelligence functions and processes for e.g., competitor benchmarking, strategic foresight activities and technology road mapping. These activities were used for tracking the development of competitive intensity resulting from e.g., the threats of globalization like low-cost Chinese competitors and anticipating the impact of potentially disruptive technological break troughs such as electrification and automation. Interview findings from formal foresight and technology roadmaps suggests that the companies have adopted a more proactive approach to sensing offering related drivers and providing inputs to resource reconfiguration instead of a solely reactive approach.

One notable challenge emerged across all the interviews regarding the difficulty of systematically processing and internally utilizing the sensed information. Interviewees from both companies a and c voiced challenges with their customer data collection process not leading to meaningful commercial actions consistently, while company b representatives implied a need for improved methods to internal knowledge sharing. These findings suggest that a potential bottleneck exists between interpreting the sensed inputs from various commoditization drivers and delivering actionable insights organization wide. Additionally, the need for a gate keeping protocol as highlighted by company a, suggests a potential self-contradiction that managing a potential company related driver, offering complexity, might inadvertently disregard crucial buyers or offering related information. While all of the case companies can collect information from a wide array of commoditization drivers, they face challenges with synthesizing and utilizing the information holistically, affecting their ability to comprehend the interplay between different commoditization drivers and to construct impactful responses.

> ***Company A:*** *"Systematic gathering of customer data is always a challenge..." (Interviewee 3, corporate function)*
>
> ***Company B:*** *"You need a solid, structured process to get these insights also documented... learnings must efficiently flow to product management, R&D, strategy, etc." (Interviewee 4, division function)*
>
> ***Company A:*** *"There needs to be a gate keeping protocol in place when answering to customer needs to avoid inefficiency." (Interviewee 1, corporate function)*

All the companies performed broad sensing activities yet displayed distinct approaches, reflecting differing operational contexts and strategic priorities. Company a emphasized observation techniques which they had implemented. Company b demonstrated the highest commitment to developing sensing capabilities with partnerships. Company c interviewees expressed most awareness of competitor’s development on offering related drivers such as technology and quality as well as a market related driver with competitive intensity coming from China. This variance suggests that while the core sensing mechanisms are similar between companies, the focus of interpretation is impacted by how the companies are positioned in their markets and how much historical burden they must carry.

4.2.2 Patterns in seizing

The analysis indicates significant similarities between the case companies approaches to seizing opportunities for responding to the threat of commoditization. All companies have chosen responses aligned with the innovation and superior offerings category, to avoid being caught, in the deterioration trap by investing in technological leadership, advanced product features and focusing on customer value creation rather than engaging in price competitions. These responses require significant R&D investments to develop the offerings that is perceived by the customers to bring superior value and enable commanding a premium.

> ***Company A:*** *"Innovation is at the core of our strategy, we are positioned as the premium player rather than fighting with price..." (Interviewee 2, corporate function)*
>
> ***Company B:*** *"Our main approach is to be a technology leader... The added value comes from productivity linked to TCO and Cost per X." (Interviewee 5, division function)*
>
> ***Company C:*** *"...how we have tried to differentiate, it’s been through developing technology as our 'cornerstone' and as a principal we avoid price competition. We try to avoid any ‘race to the bottom’ type competitions." (Interviewee 7, corporate function)*

From the innovation and superior offerings category, servitization emerges as the common theme connecting all the case companies. Although facing differing challenges and levels of commitment. All three companies view service solutions as an extension of their core equipment offering and pursue it through digitalization-enabled solutions such as installed base connectivity. Company a utilizes digital solutions for connectivity to create a solution type offering and increase customer stickiness. Company b has acquired such capabilities as battery-as-a-service and battery swapping through acquisitions to enhance its service business model. Company c utilizes its extensive service resources as a competitive moat and focuses on developing electrification solutions like infrastructure support. All of these indicate that the companies have chosen to pursue adapting or substituting service models as a means for servitization. However, none of the companies have been able to seize the full differentiation potential of servitization solutions due to facing unique challenges such as their position in the industry value system for company a and slower than expected industry electrification for company b and c.

> ***Company A:*** *"Develop our offering with digitalization to a more 'solution' type offering. Equipment connectivity and the service solutions utilizing it have been a success." (Interviewee 1, corporate function)*
>
> ***Company B:*** *"We have two as-a-service type offerings acquired through M&A. Battery-as-a-service and Battery swapping." (Interviewee 5, division function)*
>
> ***Company C:*** *"Capability to sell solutions in e.g. electrification and supporting customers in setting up the infrastructure needed." (Interviewee 6, division function)*

The companies highlighted M&A activity as a critical avenue for enhancing their seizing capabilities to capture and deliver innovation and superior offerings responses. While in-house product development was the primary response, acquiring critical technologies through M&A came up on all the interviews. Rather than going for scale due to their size, the companies had acquired critical capabilities to fill in competency white spots or increase market control. Company a had acquired some of its suppliers to insource capabilities in adjacent technologies and block competitors benefitting from those. In similar fashion, Company b had acquired a battery analytics company to fill in a competency gap and to neutralize competitive threats from OEM agnostic entrants in automation. Company c indicated the importance of having the resources and capabilities available for acquisitions to seize opportunities in technologically dynamic environments.

While all the companies have chosen to emphasize customer bonding and relationship quality, company c distinguishes itself with the highest emphasis on customer intimacy. This is due to its strategic orientation and company culture. Company c has a very vast service network as a resource to generate a reputation for reliability resulting in a protective moat. Focusing on building trust through reliability and comprehensive support generates higher switching costs and justifies commanding a premium, resulting in a strong customer relationship-based differentiation mitigating impact of demand cycles and diminishing technological differentiation. While both companies a and b did put an emphasis on the value of customer relationships, they did not have it as such a central pillar of their strategy.

However, despite all the companies having a clear strategic intent to focus on responses based on differentiation, all of them state having experienced significant challenges in executing the seizing of sensed opportunities to differentiate. The main source of difficulty is translating the sensed customer needs or innovative solutions into timely and commercially viable offerings. This execution gap is the result of challenges associated with complex and slow NPD processes, prioritization due to complex offerings, scaling innovative commercialization beyond early adopters in, slow time-to-market times in transition technologies like electrification and management short-termism. Company b explicitly highlighted seizing as the hardest capability, stating the difficulty of translating customer needs into supported offerings that customers are willing to buy.

> ***Company A:*** *"The connection disappears between good planning and execution." (Interviewee 1, corporate function)*
>
> ***Company B:*** *"Seizing is hardest. The most important thing is the ability to convert the sensed customer needs into something that the company can sell and support, and customer can actually buy." (Interviewee 4, division function)*
>
> ***Company C:*** *"Risk avoiding company culture that strives for making decisions carefully, we do not aim to move fast and break things." (Interviewee 7, corporate function)*

4.2.3 Patterns in reconfiguring

The analysis of reconfiguration capabilities reveals similar approaches, such as modularity and similar challenges such as organizational inertia. Overall, most of the interviewees recognized reconfiguring to adapt their resources and structures as the most difficult dynamic capability to break free from commodity traps. While capabilities for escaping do exist, their effective implementation faces constraints by internal barriers.

The use of modularity emerged as a common theme of reconfiguration that the companies employed in their product architectures. The three companies applied modular design principles to control complexity and enhance operational performance. However, how they view modularity from a strategic perspective varies, as company c emphasizes modularity as primarily an enabler of differentiation with cost-effective customization. Company a to add innovations “on top of” baseline products, whereas company b highlighted its role in enabling the agility and responsiveness of offerings by adopting new technologies faster. This implies that modularity functions as an essential method to manage both operational efficiencies required for escaping the deterioration trap and flexibility for the proliferation and escalation traps.

> ***Company A:*** *"With modularity we can achieve standardization, without it being visible or affecting our customers. The innovations can be delivered on top of the baseline products." (Interviewee 3, corporate function)*
>
> ***Company B:*** *"Modularity, which we have used to increase our agility, and responsiveness allows us to quickly be able to adopt and implement new technology through the modular structure." (Interviewee 5, division function)*
>
> ***Company C:*** *"I would rather say that modularity is actually the enabler of differentiation for us. It allows for us to tailor our products according to customers’ needs and to do that in a reasonable cost to us." (Interviewee 8, corporate function)*

The companies acknowledge that extensive capability reconfigurations must happen to retain market shares after technological transitions such as the shift towards electrification. This reconfiguring process requires adapting both tangible resources such as developing new products and delivery infrastructure to accommodate easily flammable batteries, as well as intangible resources such as workforce skills through, training service technicians to handle high voltage equipment. Company b stresses that building future capabilities before market demand rises serves as a vital strategy to stay competitive during technological transitions that threaten to erode historical advantages and trap incumbents.

Despite this recognized need for adaption, all the companies reported differing amounts of organizational inertia negatively affecting the required reconfiguration activities. This was apparent from the reported slowness of change as one manager described their company as a “big ship that takes a long time to change course” and another one stated that their organization has not adjusted to their new setup but rather to something that happened 20 years ago. Company culture was a prominent theme connected to this by many interviewees, indicating factors such as consensus driven decision-making culture slowing adaptation and risk aversion preventing reconfiguring. Additionally, internal siloing and misaligned interest came up as barriers preventing companies from conducting at times even blatantly obvious reconfiguring. Organizational inertia stood out as a notable barrier hindering the case companies’ ability to sufficiently transform their resource base to fully escape from rapidly forming commodity traps.

> ***Company A:*** *"We needed to change our system as we had misaligned interests and siloed thinking going on." (Interviewee 1, corporate function)*
>
> ***Company B:*** *"Us being such a huge company, we still are a 'big ship' that takes a lot of time to change course." (Interviewee 5, division function)*
>
> ***Company C:*** *"Consensus culture can be very effective in situations where things are moving very slowly, but in the middle of a transition, consensus is also wasting a lot of time." (Interviewee 6, division function)*

Adding to the challenge is the increasing complexity of product offerings as a natural result of expanding already broad offerings through customization as noted by companies a and c. This makes prioritizing really challenging, as choosing between thousands of product variants becomes increasingly difficult due to hard to make tradeoffs. This puts a significant strain on R&D resources, as a substantial part of that must be allocated to just sustaining the current offerings competitiveness, leaving only a decreasing amount for investments into new technologies. This has a direct negative impact on the potential of a company to successfully reconfigure to escape the commoditization trap. All the companies did acknowledge having mechanisms in place for strategic alignment such as portfolio management for company a, OKRs for company b and technology roadmaps for company c. However, the effectiveness of these activities is affected by the underlying organizational and cultural rigidities.

4.3 Synthesis and interpretation of findings

The cross-case analysis revealed both common patterns as well as context specific variations across all three case companies and how they deploy dynamic capabilities to survive commoditization. All the companies demonstrated active sensing of commoditization drivers, preferring methods that emphasized customer intimacy through understanding buyer’s needs and perceptions of value. These findings align with Reimann et al. (2010) suggestions that the importance of customer centricity increases simultaneously with commoditization. Along with Wagner et al. (2023) remarks that gathering information on the dimensions of customer perception on brand importance, ease of switching, price sensitivity and product homogeneity is not just market research but critical information that define if a product is becoming a commodity in the customer’s eyes. The companies maintained this intimacy with customers’ needs through both their formal market and technology scanning activities, which facilitated awareness to industry trends and competitors. However, synthesizing and utilizing this information internally emerged as a critical cross-case challenge.

The most common approach for seizing opportunities was differentiation-based responses from the innovation and superior offerings category that utilize technology leadership and service-based solutions instead of competing on price. Aligning with the non-price differentiation related value-adding pathways identified by Matthyssens and Vandenbempt (2008). Even though the strategic orientation of the companies leaned towards innovation and solution offerings, they recognized a significant gap in their capabilities to transform sensed opportunities into successful outcomes. The strategy execution gap came apparent from the reported difficulties in commercialization, prioritization and speed of implementation which echoing the internal and external alignment barriers of value-added strategies identified by Matthyssens and Vandenbempt (2008).

These capability white spots can potentially hinder the effectiveness of preferred responses to highly commoditized markets such as product leadership (Reimann et al., 2010).

Reconfiguration capabilities utilized for long-term adaptation and escaping commodity traps demonstrated both common approaches and obstacles. A major common theme was modularity, which was utilized by the case companies for enabling differentiation through easier adoption of new technologies, a critical capability when facing industry transitions such as electrification. Hindering the implementation of these reconfiguring activities were challenges with organizational inertia, company culture related factors and path dependencies stemming from historical success. The critical barriers these internal rigidities represent are consistent with Matthyssens and Vandenbempt (2008) findings on alignment challenges.

4.3.1 Commoditization dilemma

The central dilemma emerging from the cross-case findings is the relationship between activities perceived by companies as objectively rational and beneficial in the short term, and their potential to consequently accelerate commoditization in the long term. By analyzing the answers of the established incumbents, it is evident that they pursue problematic approaches such as standardization to gain efficiency, leveraging historical strengths like customization and modular product architectures that enable flexibility and cost-effective differentiation. While these are all individually rational decisions, the findings suggest that they can collectively contribute to product homogeneity, increasing offering complexity that slows down innovations into new technologies and most critically lowers barriers for new entrants over time. This highlights a critical challenge with deploying dynamic capabilities, as sensing commoditization drivers effectively requires a capability to interpret signals beyond immediate market demand to understand long-term effects, seizing opportunities to respond requires making difficult trade-offs and reconfiguring to escape from commodity traps requires a capability to challenge currently beneficial resource allocations.

Pursuing operational efficiencies through standardization and modularity was the most prominent example of this dilemma. Implementing modular designs offers multiple advantages by simplifying processes and enabling quick technological adoption as highlighted by company b along with cost effective differentiation reported by company c, which are both consistent with Matthyssens and Vandenbempt (2008) value-adding pathways. However, it simultaneously increases perceived product homogeneity (Wagner et al., 2023), and fundamentally lowers entry barriers due to standardized interfaces, which enables emerging competitors to enter the market and opens opportunities for them to creep up the value chain, both contributing to increasing commoditization (Yu, 2011). Pursuing internal efficiency through modularity aligns with operational excellence responses, but as Reimann et al. (2010) demonstrate, the performance of these approaches weaken as industry commoditization increases. Resulting in a difficult trade-off between optimizing through modularity that has its proven benefits and accepting the simultaneously increasing exposure to commoditization structurally (Yu, 2011), from the customer's perception (Wagner et al., 2023) and committing to a strategic orientation with diminishing returns (Reimann et al., 2010).

The dilemma is similarly apparent when looking at how the companies leverage their core competencies. For example, the extensive service resources of company c offer them a key competitive advantage, which supports the growing need for customer intimacy in commoditized markets (Reimann et al., 2010). However, it creates vulnerability as it directs away from exploring strategies less dependent on service capabilities like new product development that does not rely on service capabilities, which might affect customer perceptions of core product differences (Wagner et al., 2023). Additionally, the extensive customization capabilities of company a and c lead to portfolio complexity, which directly limits the availability of R&D resources for creating innovations. Illustrating a core paradox as existing assets and capabilities while valuable can simultaneously contribute to strategic challenges that limit the necessary adaptation to escape from comfortable ways of operating (Matthyssens & Vandenbempt, 2008).

4.3.2 Path dependency

When examining the commoditization dilemma from the research findings, the phenomenon of path dependency becomes evident. The established industry incumbents each have their own burden to carry in the form of historical successes, investments, and deeply ingrained capabilities that in many cases enabled current competitive advantages but simultaneously created rigidities that hinder the necessary reconfiguration needed to survive commoditization. This relationship between adapting firm capabilities and path dependency in the context of escaping commoditization (Huikkola, 2017), suggests that companies blindly following established ways on thinking and operating that worked before can trap firms, even if the market requirements are transitioned to something different (Matthyssens & Vandenbempt, 2008).

When describing their most valuable current assets, many of them were generated by leveraging historical successes and have required significant investments. These are for example, the moat created from strong service capabilities in company c's case and the complex and vast portfolio customization capabilities for company a and c. As key competitive advantages due to previous achievements, these capabilities become linked to deeply embedded organizational routines (e.g., the processes and mechanisms of service delivery and engineering for customization), customer expectations following previous interactions and managerial cognitive thinking. Diverging from these established successful paths become increasingly difficult for firms to do and faces internal resistance, even as their sensed market environment has changed (Huikkola, 2017; Matthyssens & Vandenbempt, 2008). When valuable core capabilities transform into core rigidities (Leonard-Barton, 1992), the needed adaptation to respond to commoditization drivers can become impossible.

Breaking free from these path dependencies requires developing dynamic capabilities, especially in reconfiguring. Developing the reconfiguring capabilities requires creating new capabilities, releasing existing non-core resources and adapting organizational routines (Huikkola, 2017). Aligning exactly to the major challenge faced by the case companies of organizational inertia, cultural resistance and increasing complexity of product offerings. Suggesting significant challenges with conducting the necessary releasing of resources due to challenges with prioritization and rationalizing offerings. As a result, making strategic shifts due to transitioning industry conditions such as moving away from product leadership strategies as suggested by Reimann et al. (2010) becomes harder to achieve. Path dependency and its paradoxical constraint caused by historical strengths could explain why many industrial equipment manufacturers face challenges with adaptation, even when acknowledging the need to change to survive commoditization.

4.3.3 Interplay of dynamic capabilities in practice

Individual analysis of the sensing, seizing and reconfiguring capabilities is essential for understanding their underlying microfoundations. However, to survive commoditization companies need to ensure the successful interplay between these capabilities as they are strongly interlinked. Interviews with the case companies revealed that while they might have strong capabilities in individual capabilities, they often have trouble when linking them together, which affects the ability to successfully adapt. Suggesting that the capability to integrate and deploy multiple capabilities is more critical and challenging than excelling in one capability area.

The link between sensing and seizing capabilities emerged as particularly prone to challenges. All the companies demonstrated sophisticated sensing capabilities, but had experienced challenges with systematically processing, interpreting, and sharing information internally, contributing to the challenges observed with seizing capabilities. A prominent challenge was prioritization due to offering complexity and ensuring that the market, buyer and offering related drivers are holistically considered when facing industry transitions such as electrification. When the companies had been successful at integrating sensing insights to seizing opportunities, it had led to successes e.g. through focusing on solving customer problems to drive innovations.

Seizing activities reveal hidden requirements and challenges of reconfiguring such as company c's decision to capture first-mover advantages during a transition period, which necessitates retraining workforce skills and adapting operational capabilities. The company did acknowledge that making these changes is difficult and slow, because of organizational inertia. Similarly, the seizing strategy of aggressive M&A to acquire new capabilities (e.g., battery-as-a-service) chosen by company b, implies a need for effective post-acquisition integration capabilities. Additionally, previous decisions to seize opportunities like the pursuit of vast customization made by companies a and c, have led to significant path dependencies that create major challenges to future reconfiguration.

Similarly, the effectiveness and scope of seizing responses is directly constrained by bottlenecks in reconfiguration. The case company's ability to implement new strategies was hindered by organizational inertia described as "a big ship not being able to change course quickly" by company b, and being adjusted to something that happened 20 years ago b company c. Breaking silos emerges as a fundamental challenge according to company b, to ensure that the organization is aligned for effective collaboration and information flow. For example, the R&D, product management, sales and operations functions need functional links to translate innovative ideas into commercially viable solutions, which is especially important as the complexity of solutions increases, as internal alignment becomes a critical capability for value-added strategies (Matthyssens & Vandenbempt, 2008; Huikkola, 2017).

4.3.4 Empirically grounded framework

The revised framework below demonstrates the dynamic capabilities and specific microfoundations needed in sensing the drivers of commoditization, seizing opportunities to respond and reconfiguring to escape from commodity traps according to the gathered empirical evidence. Additionally, the key challenges associated with each of the capability categories are listed.

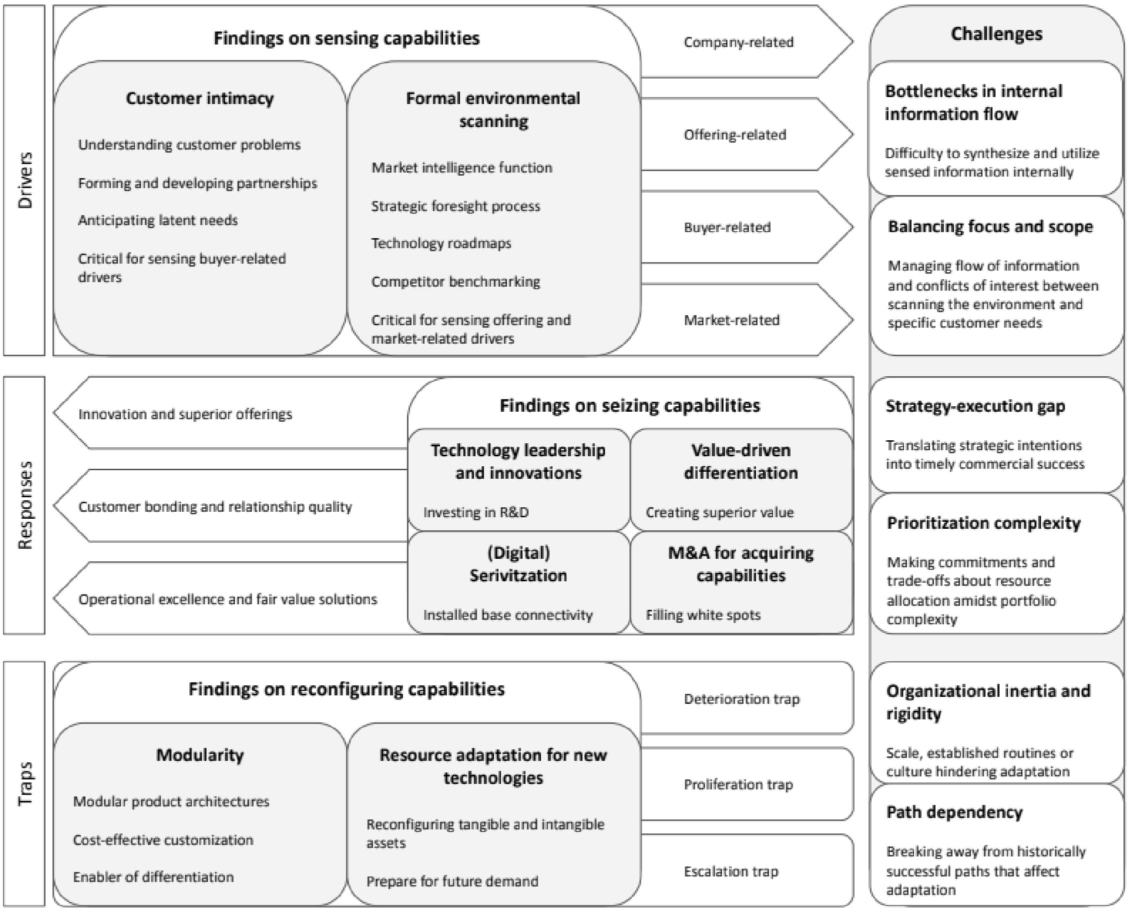

Figure 10. Revised framework.

5 Discussion

This concluding chapter discusses the key findings presented in this thesis, their relevance to the research objective, and the questions guiding this exploration. This is achieved through interpreting empirical evidence on how industrial equipment manufacturers leverage dynamic capabilities to survive commoditization and linking the findings back to the theoretical foundations discussed in the literature review. First, the theoretical implications of the findings and conclusions to the understanding of dynamic capabilities and strategic responses to commoditization are discussed. Following with the managerial implications that offer actionable insights for industry practitioners. The discussion then outlines potential avenues for future research and acknowledges the limitations inherent in the research design and execution.

5.1 Theoretical implications

This thesis set out to explore how industrial equipment manufacturers leverage dynamic capabilities to survive commoditization and sustain competitive advantage. Contributing to the under-explored area of research on how specific resources and capabilities are used for combating commoditization. The aim of this study was to provide empirical evidence of this within the Nordic industrial equipment manufacturing sector and particularly how these capabilities are connected to each other and what specific microfoundations lie underneath them in this context. The primary theoretical contribution of this research was advancing knowledge on the practical application and complicated interplay of DCs when responding to commoditization threats. The analysis of microfoundations and their contextual challenges with a multiple-case study offers a contribution to both the dynamic capabilities theory and advances the understanding of strategic responses to commoditization.

The findings of this study on the sensing capabilities place a strong importance on customer intimacy and systematic scanning of the business environment. Whereas the formal scanning capabilities such as an internal market intelligence function, strategic foresight processes and technology road mapping came up as critical resources for tracking the market and offering-related drivers, the empirical findings strongly emphasized understanding your customers problem intimately to successfully survive commoditization. This thesis contributes a critical and practical insight into the challenge of internally synthesizing and utilizing information. While the companies had well developed capabilities in sensing information, the processing and delivery of this diverse information from various inputs proved to be a significant challenge between sensing and seizing activities.

The case companies confirmed an emphasis on proactive responses aimed at differentiation, instead of competing solely on costs to avoid falling into the deterioration trap (D'Aveni, 2014). Differentiation was pursued through responses aligned with the innovation and superior offerings category and the pathways identified by Matthyssens and Vandenbempt (2008). Pursuing these responses required significant investments into R&D to attain technology leadership and create value-driven differentiation with (e.g., productivity, TCO and reliability). Servitization, particularly through digital applications emerged as another common response amongst the companies, supporting previous findings on the importance of service-based differentiation (Oliva & Kallenberg, 2003; Gebauer et al., 2021). Additionally, utilizing M&A as a seizing capability to acquire new or adjacent capabilities was used successfully by the companies. A gap between strategy and execution was identified as a major challenge affecting the implementation of these responses, caused by hurdles in commercialization, prioritization and implementation aligning with the alignment barriers identified by Matthyssens and Vandenbempt (2008).

Modularity in product designs emerged as a critical enabler of reconfiguring, that the companies had utilized to escape from deterioration traps by increasing efficiency and from proliferation and escalation traps by enabling cost-effective customization and easier adoption of new technologies, aligning with the need for ambidexterity as highlighted by O'Reilly and Tushman, (2008). Additionally, the findings showed that the case companies had realized a necessity to adapt their tangible and intangible resources, most notably workforce skills due to new requirement set by industry transitions such as electrification. This aligned with the findings of Conboy et al. (2020) on the importance of dynamic asset alignment microfoundations in reconfiguring capabilities. Whereas the major challenges of reconfiguring were found from organizational inertia and path dependency as each company had identified core rigidities stemming from following historical successes and established routines, that hindered their abilities to escape from commodity traps.

Finally, this thesis contributes to the interplay between dynamic capabilities and identifies a paradox in how companies might view commoditization. The empirical findings suggest that dynamic capabilities are deeply interconnected and face challenges in areas such as sensing information which have a direct impact on how effective their seizing activities are. Suggesting that having strong capabilities within one dynamic capability area is not enough without strong integration capabilities. The identified commoditization dilemma could potentially be a significant reason some companies have fallen into commodity traps, by grasping only the rational justifications of choosing e.g., modularity without understanding their long-term impact on lowering barriers and increasing commoditization. Deploying dynamic capabilities requires making difficult trade-offs between short-term competitiveness and long-term strategic positioning. This perspective seems to have been missing from commoditization literature.

5.2 Managerial implications

The findings of this thesis have several practical implications for managers in the industrial equipment manufacturing sector and propose key levers for action that help firms battling with commoditization pressures. Successfully surviving commoditization requires both the ability to recognize the impending threat and delivering actionable managerial decisions that enhance customer intimacy, innovations, and organizational adaptation.

A key response to commoditization involves developing better customer insight processes and value communication. While formal market intelligence is a critical capability, managers must facilitate the development of truly meaningful customer intimacy to understand customers' operational requirements, challenges, and latent needs to achieve differentiation. This requires adequate resources for frontline teams and striving toward customer collaborations to deliver unique and valuable solutions. Critically, managers must address the common internal challenges affecting the processing and utilization of the gathered insights. Implementing knowledge sharing mechanisms is essential to ensure that valuable customer insights translate into action. Additionally, communicating the added value effectively requires clearly presenting how advances in technology or services translate into quantifiable customer benefits like improved TCO or productivity.

Another key capability is the ability to efficiently deliver innovations to the market. The findings identified a prevalent challenge hindering the effectiveness of commercialization which requires managerial attention. To improve on this, firms must align their R&D efforts into creating and delivering demonstrable customer value, improve their commercialization capabilities, and strive for less complicated NPD processes. To manage increasing complexity in offerings, managers need to make tough decision on prioritization and trade-offs, which typically require killing products to free up resources. Addressing the root causes of the execution gaps (e.g., inefficient processes or short-sighted view of managers), is critical for increasing customers' perceived benefits from product innovations of servitization solutions.

Most importantly, managers should deliberately strive to enhance organizational adaptability and alignment, as both organizational inertia and path dependency can lead to truly dangerous outcomes. Modularity, as a key enabler, should always be intricately linked to agility and responsiveness instead of efficiency alone, as it is a potentially dangerous route as well. Actively challenging established routines, breaking down internal silos, and fostering a culture that is less risk-averse and more open to change are crucial leadership goals. This includes preparing the company for necessary transformations such as adapting workforce skills for technological transitions like electrification. Overcoming such internal rigidities is a crucial capability requirement for escaping and evading commodity traps.

5.3 Suggestions for future research

To further validate the qualitative insights generated in this thesis and to advance understanding on the issue of commoditization, quantitative research is required. This research could measure the impact of specific commoditization drivers and responses on firm performance (e.g., profitability and market share development) in sectors such as manufacturing or technology. Additionally, evaluating the impact of the identified challenges in this thesis (e.g., execution gap and path dependency) on sensing, seizing, and reconfiguring activities through surveys and historical data analysis would lead to more generalizable findings.

Combating organizational inertia and path dependency deserve more attention and further research. Future research could utilize a longitudinal approach to examine how incumbents respond to these rigidities over time, when faced with disruptive threats or significant technological transitions such as industry electrification or automation. Exploring specific responses, trade-offs, or cultural change aimed at fostering firm adaptation and breaking path dependencies in mature industrial firms would offer valuable insights.

Interplay between dynamic capabilities emerged as a critical challenge and future research could adopt a focus specifically on the interactions between sensing, seizing, and reconfiguring. For example, investigating the processes and mechanisms of translating sensed market information into successful seizing, or examining the impact that reconfiguring through modularity has on sensing and seizing activities. Advancing the understanding of these relationships would provide valuable insights to practitioners.

The commoditization dilemma identified in this thesis highlights the trap companies can fall into by making rational decisions now, that end up accelerating commoditization in the long-term, should be researched more. Similarly, the paradoxical effect of modularity would benefit from future research. Especially through quantitative studies measuring the increase of product homogeneity and lowering of entry barriers. Exploring how firms strategically manage these trade-offs (e.g., where the benefits of modularity outweigh the increase in commoditization) would be highly valuable.

This study focused on solely Nordic industrial equipment manufacturers, adopting a wider geographical or industry context such as the viewpoint of a low-cost competitor would offer valuable insights. This study focused solely on Nordic industrial equipment manufacturers, adopting a wider geographical or industry context such as the viewpoint of a low-cost competitor would offer valuable insights. Examining how firms in emerging economies deploy dynamic capabilities against commoditization could reveal hidden contextual differences and lead to findings that are more generalized. Additionally, researching specific responses such as different servitization pathways in surviving commoditization across various contexts would offer practitioners valuable insights.

5.4 Limitations

The scope and generalizability of the findings are constrained by the chosen qualitative, multiple-case study design. The research focused solely on Nordic industrial equipment manufacturers. This approach enabled a focused exploration that identified contextual patterns through the chosen purposeful sampling strategy. However, the findings are contextual and not statistically generalized to the entire industrial equipment manufacturing sector or other industries. The context specific strategic positions, technological paths, and historical decisions of the case companies certainly influenced the gathered findings. However, the within case analysis and cross-case comparisons aimed to provide theoretical insights to enhance the understanding in similar contexts.

The findings relied on empirical evidence gathered through semi-structured interviews with managers and senior specialists involved in corporate strategy, business development, product management, and other related functions. While the interviews provided valuable insights, the answers may not fully represent the decisions and views of the entire company. Relying on interview accounts means the data reflects the participants' subjective perceptions and interpretations of complex phenomena at a specific point in time. The interpretive nature of the qualitative analysis inevitably means that the thesis authors own perceptions have shaped the final analysis and synthesis of findings.

The thesis did not utilize a qualitative approach to measure performance metrics linked to specific dynamic capabilities or activities with actualized financial performance or market share development of the case companies. Examining the relationship between identified microfoundations and measurable financial indicators was excluded outside of the scope of this exploratory thesis. However, exploring this angle would generate valuable information.

Despite these limitations, the thesis provides a theoretically grounded and empirically novel exploration of a critical challenge facing industrial equipment manufacturers. By focusing on the dynamic capabilities framework and examining their utilization within a specific industry context, the research offers valuable insights and practical implications for both academics and managers investigating the complexities of surviving commoditization.

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Appendices

Appendix 1. Interview guide sent to strategy interviewees

1. Please describe [Company X] **overall approach to maintaining their competitive advantage when facing the pressures of commoditization?**

(If possible, please highlight specific challenges you perceive as the most critical to address.)

2. How does [Company X] **identify and anticipate shifts in market trends and customer needs that may contribute to commoditization?**

3. Can you provide an example of a recent strategic decision or initiative that [Company X] **has undertaken to counter commoditization pressures or differentiate its products/services?**

4. What role does innovation play in [Company X] **strategy to avoid the commodity trap?**

5. In your opinion, what are the most critical dynamic capabilities* that industrial equipment manufacturers need to develop to successfully navigate commoditization?

(Note: Dynamic capabilities were explained to the interviewees).

6. How does [Company X] **balance the need for standardization and efficiency with the need for differentiation and customization in its product/service offerings?**

7. What advice would you give to other industrial equipment manufacturers seeking to avoid the commodity trap and sustain their competitive advantage?

Appendix 2. Interview guide sent to product management interviewees

1. **Could you describe** [Company X] **approach to product innovation and development? How does** [Company X] **identify and prioritize areas for innovation in its product management?**
2. **How does** [Company X] **leverage technology and innovation to differentiate its products in the market and counter the effects of commoditization?**
3. **How does** [Company X] **balance the need for standardization and modularity in product development with the desire to differentiate its products through innovation?**
4. **How does** [Company X] **product management team collaborate with other departments, such as R&D and marketing, to ensure that new product innovations are successfully brought to market?**
5. **What are some of the challenges that** [Company X] **faces in managing product innovation, and how does the company overcome these challenges?**
6. **How does** [Company X] **measure the success of its product innovation efforts?**
7. **From your perspective as a** [X]**, how do you see the role of innovation evolving in the industrial equipment industry in the coming years?**
8. **What advice would you give to other industrial equipment manufacturers who are looking to leverage innovation to counter product commoditization?**