

Giving a Voice to Global Production: Rethinking Global Operations Strategy

D I S S E R T A T I O N

of the University of St.Gallen,

School of Management,

Economics, Law, Social Sciences,

International Affairs and Computer Science,

to obtain the title of

Doctor of Philosophy in Management

submitted by

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from

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Dissertation no. 5300

Difo-Druck GmbH, Untersiemaun 2023

The University of St.Gallen, School of Management, Economics, Law, Social Sciences, International Affairs and Computer Science, hereby consents to the printing of the present dissertation, without hereby expressing any opinion on the views herein expressed.

St. Gallen, October 24, 2022

The President:

Prof. Dr. Bernhard Ehrenzeller

Vorwort des Autors

Die vorliegende Dissertation entstand im Rahmen meiner Tätigkeit als wissenschaftlicher Mitarbeiter im Bereich Produktionsmanagement des Instituts für Technologiemanagement an der Universität St.Gallen. Durch eine Vielzahl verschiedener Industrie- und Forschungsprojekte hatte ich die Möglichkeit einen tiefen Einblick in das Management global produzierender Unternehmen zu bekommen. Schon früh haben mich dabei vor allem die strategischen Aspekte von Produktionsnetzwerken fasziniert. Besonders hervorzuheben ist das Konsortialbenchmarking-Projekt „Rethinking Global Production Strategies“, welches das Fundament dieser Dissertation bildet. An dieser Stelle möchte ich meine grösste Dankbarkeit den beteiligten Projektpartnern für die konstruktive Zusammenarbeit und das entgegengebrachte Vertrauen ausdrücken. Ohne ihre Bereitschaft für die offenen, lebhaften Diskussionen wäre diese Arbeit nicht möglich gewesen.

Einen besonderen Dank möchte ich auch an meinen Doktorvater und Professor Thomas Friedli richten. Sein unerschütterliches Vertrauen und seine bedingungslose Unterstützung haben wesentlich zum Erfolg dieser Arbeit beigetragen. Selbstverständlich möchte ich mich auch bei Professor Johannes Rüegg-Stürm für die Übernahme des Koreferats meiner Dissertation bedanken.

Darüber hinaus möchte ich meinen ehemaligen und aktuellen Kollegen am Lehrstuhl für die besondere Zusammenarbeit danken. In den vergangenen Jahren haben wir nicht nur erfolgreich Projekte abschliessen, sondern auch grossartige Momente am Mittagstisch, vor der Kaffeemaschine, am Tischfussbaltisch, in den Bergen und in der einen oder anderen Bar geniessen können. Hervorheben möchte ich an dieser Stelle vor allem meine Kollegen aus dem GPROD-Team Michael, Christian, Dominik, Ferdinand, Jens, Fabian und Benedikt.

Abschliessend möchte ich mich herzlichst bei meiner Familie und insbesondere bei meinen Eltern bedanken, die mich stets unterstützt und meinen Lebens- und Bildungsweg erst ermöglicht haben.

Mein grösster Dank gilt jedoch meiner Frau Sophie, die mich besonders in der letzten Phase der Dissertation mit viel Geduld, Verständnis, aber auch Disziplin begleitet und sich wunderbar um unsere Tochter gekümmert hat.

Zusammenfassung

Im hart umkämpften und globalen Geschäftsumfeld, das auch durch rasche technologische Veränderungen und zunehmende Produktvielfalt gekennzeichnet ist, trägt das Management von globalen Produktionsnetzwerken zur Sicherung der Wettbewerbsfähigkeit bei. Doch um die Netzwerkpotentiale tatsächlich nutzen zu können, müssen Netzwerkziele, -konfiguration und -koordination mit der übergeordneten Unternehmensstrategie im Einklang stehen. Dabei kann jede strategische Entscheidung die Struktur und das Management von globalen Produktionsnetzwerken beeinflussen und im schlimmsten Fall, durch eine strategische Fehleinschätzung, die Netzwerkfähigkeiten dauerhaft beeinträchtigen. Es ist wichtig zu verstehen, wie die globale Produktion in strategische Entscheidungen integriert werden muss, um strategische Fehlentwicklungen zu vermeiden. Die vorliegende Forschungsarbeit zielt darauf ab, sicherzustellen, dass die globale Produktion in der Unternehmensstrategie und der strategischen Entscheidungsfindung ausreichend Aufmerksamkeit bekommt.

Die Arbeit ist in einen theoretischen, empirischen und konzeptionellen Teil aufgegliedert. Eine systematische Literaturrecherche bildet die Basis der vorliegenden Forschung und identifiziert Entscheidungskategorien, die für das Management von Produktionsnetzwerken wichtig sind. Der empirische Teil umfasst sowohl eine quantitative Analyse einer Umfrage als auch eine qualitative Auswertung von Experteninterviews. Dabei sind wichtige Erkenntnisse in Bezug auf die Entscheidungsverteilung und Methoden für ein Involvement der globalen Produktion erzielt worden. Diese Erkenntnisse werden unter einem theoretischen Forschungsrahmen zu Praktiken konzeptioniert, die die Stimme der globalen Produktion bei strategischen Entscheidungen stärken soll. Im Zuge einer abschliessenden Fallstudie wurde die Anwendbarkeit der Praktiken genau untersucht. Die Forschungsergebnisse haben deutlich aufgezeigt, wie wichtig die Miteinbeziehung der globalen Produktion bei strategischen Entscheidungen ist, um ein Alignment zwischen Unternehmens- und Produktionsnetzwerkstrategie sicherzustellen.

In der jüngsten Vergangenheit haben globale Pandemien und andere disruptive Ereignisse veranschaulicht, wie essenziell vernetzte Betriebsabläufe und Lieferketten nicht nur für die Wettbewerbsfähigkeit von Unternehmen, sondern auch für den Wohlstand der Menschheit sind. Es ist an der Zeit, dass die Stimme der globalen Produktion einen angemessenen Stellenwert im Unternehmen und in der Vorstandsetage zugeschrieben bekommt.

Summary

In the highly competitive and global business environment, which is also characterized by rapid technological changes and increasing product diversity, the management of global production networks contributes to ensure competitiveness. Yet, in order to actually leverage network potentials, network objectives, configuration and coordination have to be consistent with the overarching corporate strategy. In this context, any strategic decision can influence the structure and management of global production networks and, in the worst case, permanently harm network capabilities through a strategic misjudgment.

It is important to understand how global production needs to be integrated into strategic decisions in order to avoid strategic misalignment.

This research aims to ensure that global production receives sufficient attention in corporate strategy and strategic decision making. The thesis is divided into a theoretical, empirical and conceptual part. A systematic literature review forms the basis of this research and identifies decision categories relevant to the management of production networks. The empirical part includes a quantitative analysis of a survey as well as a qualitative analysis of expert interviews. Important findings regarding decision distribution and methods for global production involvement have been obtained. These findings are conceptualized under a theoretical research framework on practices to strengthen the voice of global production in strategic decision-making. During a final case study, the applicability of the practices was explored in detail. The research findings clearly indicated the importance of involving global production in strategic decision-making to ensure alignment between corporate and production network strategy.

In the recent past, global pandemics and other disruptive events have highlighted how essential connected operations and supply chains are not only for corporate competitiveness but also for human wealth. It is time for the voice of global production to be given its proper status in the company and in the boardroom.

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List of Abbreviations

ABV	Attention-Based View
AI	Artificial Intelligence
(A)IoT	Artificial Internet of Things
APMT	Advanced Production Manufacturing Team
B2B	Business to Business
BU	Business Unit
CEO	Chief Executive Officer
cf.	confer (compare)
COGS	Costs of Goods sold
COO	Chief Operations Officer
COVID-19	Coronavirus Disease 2019
EBIT	Earnings before Interest and Taxes
EBITDA	Earnings before Interest, Taxes, Depreciation and Amortization
et al.	et alii (and others)
e.g.	exempli gratia (for example)
GPN	Global Production Network
HR	Human Resource
HMI	Human Machine Interface
HSE	Health, Safety and Environment
HSG	Hochschule St. Gallen
i.e.	id est (that is)
IMN	International Manufacturing Network
IoT	Internet of Things
IT	Information Technology
ITEM	Institute of Technology Management, University of St.Gallen,

KPI	Key Performance Indicator
MD	Managing Director
MRQ	Main Research Question
PESTLE	Political, Economic, Socio-cultural, Technological, Legal and Environmental factors
ROCE	Return of Capital Employed
R&D	Research and Development
SRQ	Sub-research Question
SBF	Strategic Business Field
SVP	Senior Vice President
SWOT	Strengths, Weaknesses, Opportunities and Threats
S&OP	Sales and Operations Planning
VP	Vice President

1 Introduction

This chapter presents this dissertation's practical and theoretical motivation, underlying research problem, research questions and objectives, and research methodology. Sections 1.1 and 1.2 introduce the motivation for this study from the perspective of practice and theory by providing the rationale for the underlying research problem. Section 1.3 introduces the research questions addressed in this dissertation and also highlights its objectives. Section 1.4 illustrates the research methodology employed to answer the research questions. Section 1.5 presents the theoretical perspective that served as a guiding framework for this research and highlights the constructs of interest to the study. Finally, Section 1.6 presents the structure of the dissertation, demonstrating how each part contributes to the research objectives.

1.1 Practical Relevance and Motivation

In today's rapidly changing, fiercely competitive, and increasingly global environment, meeting the challenges of highly contentious and diverse markets, an uncertain and risky business environment, and changing customer needs is a growing concern for manufacturing companies (Garetti and Taisch 2012; Qiu 2009). The new production environment, also characterized by rapid technological changes and increasing product diversity, requires the production function to be strategically managed (Fai Pun 2004; Dangayach and Deshmukh 2001). A sound production strategy plays a crucial role in the implementation of an industrial company's business strategy. Research has demonstrated that the presence of a production strategy and its linkage to the company's business strategy lead to improved performance (Papke-Shields and Malhotra 2001; Sun and Hong 2002; Joshi et al. 2003; Papke-Shields et al. 2006; Thun 2008; Brown et al. 2010). In addition, the importance of manufacturing in a company's business strategy has a significant positive impact on the effectiveness of that company's global production network (GPN) strategy (Wheelwright and Hayes 1985).

In addition, the results of a benchmark study titled "Managing Global Production Networks" emphasized the importance of having a network strategy in place (Friedli et al. 2020). In total, 88 manufacturing company managers completed the

questionnaire. Based on their answers, 14 companies were classified as “successful practice” companies, whereas the remainder were classified as “follower” companies. Notably, 86% of the successful practice companies considered a clear and detailed strategy to exist for the GPN. Among the follower companies, however, opinions were divided with only 44% agreeing with the same statement, as indicated in Figure 1.

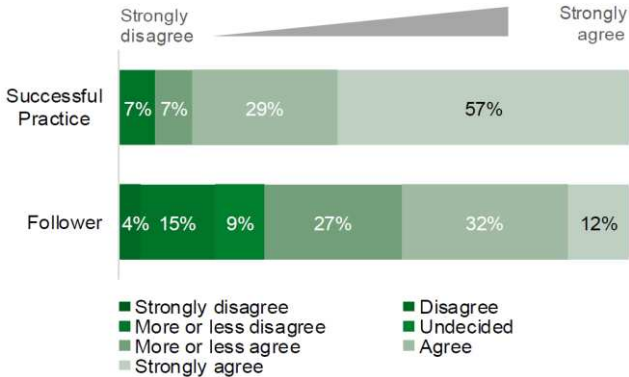


Figure 1: Benchmark study results for the statement of whether a clear and detailed strategy exists for the global production network (e.g., defined criteria, goals, and implementation roadmap). Reprinted from „Benchmarking: Managing Global Production Networks. General Report.“ by Friedli, T. et al.,(2020).

A production strategy is complex, not only in what it consists of but also in how it should be formulated (Adamides and Pomonis 2009; da Silveira and Sousa 2010). Further complicating this is the fact that companies must adapt to the changing environment and regularly rethink their strategies (Porter and Heppelmann 2014). Globalization has accelerated considerably in recent decades (Johansen et al. 2014). Diversified, globally dispersed organizations face difficulty in strategy formulation and implementation because the decision-making contexts of different geographic subunits differ greatly (Doz and Prahalad 1991). Therefore, when companies think about their production network strategy, they should consider that the pace of change in today’s global economy will continue to accelerate. They must no longer think of the development of their production network strategy as an intellectual exercise performed once every 5–10 years. Rather, they must constantly evaluate their asset base to determine whether it is optimally positioned to maximize returns in their

business.¹ During the World Economic Forum 2021, the necessity to integrate the "voice of manufacturing" in the strategic discussion was stressed:

It is no longer about delivering the decisions taken by other functions, supply chain and operations need to be an integral part of business decision making – they cannot work in silos anymore. These changes need to start at our universities and in our boardrooms, at the same time, for the transformation to really create ripple effects. If that seems like an accelerated pace, remember COVID-19 has already shown us how fast we can change things and we don't need another pandemic to remind us of that. (World Economic Forum, 2021)²

1.2 Theoretical Relevance and Motivation

Since the late 1980s, the management of an international network has become increasingly critical, not only in practice but also in theory in the field of operations management (Cheng et al. 2015; Ferdows 2018). This growing importance has attracted the attention of several leading scholars, who have developed many frameworks to optimize the design and management of GPNs. Consequently, several divergent frameworks consider various issues around GPNs. However, researchers have primarily focused on configuration and coordination. Research that follows the established curriculum of traditional production strategy and focuses on how to accomplish the production task in accordance with market requirements (i.e., applying competitive priorities) is rarely found. (Rudberg 2004)

Regarding the alignment of production strategy with business as well as corporate strategy, majority of the empirical scientific work has focused on examining the influence of organizational factors on this relationship, such as the length of employment, age, and level of education of production managers (Chatha and Butt 2015). Strategic planning will ultimately fail if it is restricted to the top management while excluding other relevant managers (Mintzberg 1994). One reason for this is that operation managers must create strategic initiatives and engage in activities that are consistent with strategy, which requires the involvement of middle managers in

¹<https://www.mckinsey.com/business-functions/operations/our-insights/manufacturing-network-strategy-in-a-world-of-unprecedented-change>

² <https://www.weforum.org/agenda/2021/05/operations-and-supply-chain-leaders-would-make-great-ceos/>

the strategy formulation process (Wooldridge and Floyed 1989, 1990) Therefore, the participation of production managers in strategic planning is critical to the development of a "strategic resonance" between overarching and production strategies, which is consistent with the concept of strategic alignment at the strategic management level (Brown and Blackmon 2005). Yet, very limited attention has been paid in research to the development of methods and techniques to support such an alignment process (Chatha and Butt 2015). The importance of defining a strategy for production networks and improving managers' understanding of the characteristics of production networks has also been noted (Rudberg 2004).

1.3 Objectives and Research Questions

This research aimed to ensure that global production finds a sufficient voice in corporate and business strategy as well as strategic decision-making. The research focused on strategic decisions related to the management of GPNs. This topic was approached with the attention-based view (ABV), a theory that helped to identify methods for ensuring that global production receives sufficient attention in these decisions. Underlying this objective was the main research question (MRQ), from which four additional sub-research questions (SRQs) were derived. The guiding MRQ is presented in bold as follows along with the SRQs underneath:

MRQ: How can global operations be given a voice in strategic decisions?

SRQ 1: What are strategic decisions in the context of GPN management?

SRQ 2: How are strategic decisions made in the production network?

SRQ 3: What practices and methods increase attention to global production-relevant issues?

SRQ 4: How can top management involve global production in strategic decisions?

The MRQ and four SRQs were structured in a logical sequence, starting with a systematic literature research in SRQ 1 for selecting the relevant strategic decisions in the context of GPN management. These decisions were validated and expanded over the course of a quantitative study. Based on the identified decisions, SRQ 2 focused on where and which decisions are made in the production network.

Understanding how decisions are made is a prerequisite for developing methods for involving global production in the decision-making process. An evaluation was performed through expert interviews. SRQ 3 aimed to identify practices and methods that increase top management's attention to global production-relevant issues. On this basis, SRQ 4 was aimed at making the emergent knowledge actionable for managers by providing knowledge on how and when to involve global operations managers.

1.4 Research Methodology

This study views business management as an applied social science (Bleicher 2011; Ulrich 1983; Ulrich and Hill 1973), in accordance with the common notion of management put forward by the University of St. Gallen. Practical solutions to everyday problems that practitioners are confronted with in day-to-day business have been developed to ensure scientifically valid standards. The results of the research are therefore intended to reflect social reality (Ulrich 1983; Hofmann 2004) and to influence this by supplying new knowledge to manufacturing executives, as well as methods with which to tackle the current challenges they face when managing their international manufacturing networks (IMNs). The inherent high level of complexity of such networks presents a major issue, as they form a complex system of manufacturing sites in different locations around the world, with dynamic interactions between them (Rüegg-Stürm 2005). This study applied an iterative research process, as shown in Figure 2 , to achieve an in-depth understanding of IMNs, rather than seeking full control.

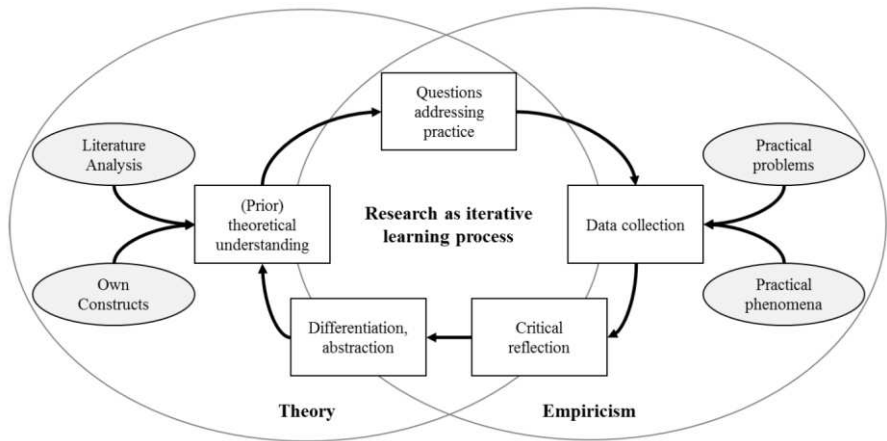


Figure 2: Research as an iterative learning process (adapted from Baumbach, 1998; Kubicek, 1977; Tomczak, 1992)

The reciprocal interplay between theory and practice ensured both a formal scientific foundation and applicability (Gassmann 1999). A preliminary theoretical understanding of the phenomenon being studied formed the basis for formulating questions in order to acquire new insights for practice. A critical reflection on the results thus obtained followed the subsequent data collection. New knowledge and a deeper understanding of the particular phenomenon were acquired through the repeated differentiation, abstraction and interpretation of information (Gassmann 1999). For the researcher in question, this represents a continuous learning process that benefits their expertise, deriving theoretical knowledge from the experience and gradually adding to the existing body of knowledge (Kubicek 1977).

As illustrated in Figure 3, a five-step iterative research process was followed with an explanatory, sequential, mixed-methods approach involving qualitative and quantitative research methods (Teddle and Yu 2007). The two major reasons for applying a mixed-methods approach in this study were triangulation and complementarity. Triangulation and complementarity were two key reasons for the study to take the approach of mixed methods. While triangulation signifies the “convergence, corroboration, [and] correspondence of results from different methods,” complementarity enables “the elaboration, enhancement, illustration, clarification of the results from one method with the results from the other method” (Greene et al. 1989).

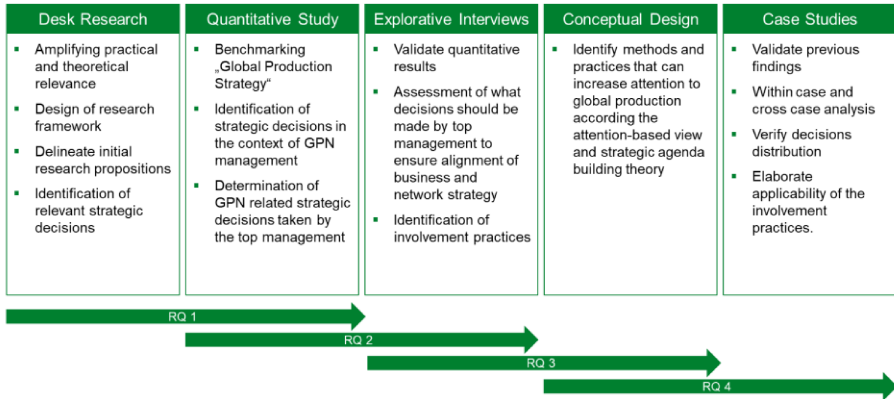


Figure 3: Research approach (own illustration).

A detailed description of the approach and structure of this thesis is provided in Section 1.6 at the end of this chapter.

1.5 Research Theory

This section presents the theoretical perspective that served as a guiding framework for this research. Then, it highlights the constructs that were of interest to the study. The ABV constituted the scientific foundation for the present research. Ocasio (1997) described the relationship between strategic performance and focused attention as follows:

The accurate planning and performance of strategic actions and the speed of their execution require that individual and group decision-makers concentrate their energy, effort, and mindfulness on a limited number of issues and tasks. Successful strategic performance thereby requires the sustained focusing of attention and effort associated with controlled attentional processing. (Ocasio 1997)

As defined Ocasio (1997), attention is when organizational decision-makers notice, encode, interpret and invest time and effort regarding problems and solutions, generally referred to as “issues” that collectively form the agenda of the organization, towards which corporate activities are then oriented (Mintzberg 1979). In order to devise a strategy to bridge macro-organizational and micro-

organizational aspects, a theory based on attention was put forward by Ocasio and Joseph (2005), especially bringing together evolutionary perspectives on strategy (Burgelman 1991, 2002) and matters of strategic choice (Child 1972) in organizational and strategic decision-making (Bower 1970; Carter 1971). The notion of strategy formulation resulting from organizational attention patterns relating to the interacting network of specific operational and managerial channels at the levels of both the corporate and business unit (BU) was also put forward by Ocasio and Joseph (2005). These comprise formal decision-making channels that include board of directors, board committee, executive committee and operating committee meetings, requests for capital and operational budgets, financial performance and strategic planning reviews, as well as employee evaluations, ad-hoc channels for mergers and acquisitions, organizational restructuring, joint venture projects and informal interactions outside of formal procedures.

As an explanation of the dynamics of formulating corporate strategy from the point of view of an ABV, as well as focusing on channels, Ocasio and Joseph (2005) also put forward the five orientation suggestions below, intended to direct further theoretical development and empirical research, as well as to establish a link between the attentional processing theory of strategy formulation (Ocasio 1997) with the strategy process theory of guided evolution (Lovas and Ghoshal 2000).

- (1) for decision-making to be led by selective attention to organizational issues and initiatives;
- (2) for selective attention to organizational issues and initiatives to be situated within a dynamic network of operational and management channels;
- (3) for formal channels to guide the establishment of informal channels;
- (4) for closer and looser linking of the network of channels to guide strategy development through the selective retention of strategic initiatives;
- (5) for the selective retention of initiatives in channels to be a way of gaining a competitive advantage.

The company's network of operational and management channels is the focus of organizational attention. Management channels provide a forum for drawing the attention of managers to corporate matters, such as problems and opportunities, and are therefore especially important for devising strategic initiatives in response. Information is filtered and decisions are guided through formal and informal

channels. The range of issues and initiatives addressed by managers is filtered and reduced through a process of selective attention and through the company's channels. Finding initiatives in response to issues leads to decision-making within the organization. The choice and retention of initiatives within the organization is determined by how these channels work together, because although the formulation of strategies is a key task for management channels, the initiatives they take must be strategically implemented by the company's operational channels. It is also essential for management and operational channels to cooperate in order to obtain operational feedback that allows strategic issues to be accurately identified and suitable strategic initiatives to be taken in response.

According to the ABV, all companies should devise a strategy as a pattern of focused attention, which can be the result of intentional strategy definition and decision-making processes (Ocasio and Joseph 2008), or of the repeated reformulation of original decisions in accordance with changing market and organizational circumstances (Joseph and Ocasio 2012; Ocasio and Joseph 2018). In order to develop a strategy, it is not necessary or adequate to have foresight, from the point of view of ABV, as it is not the original idea, plan or intention that brings forth a viable strategy but a strategic agenda resulting from a focus of attention that is consistent, compatible and coherent, whilst being able to adapt to changing situations (Ocasio and Joseph 2018). This agenda prioritizes certain actions that determine how markets and customer segments are selected, as well as the range of products and services, corporate values, price setting and cost structures, how assets and competences are developed, acquired and applied, the development of cooperations and partnerships, and how to respond to competition. The strategy that emerges from this represents both a configuration of prior strategic choices (Rivkin 2000) and a consistent agenda for the ongoing development and elaboration of a strategy (Ocasio and Joseph 2018). The notion that great strategies are characterized by evolving strategic agendas and subsequent advantageous adaptations is at the heart of the approach taken by Ocasio and Joseph (2018). The creation of long-term added value for the organization and its stakeholders is driven fundamentally by such great strategies (c.f. Cyert and March, 1963), which must reflect the distinctive identity and values of the company, as well as providing a focal point towards which managers throughout the organization can direct their attention and efforts over time, allowing the flexibility to respond to new issues and circumstances (Ocasio and Joseph 2018). It is evident, therefore, that successful strategies represent a collection

of issues and initiatives, rather than a monolithic concept, that together form a flexible corporate strategic agenda.

In terms of theory, new possibilities for understanding strategic decision-making in its early stages, in which decision-makers identify potential problems and opportunities, are provided by the notion of putting together a strategic agenda (Kiesler and Sproull 1982; Lyles and Mitroff 1980; Mintzberg et al. 1976), which signifies the process of strategic issues being identified and brought to the attention of decision-makers within the organization. A strategic agenda is put together in a step-by-step process, with new strategic issues being placed in relation to those of which decision-makers are already aware (Dutton 1986). The strategic issues that are accorded collective attention within the organization is referred to as the strategic agenda or issue portfolio (Huff and Pondy 1983). Collective signifies a consensus that a certain issue exists and can be discussed by individuals (Simon 1971). When decision-makers deem issues to potentially affect corporate objectives and the required allocation of resources, they are considered to be strategic (Chandler 2001). When various organizational levels work together to agree on a legitimate issue that requires company resources, it results in a strategic agenda.

According to this model, the agenda is influenced by the context of the issues raised. When formulating the agenda, each step is an instance of an “issue-within-an-organization” (Downs and Mohr 1976) and the resulting decision of whether to include it on the agenda depends on the issue and on forces operating at the organizational level. The definition of issues as either important or unimportant represents the strategic framework of an organization (Huff 1982), providing orientation as to whether to focus attention on them or not (Hambrick 1981). The perceived importance of issues thus influences whether they are included in the agenda and the organization’s overall strategy.

The notion of issue exposure signifies people’s awareness of it, while issue interest refers to people’s involvement with an issue that they are aware of, indicated by the time, effort and personal resources they are willing to commit to it. Both of these can determine whether an issue becomes part of the strategic agenda, representing the fundamental proposition on which the building of an agenda is based. This indicates essentially that there is a relationship between the forces driving an issue and how likely it is to be included in the agenda. Eight hypotheses were set out by Dutton (1986) relating to his agenda building model:

- (1) The greater the perceived magnitude of a strategic issue, the greater the probability of being included in the agenda.
- (2) The more abstract an issue is, the greater the probability of being included in the agenda.
- (3) The less complex an issue is perceived as, the greater the probability of being included in the agenda.
- (4) The more immediate an issue is, the greater the probability of being included in the agenda.
- (5) The greater the power of an issue sponsor, the greater the probability of being included in the agenda.
- (6) The more the sponsor is personally involved with an issue, the greater the probability of being included in the agenda.
- (7) The bigger the agenda, the greater the probability of being included in the agenda.
- (8) The wider the variety of issues on the agenda, the greater the probability of being included in the agenda.

The development of suitable ways of raising awareness of global issues relating to production in strategic decision-making, in order to better align the global production strategy with corporate strategy, is based on the critical pillars put forward by Ocasio and Joseph (2005) and Dutton (1986).

1.6 Thesis Structure

The research thesis at hand is structured in seven chapters. Each chapter is based on the others and together they contribute to achieving the research objective. The chapters are aligned with the research approach illustrated in Figure 6. The remainder of the thesis is organized as follows: Chapter 2 elaborates on the current theoretical status and Chapter 3 provides an up-to-date picture of practice. Chapter 4 describes how exploratory, semistructured expert interviews were conducted to verify and complement the findings. Subsequently, Chapter 5 consolidates and links the preliminary research findings, which are discussed in detail in Chapter 6 in practice. Finally, Chapter 7 provides a description of the final research results, draws conclusions for theory and practice, and concludes by addressing the limitations of the study and an outlook for future research. Each of the remaining chapters is described in more detail in the following paragraphs.

Chapter 2 – State of Research

The theoretical relevance of the literature was first confirmed through screening, also in order to show in what ways existing solutions are inadequate. A comprehensive literature overview is presented by this chapter, which outlines the research gap, helps to define the research questions and to put together a preliminary research model. It also forms the basis for the sub-research question 1. The literature gives rise to the research questions in most cases, as they help to define the purpose, showing knowledge gaps. It is always beneficial to study the literature, even in cases where it is practical experience that prompts the research question, firstly to provide a context for the question and secondly to establish whether any other researchers have already addressed it. Reviewing the literature therefore helps researchers to define their research questions.

Chapter 3 – State of Practice

The second step of the research procedure built on a quantitative study in the course of a benchmark project titled “Rethinking Global Production Strategy.” The survey addressed operations managers in charge of a manufacturing network (network managers) across all industries. The aim was to verify the results from the literature review and identify strategic decisions in the context of the management of GPNs, which must be taken by top management to ensure the alignment of the overall company strategy with the global production strategy.

Chapter 4 – Expert Interviews

This chapter describes the explorative interviews that were conducted with network managers. These interviews provided a comprehensive understanding of strategic decisions as well as how certain contextual factors support the consideration of the GPN.

Chapter 5 – Conceptual Design

In this chapter, the previous research findings are consolidated under the theoretical lens of the ABV and strategic agenda building. Moreover, practices are elaborated to strengthen attention to global production issues in strategic decision-making.

Chapter 6 – Case Studies

This chapter presents multiple in-depth case studies that were conducted on industry and research projects at ITEM. The inputs provided the basis for identifying elements that could guide top management’s attention and eventually for considering

GPN-related decisions. This chapter concludes with a network management discussion regarding the criteria and respective weighting for the selection of attention-guiding routines.

Chapter 7 – Discussion and Conclusion

This research ultimately aimed to develop a conceptual model to support the consideration of GPN in strategic decisions in the design of attention structures, which is presented in this chapter. The obtained knowledge is generalized to enrich the existing knowledge base and theory. Lastly, the limitations of the study are discussed along with recommendations for future research.

2 State of Research

The aim of this chapter is to build a thorough understanding of the knowledge that already exists in the area of global production strategy. Such an understanding is essential before conducting any further research within it, because it guides the identification of research gaps and supports the formulation of new research questions (Cooper 1988; Webster and Watson 2002). The chapter is divided into 5 sections. Section 2.1 provides an overview of the current IMN literature. Section 2.2 focuses on the research area of production strategy. Theoretical research gaps are derived in Section 2.3. In the course of a systematic literature review, scientific knowledge is identified that deals with both literature streams, in section 2.4. These findings are summarized in section 2.5.

The analysis of the existing knowledge base of production and network strategy and GPNs has been partly incorporated into the theoretical discussions of the following publications:

- Miedler, P. (Miedler 2021). Analyzing and optimizing international manufacturing networks – learnings from the field. *Die Unternehmung*, 75(4), pp. 521–536.
- Miedler, P., and Friedli, T. (Miedler and Friedli 2021). Deriving a Network Strategy. *Global Manufacturing Management* (pp. 87–100). Springer, Cham.

2.1 Analyzing the Knowledge Base on Manufacturing Networks

In the 1960s, internationalization and globalization resulted in changes in the approach to marketing and sales activities. Even though markets had become more global, manufacturing activities were still geographically localized and production facilities were treated as independent, self-contained units (Rudberg and Olhager 2003). For decades, companies established production sites around the world and built GPNs (Schmenner 1982), but network interactions were largely neglected. With the increasing internationalization of manufacturing in the late 1980s, research into the relationships between intertwined manufacturing plants and supply chains became essential. A change occurred from traditional factory-focused manufacturing systems to an overall view of globally distributed plants in the form

of so-called IMNs (Cohen and Lee 1988; Porter 1986).

According to Rudberg and Olhager (2003), manufacturing activities are conducted in so-called value-added networks, which can be divided into four different classes depending on the number of organizations involved and the number of sites that are part of the network. These classes are plant, intra-firm/-company network, supply chain, and inter-firm/-company network, as presented in Figure 4.

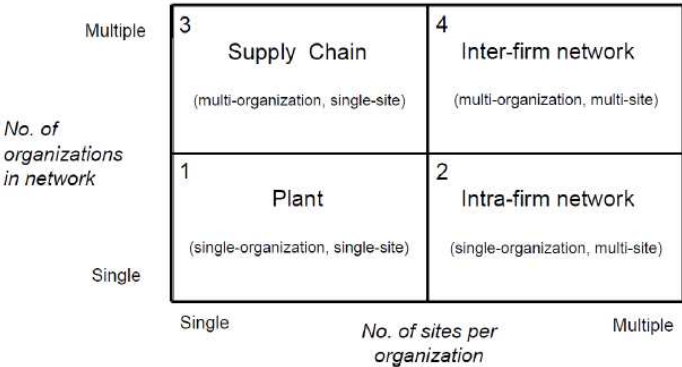


Figure 4: Classes of value-adding networks. Reprinted from “Manufacturing networks and supply chains: An operations strategy perspective,” by M. Rudberg and J. Olhager, 2003, Omega, 31, p. 30.

An IMN describes two or more sites located in different places, which constitute a coordinated accumulation (network) of intra-firm production entities under the managerial control of one organization (Cheng et al. 2015; Cheng et al. 2019; Lanza et al. 2019; Johansen et al. 2014; Rudberg and Olhager 2003; Shi and Gregory 1998). An IMN is assigned to class 2, namely “intra-firm/-company network.”

However, an IMN does not simply constitute an aggregation of individual production entities. The network is seen as an independent and complex system in which the sites interact and influence each other (Khurana 1999; Shi and Gregory 1998). All entities within the network execute direct value-adding activities under a joint corporate strategy (Lanza et al. 2019). In the course of globalization and the resulting global transformation of production networks through offshoring, reshoring, restructuring, mergers, acquisitions, and divestments, the development of production networks in most industrial cases has been evolutionary and to some degree accidental rather than systematically driven. The resulting complex and

inefficient structures have made it difficult for managers to successfully design and steer their production network (Ferdows 2018; Friedli et al. 2014). The literature provides numerous frameworks and tools for analyzing and optimizing an IMN. Porter (1986) used configuration and coordination as the two key dimensions for differentiating between various types of global manufacturing networks. Numerous researchers have used Porter's model as the basis for extended conceptual models; for example, see Meijboom and Vos (1997), Shi and Gregory (1998), Colotla et al. (2003), Rudberg and Olhager (2003), and Rudberg and West (2008). Friedli et al. (2014) provided an overview of various tools by consolidating them into the following three fields of action: strategy, configuration, and coordination, which are given in Figure 5 (Miltenburg 2015b).

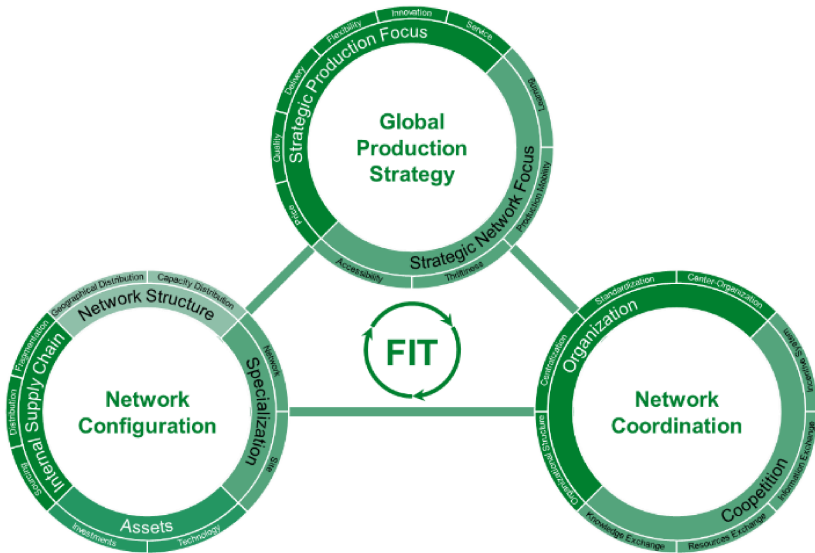


Figure 5: St. Gallen Global Manufacturing Management Model for optimizing global production networks. Reprinted from “Strategic Management of Global Manufacturing Networks,” by T. Friedli et al., 2014, Berlin Heidelberg: Springer, p. 46.

The following subsections provide a more detailed description of the three categories and the "fit" to be aimed for.

2.1.1 Network strategy

Very few of over hundreds of papers or books on manufacturing strategies published since the 1960s have put forward new production network strategies (Brennan and Vecchi 2017). Presumably on account of their complexity, international manufacturing strategies are among those discussed the least in the field and they have only been addressed by few authors.

A framework (presented in Figure 6) for defining a manufacturing strategy within the multi-plant network of a company was put forward by Miltenburg (2009), illustrated through the example of three companies in the global steel industry. This framework focused on network configuration, comparing network strategy models in terms of pressure for globalization versus a pressure to be locally responsive, (Prahalad and Doz 1987; Shi and Gregory 1998), as well as factory types (Ferdows 1997) and decision categories (Hayes and Wheelwright 1984).

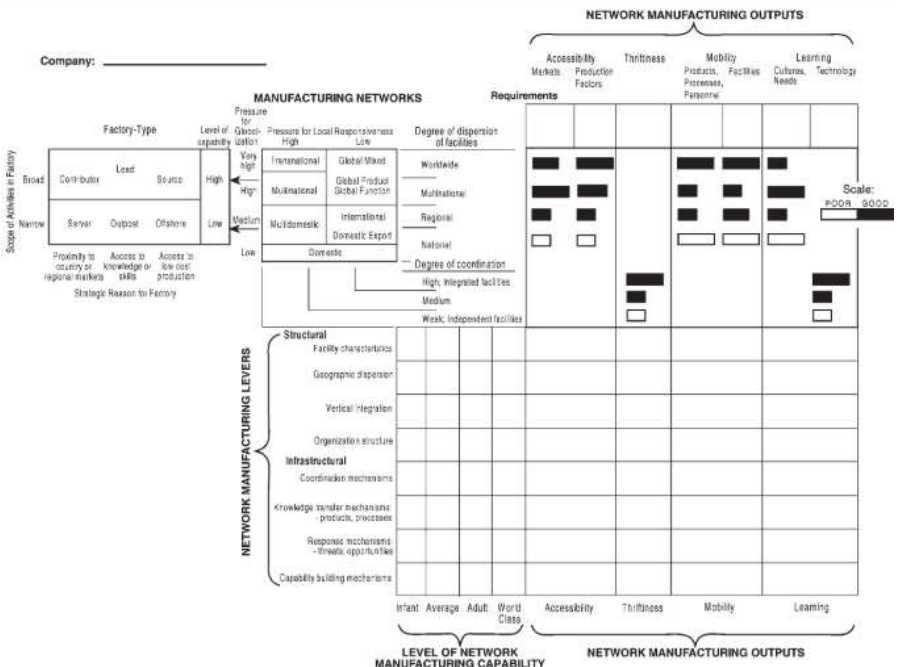


Figure 6: Manufacturing strategy framework for a manufacturing network (Miltenburg 2005).

This framework was applied in later papers by Miltenburg to describe the

development of the manufacturing network and types of facility of Michelin (Miltenburg 2015a) and Heinz (Miltenburg 2015b), with a focus respectively on their operations in North America. Fleury et al. (2015) made use of a similar approach, seeking to combine various frameworks in IMNs for the development of an analytical framework for operational management in multinationals in emerging countries.

The “Global Production Strategy” layer in Figure 5 consists of the two decision dimensions of production strategy and network strategy. The production strategy, like other functional strategies, is derived from the corporate strategy. The framework is determined by the production priorities it intends to support and is key to the company’s success on the market in terms of price, quality, delivery, flexibility, innovation and service (Friedli et al. 2014; Thomas 2013; Miltenburg 2009; Slack 2015). Production targets and market demands are often defined by the notion of production priorities (Dangayach and Deshmukh 2001; Wheelwright and Hayes 1985), which according to Hill (1993) can be classified either as “not relevant”, “order qualifier”, “critical order qualifier”, “low-priority order winner”, “high-priority order winner” or “top-priority order winner.” In order to strategically align sites with the competitive priorities of a network, one possibility is to break down the global into site-specific production strategies with their respective operational performance targets, although this does not take account of the interaction between manufacturing sites within the network and therefore the so-called specific network capabilities (Shi and Gregory 1998), which can be realized alongside production priorities on various levels, depending on the configuration and coordination of the network (Colotla et al. 2003; Jonsson and Rudberg 2014). The four capabilities of accessibility, thriftiness, mobility and learning, which are achievable on a network level, were proposed by Shi and Gregory (1998).

The purpose of the Global Production Strategy layer is to identify the relevant production priorities and derive the necessary network capabilities. Through the configuration and coordination layer, these network capabilities can be supported and coordinated to most effectively support the implementation of the production strategy (Friedli et al. 2014). Manufacturers can set out the strategic goals for the whole network through the accurate definition and description of the required network capabilities. The competences and characteristics of individual sites that influence the interaction of sites contribute to the strategic network goals (Thomas et al. 2015).

2.1.2 Network configuration

The physical setup of individual sites and of the overall network is referred to as its configuration (Friedli et al. 2014), comprising the network structure and geographical position (Abele et al. 2008; Miltenburg 2009; Shi and Gregory 1998) and how capacities are distributed among the sites in the network, as well the specializations and strategic roles of the sites (Feldmann et al. 2009; Feldmann 2011; Feldmann and Olhager 2013; Ferdows 1997; Maritan et al. 2004; Schmenner 1982; Vereecke et al. 2006; Vereecke and van Dierdonck 2002; Vokurka and Davis 2004). Typologies of networks provide support for a reduction of complexity to enable better decisions to be made (Ferdows et al. 2016). So-called “site portfolios” offer another way to reduce complexity and make better configurational decisions. One example is the mountain model by Christodoulou et al. (2007), which is intended to support the definition of site roles. Friedli et al. (2014) extended this model and complemented both Ferdows’ role model (1997) and Feldmann et al. research on the classification of plant competencies (2009). Another crucial approach in the IMN literature was developed by Ferdows et al. (2016), according to whom today’s manufacturing networks must fulfill a wide range of strategic tasks that make design and management increasingly complex. Therefore, to reduce this growing complexity, the network should be delayered into smaller subnetworks.

2.1.3 Network coordination

Network coordination comprises the organization and management of the global distribution of activities within the network and requires organizational and competition decisions, such as regarding the autonomy of the sites (Feldmann 2011; Maritan et al. 2004; Miltenburg 2005; Rudberg and Martin West 2008), how resources are allocated within the network, the means of information and knowledge exchange between sites (Mundt 2013; Thomas 2013), as well as incentive systems for fostering competition and cooperation within the network (Bartol and Srivastava 2002).

Although many researchers are of the conviction that coordinating the network properly is critical to optimization (Cheng et al. 2011; Fredriksson and Wänström 2014; Rudberg and Olhager 2003), the literature has devoted less attention to this than to network configuration (Cheng et al. 2015; Pontrandolfo and Okogbaa O. 1999; Sayem et al. 2018; Cheng et al. 2019).

2.1.4 Network fit and continuous improvement

The “network fit” can be divided into the two different categories of internal and external (Arogyaswamy and Byles 1987). The systematic alignment of the selected strategy, structural and infrastructural parts of the network leads to the achievement of an internal fit (Hill and Brown 2007), while the extent to which a network’s competitive environment is aligned with its organizational structure - comprising strategy, configuration and coordination - is referred to as the external fit (Friedli et al. 2014). It is essential to improve the network configuration and coordination on an ongoing basis in order to maintain competitiveness (Friedli et al. 2014; Cheng et al. 2015; Colotla et al. 2003).

The findings from the production strategy literature are discussed in the next section.

2.2 Analyzing the Knowledge Base on Production Strategy

Many researchers in the academic world since the 1960s have placed an emphasis on how important the notion of production strategy or manufacturing strategy is, two terms which have different meanings in certain contexts but which are used interchangeably in this thesis (Adamides 2015; Fai Pun 2004), as well as on how successfully business strategies align with operational practices (Skinner 1969; Skinner 1974; Hayes and Wheelwright 1984; Voss 1995; Hill 1993). One of the core topics of production management research is the strategic importance of production (Chatha and Butt 2015; Dangayach and Deshmukh 2001).

Literature and practice both put forward a variety of definitions of production strategy, which is also due to the fact that there can be a wide variation in the contextual factors of manufacturing strategies on account of the different types of industries and competitive environments (Kulkarni et al. 2016; Platts et al. 1998; Ward and Duray 2000). The general definition of a production strategy is the optimization of production capabilities through structural and infrastructural decisions in order to obtain a unique strategic position on the market that is in line with the overall corporate targets (Brumme et al. 2015; Hayes et al. 2005; Platts et al. 1998). This strategy is usually divided into context, content and process (Löfving et al. 2016; Kulkarni et al. 2019).

The notion of manufacturing strategy was put forward by Skinner (1969) to describe how a company plans to compete on the market. According to him, manufacturing is subject to consistent internal decision-making and reflects the company’s

competitive priorities in line with the corporate strategy and the competitive environment. Skinner's basic insights were developed further by Hayes and Wheelwright (1984) and Hill (1993). The process of forming manufacturing strategies is based on the traditional framework proposed by Wheelwright and Hayes (1984), which states that strategic manufacturing objectives such as cost, quality, delivery and flexibility must be in line with corporate and business objectives. A framework for setting out a manufacturing strategy was put forward by the authors, based on a set of structural and infrastructural decision categories. The former signifies decisions regarding physical properties for which significant capital investment is necessary and which are difficult to change or reverse, such as processes, capacities, facilities and vertical integration, while the latter represents the systems, policies and practice that define how to manage the structural aspects, such as quality and control systems, planning, organization and the workforce.

According to the definition by Wheelwright (1984), a manufacturing strategy represents a decision-making pattern within the aforementioned categories. The effectiveness of the manufacturing strategy is determined by the consistency of these decisions in order to support manufacturing and the competitive priorities. The manufacturing strategy was described by Hayes et al. (2005) as the process of forging the operational capabilities required by the company in future, which brings together Skinner and the resource-based view of a company.

While the content aspects of the production strategy are covered by the explanation of the manufacturing strategy above, strategic production decision-making is referred to as the strategy process.

According to Dangayach and Deshmukh (2001), up until the year 2000 manufacturing strategy literature paid little attention to the process aspect in favor of the content aspect. The literature presented primarily hierarchical early manufacturing strategy process models (Leong et al. 1990), in which the business strategy was driven by the corporate strategy, in turn driving the functional and production strategies. An empirical study by Marucheck et al. (1990) of the manufacturing strategy process in six companies showed that a top-down approach is prevalent. Fine and Hax (1985), Platts and Gregory (1990), Anderson et al., (1991), Garvin (1993), Mills et al., (1995), Menda and Dilts (1997), Gilgeous (2001), Swamidass et al., (2001), Barnes (2002), and Brown et al. (2010) have also discussed similar structural approaches to the development of manufacturing strategies. A more recent analysis by Kim et al. (2014) of 111 action plans within German

companies has indicated the opportunities for improving and honing competitive advantages through bottom-up initiatives, complementing a top-down operational strategy. The production strategy is carried out as a sequence of actions, starting with formulating the strategy, also referred to as “intended strategy” in line with the company’s intentions, followed by the “deliberate strategy” that comprises the actions taken in order to achieve the intended strategy (Quezada et al. 1999), then the “emergent strategy” comprising actions that were not part of the original intention but are a response to changed circumstances, followed by the “realized strategy” referring to the occurring results (Boyer 1998) and the “unrealized strategy”, which comprises sought after results that were not achieved (see Figure 7) and ending with operational implementation or “business performance”

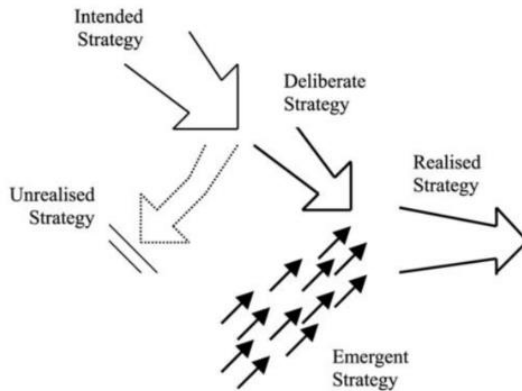


Figure 7: Intended and realized strategy. Adapted from “Of strategies, deliberate and emergent,” Mintzberg, H., and Waters, J. A. (1985). Strategic management journal, 6(3), 257–272.

Empirical evidence of a positive correlation between the initial strategy formulation and concluding actual performance has been provided by Ahmed et al. (1996). Companies that devise and implement their strategy sequentially (Figure 8), whereby the strategy is planned before addressing implementation, often display divergences between the intended and the realized strategy. If these are too wide, the companies seek to enable a continuous process by integrating the strategy formulation and implementation sequentially, with the disadvantage that too much time passes between formulation and ultimate implementation, often not taking changes in the dynamic environment into account. It is recommended in this case for strategy formulation and implementation to be almost simultaneous, although this is

based on the presupposition that the strategy follows a bottom-up approach alongside being formulated within the inner circle of the management team, in order to speed up implementation (Müller-Setwens and Lechner 1999).

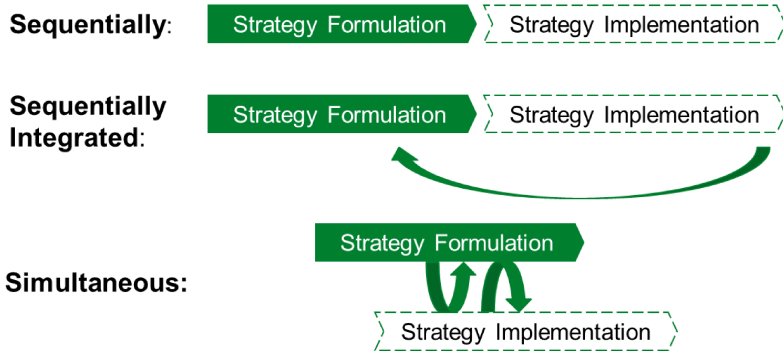


Figure 8: Strategy implementation. Adapted from “Die Gestaltung unternehmerischer Einheiten: Der General Management Navigator als ein Konzept zur integrierten Strategie- and Wandelarbeit,” Müller-Stewens, G. and Lechner, C., “Die Organisationsentwicklung,” 1999, Vol. 18, No.2, p. 24–43.

The distinction between the process of formulating the manufacturing strategy and its content is highlighted by thinking of the manufacturing strategy as a series of actions (Platts et al. 1998; Barnes 2002). The prime focus of production strategy has been on content, as well as process aspects at the beginning of the new millennium, whilst there has been a great lack of context-specific research (Chatha and Butt 2015; Chatha et al. 2015; Kulkarni et al. 2016; Ward and Duray 2000). However, it is not possible to formulate a production strategy in isolation (Fine and Hax 1985). The necessity of gaining an understanding of changes in a volatile market and of the competitive environment is the basis for aligning production strategy with business strategy (Hill 1993; Kulkarni et al. 2016; Sarmiento et al. 2013). This makes it very important to understand “contextual” circumstances that show how the production strategy relates to the competitive environment (Platts 1993; Ward and Duray 2000; Wit and Meyer 2010). It is necessary to address internal contextual factors, for example culture and leadership that can be sources of competitive advantage as they define the context for the strategy formulation of an organization, alongside external contextual factors (O'Regan and Lehmann 2008).

In conclusion, the triad of content, process and context dimensions must be considered in a balanced manner in order to ensure the stable formulation and

implementation of a production strategy (Brumme et al. 2015; Hayes et al. 2005; Kulkarni et al. 2016; Ward and Duray 2000; Wit and Meyer 2010).

Strategy has been divided into a hierarchy of corporate, business and functional levels by scholars (Hill 1997; Fai Pun 2004), with the manufacturing strategy potentially being situated on two levels: (1) the corporate level, whereby a broad view is taken across a collection of related or separate businesses, or (2) the business level, as a functional strategy (Mills et al. 1995). Many researchers from Skinner (1969), Hayes and Wheelwright (1984) to more recent publications (Swamidass et al. 2001, Barnes 2002, Dangayach and Deshmukh 2001, Hayes and Upton 1998), have highlighted how important a production strategy is within the wider organizational strategy. Applying strategic decisions in various production areas, in order to match the company's capabilities and resources on the one hand with the competitive strategy on the other enhances the company's competitiveness in different sectors of the market (Platts and Gregory 1990; Fai Pun 2004). Skinner (1969) highlighted the role that operations managers play in the strategic process, while Wheelwright (1984) pointed out that operations managers have been isolated for decades by a narrow technical perspective, reducing their influence on the strategic process. In the studies of the relationships between strategy formulation, strategy process and operational performance carried out by Brown et al. (2007), it emerged that low-performing operations do not display both the strategic operations content and operational process characteristic of world-class operations. According to them, production performance could be augmented through the involvement of senior production managers in the strategic planning process, helping to bring the business strategy and operational practice in line with each other.

The seminal works of Skinner (1969) and Wheelwright and Hayes (1985) also included cross-functional integration, showing that it was beneficial for operations managers to be involved in the strategic process. The integrated participation of different functional areas in the strategic business process has been proven to improve operational and business performance according to various competitive criteria, as shown by Swink et al. (2007). The importance of the integration of marketing and operations for improving business results has also been demonstrated by other authors such as Malhotra and Sharma (2002). Hierarchical gaps are reduced with the increased involvement of different functional areas in the strategic process, according to Lee Park et al. (2018).

The following sets out theoretical research gaps based on theoretical knowledge in

the areas of IMN and production strategy.

2.3 Theoretical Gaps

The associated theories allow two conclusions to be drawn. First of all, while manufacturing strategy literature has increased greatly since Dangayach and Deshmukh (2001) was published, it remains unclear as to how questions about the new set of future challenges presented by an uncertain global marketplace can be answered by the current existing literature (Chatha and Butt 2015). Secondly, whilst the literature provides ample coverage of the field of IMN management (Bartlett and Goshal 2000; Cheng et al. 2011, 2015; Ferdows 1997), deficits in research on manufacturing strategy in multi-plant networks remain (Olhager and Feldmann 2018). Cheng et al. (2019) suggested the following:

“[S]cholars should link firms’ business strategies with the management of global operations and IMNs and take on the significant decisions in this area, including specifying strategies for choosing global sites for production and setting their strategic roles (Ferdows 2018), designing the configuration of a firm’s IMN (which can be thought of as the structure of multi-plant networks and concerns issues such the building of an IMN; (Colotla et al. 2003) and managing the coordination of the firm’s IMN (which refers to the questions of how to link or integrate manufacturing facilities and how to achieve an efficient and effective plan among the network’s plants; (Rudberg and Olhager 2003)” (Cheng et al., 2019).

In a comprehensive literature review, Chatha and Butt (2015) identified various research potentials in the field of production management. Among other things, they suggested that global production should be viewed through the lens of production paradigms, such as strategic decisions as well as from economic, social, and environmental perspectives. According to Rudberg (2004), it was important to develop a manufacturing network strategy alongside increasing managers’ understanding of the properties of a manufacturing network. The fact that a competitive advantage is gained by operations executives playing an active role in the formulation of strategies is well known (Brown et al. 2007; Papke Shields and Malhotra 2008; Swamidass and Newell 1987; Wheelwright and Hayes 1985). Descriptions of the operations strategy process have also revealed the types of decisions made in this role (Skinner 1969; Fine and Hax 1985; Menda and Diltz

1997). However, there is only a limited understanding of in what ways and to what degree a variety of internal and external contingencies have an impact on the optimal involvement of operations management in the formulation of strategies (Demeester et al. 2014). Notions and definitions from the literature relevant to this work have been highlighted in the previous sections, such as production strategy and the field of GPN management and design, which is wide-ranging and complex. Even so, GPNs are not accorded sufficient attention by the majority of strategic and general management scholars, treating them as a type of black box (Prasad and Babbar 2000; Ferdows 2018; Cheng et al. 2015).

While the importance of aligning the production strategy with the business strategy has been pointed out by various researchers (see Chapter 2.2), a more widely global operation perspective would enrich the overall discussion (Cheng et al. 2019).

2.4 Systematic Literature Review

The purpose of this section is to identify and review studies that have addressed the interface of the two research streams. A systematic literature review was conducted to identify and analyze relevant studies that address this exact area, which is illustrated in Figure 9.



Figure 9: Relevant research streams (own illustration).

The systematic literature review is presented as follows. Section 2.4.1 outlines the methodology employed to conduct the review, and then Section 2.4.2 presents the findings.

2.4.1 Approach

The structure of a literature review can be either systematic, semi-systematic or integrative (Snyder 2019). The previous knowledge of the researcher may make latent beliefs or biases evident, which cannot be ruled out even in the most rigorous of approaches (Onwuegbuzie and Frels 2016). The aim is therefore to carry out a process that is transparent, justifiable and systematic throughout, allowing reviewers to examine, evaluate and build on the findings.

To conduct this literature review, a specific approach comprising three basic steps (Onwuegbuzie and Frels 2016) was applied. The three sequential steps of this systematic literature review are presented in Figure 10.



Figure 10: Three phases for a comprehensive literature review, consisting of exploration, interpretation, and communication. Adapted from Onwuegbuzie, A. J., and Frels, R. (2016). Seven steps to a comprehensive literature review: A multimodal and cultural approach.

The exploration phase involved a series of investigative steps. Based on the knowledge from the literature mentioned in Sections 2.1 and 2.2 and the existing theoretical gap described in Section 2.3, the following problem statement was defined:

A large share of companies fail to consider GPNs an integral part of strategic decision making.

This review has been defined in its nature and extent by the stated problem. Step 1.1, the initiation of the search, is about the identification of relevant databases, which should include multidisciplinary, interdisciplinary and transdisciplinary types (Onwuegbuzie and Frels 2016). Three disciplinary databases were identified for the purpose of this review: EBSCOhost (multidisciplinary), Emerald and ScienceDirect (interdisciplinary), and ProQuest (transdisciplinary), followed by an initial search. The following keywords were generated based on the initial search: (“Manufacturing Network*” OR “Production Network*”) AND (“Production Strateg*” OR

“Manufacturing Strateg*” OR “Operations Strateg*” OR “Strategic alignment”). The selection of keywords was an iterative process, according to the recommendation of Onwuegbuzie and Frels (2016), who stated that by “reading at least six sources in their entirety during the initial search, additional keywords and phrases can be identified and lead to a more focus search.” After an initial search, the following additional refinements were applied in all databases: Language: English; Search in: Abstract, Title, Key/Subject Terms; and Quality: Scholarly (Peer Reviewed). The search returned 163 hits. Based on title and abstract screening, 99 documents were excluded. The remaining 64 articles were fully reviewed and another 46 documents were excluded. Accordingly, 18 relevant articles were identified by the initial search. To ensure a comprehensive, up-to-date review of the literature, it was necessary to extend the search to other sources according to the MODES (Media, Observations, Documents, Experts, Secondary Data) approach (Onwuegbuzie and Frels 2016). Inspired by executed projects and interviews with experts, three more relevant articles were added. To conclude the fifth step, it was important to consider further relevant literature through forward and backward reference searching (Webster and Watson 2002). Accordingly, 13 additional articles were found for a final total of 34 relevant documents.

The following questions guided the evaluation in the selection and extension process:

- Does the article explicitly refer to IMNs?
- Does the article explicitly mention global production strategy?
- Does the article explicitly mention strategic decision making?
- Does the article explicitly mention strategy alignment?
- Does the article explicitly mention the strategic agenda of top management?

The steps of the exploration phase are summarized in Figure 11:

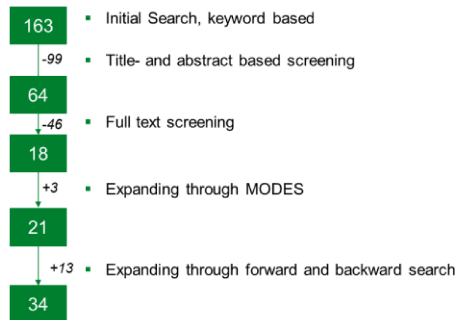


Figure 11: Relevant article selection procedure (own illustration).

The journals covered by the 34 papers are listed in Table 1:

Table 1: Coverage of journals.

Journal	Count
<i>International Journal of Production Research</i>	7
<i>International Journal of Operations & Production Management</i>	6
<i>Journal of Manufacturing Technology Management</i>	3
<i>Journal of Operations Management</i>	3
<i>Production Planning & Control</i>	3
<i>CIRP Annals</i>	2
<i>International Journal of Production Economics</i>	2
<i>Omega</i>	2
<i>Computer Integrated Manufacturing Systems</i>	1
<i>Analysis of Business Administrative Science</i>	1
<i>Benchmarking: An International Journal</i>	1
<i>Management Science</i>	1
<i>International Operations Networks</i>	1
<i>International Journal of Manufacturing Technology & Management</i>	1

The second phase, namely interpretation, involved analyzing and synthesizing the selected information extracted through the steps in the previous phase. This phase was also supported by the aforementioned guiding questions. During the analysis, the content of the relevant articles was systematically fragmented into key ideas, theories, concepts, and methodological assumptions (Hart 2009). Onwuegbuzie et al. (2012) outlined several approaches that are suitable for a qualitative analysis of information extracted from a literature review. One of these approaches is “constant comparative analysis,” which was applied in this research. It involves systematically and inductively reducing the information from the sources to codes and then developing themes based on those codes (Onwuegbuzie et al. 2012). Based on the “initial coding” procedure, which is particularly suitable for both within- and across-literature data analysis (Saldaña 2021), 40 different codes were generated.

Next, the analysis of information involved a systematic decomposition of information into its constituent elements, whereas the second step of the interpretation phase, namely synthesis, involved making connections between those elements (Onwuegbuzie and Frels 2016). Therefore, the generated codes were clustered into four code groups and three subgroups, which synthesized the analyzed information into their respective main themes, which are presented in Section 2.4.2. The computer-assisted qualitative data analysis software ATLAS.ti was used to label individual sections, paragraphs, or sentences of each article with codes. Using network analysis, four main code groups were formed (Figure 12). These included “Content,” “Process,” and “Context,” which are the categories according to which production strategy is usually divided (Löfving et al. 2016; Kulkarni et al. 2019), as well as an additional “Definitions” group.

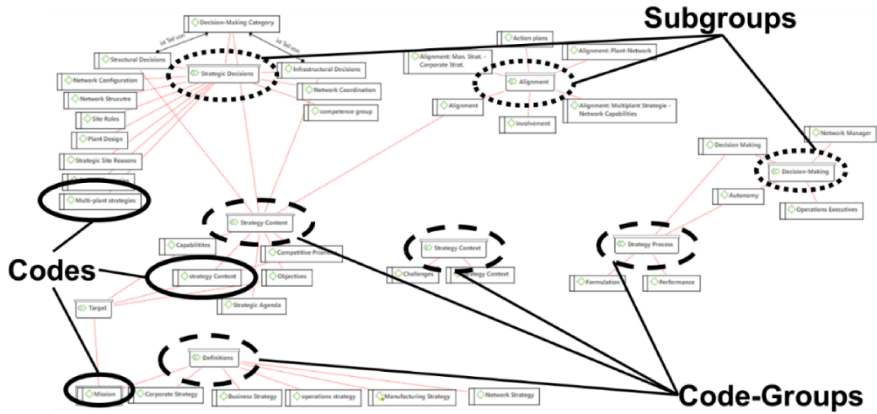


Figure 12: Network analysis using ATLAS.ti (own illustration).

2.4.2 Findings

This section presents the findings, which is the final step of the literature review procedure (Onwuegbuzie and Frels 2016). Table 2 illustrates an inter-respondent matrix with the five relevant code groups, which also represent the headings used to structure this section.

Table 2: Inter-respondent matrix depicting relevant code groups and identified articles.

Article	Formulation	Alignment	Decision Making	Strategic Decisions	Strategy Context	Target	Total	%
Lohmer et al., 2021	X	X	X	X	X	X	6	100
Alberto De Toni, 1992	X	X	X	X			4	67
Cheng et al., 2019		X	X				2	33
Cheng et al., 2021							0	0
Christodoulou et al., 2019	X	X	X	X	X		5	83
Costa Ferreira Junior and Fleury, 2018	X	X		X		X	4	67
Olhager and Feldmann, 2018	X	X	X	X	X		5	83
Dohale et al., 2021		X	X				2	33
Feldmann et al., 2013		X	X	X			3	50
Ferdows, 2014		X					1	17
Fukuzawa, 2019	X	X	X	X		X	5	83
Golini et al., 2016		X	X				2	33
Hallgren and Olhager, 2006	X	X	X			X	4	67
Kim et al., 2014	X	X	X		X	X	5	83
Kuhn, 2006		X					1	17
Lanza et al., 2019	X	X		X	X	X	5	83
Miltenburg, 2015a		X		X	X		3	50
Miltenburg, 2015b				X	X		2	33
Olhager and Feldmann, 2021		X	X	X			3	50
Platts, 1994	X	X					2	33

Rudberg, 2004		X	X	X		X	4	67
Rudberg and Martin West, 2008			X	X	X	X	4	67
Rudberg and Olhager, 2003	X			X			2	33
Scherrer and Deflorin, 2017		X	X	X		X	4	67
Schmenner, 1982				X			1	17
Shi and Gregory, 1998	X	X	X	X		X	5	83
Szwejczewski et al., 2016	X	X		X			3	50
Thomas et al., 2015		X				X	2	33
Vereecke and van Dierdonck, 2002			X	X	X	X	4	67
Verhaelen et al., 2021		X	X	X	X		4	67
Voss, 2005		X		X		X	3	50
Wang and Zhang, 2019		X	X	X	X		4	67
Miltenburg, 2009	X	X		X	X	X	5	83
Fleury et al., 2015		X	X	X	X	X	5	83
Total	14	28	20	24	13	15	114	
%	41	82	59	71	38	44		

Many scholars have not distinguished between manufacturing and manufacturing network strategy, although the identified studies do refer to companies with multiple sites. In the literature analysis, quotations were only marked with a “network strategy” code if they had been explicitly mentioned. Accordingly, despite the focus on global manufacturing networks, the number of quotations with network strategy codes (total = 49) was lower than the number with manufacturing strategy codes (total = 69). Table 3 presents an overview of the percentage of mentioned code groups in network strategy- and manufacturing strategy-related quotations. The analysis of this systematic literature review supported the statement made in previous sections that the literature on manufacturing strategy primarily addresses content-specific themes, followed by process-specific themes, and only rarely discusses context-specific issues. This tendency was even more evident in the network strategy-related articles.

Table 3: Percentage of mentioned code groups in network strategy- or manufacturing strategy-related quotations.

Code Groups	Quotations Related to Network Strategy	Quotations Related to Manufacturing Strategy
Strategy Content	75%	58%
Strategy Process	21%	37%
Strategy Context	3%	5%

According to several authors in this literature review, the manufacturing strategy typically involves the network and plant levels (Lohmer et al. 2021; Feldmann and Olhager 2013; Miltenburg 2015a; Cheng et al. 2015; Olhager and Feldmann 2021). Hence, the manufacturing network strategy constitutes a part of the manufacturing strategy (Lohmer et al. 2021; Scherrer and Deflorin 2017; Christodoulou et al. 2019). The literature has also highlighted how critical it is for global production strategy to improve managers' understanding of the attributes of GPNs (Rudberg and Martin West 2008). Consequently, the following subsections demonstrate which aspects of GPNs are relevant for the global production strategy.

Manufacturing priorities and network capabilities

According to the concept of Skinner (1969) and Hayes and Wheelwright (1984), the authors identified in this literature review have followed the definition of strategy content and mentioned the particular decisions regarding competitive priorities and capabilities based on corporate and/or business goals, which specify the production's strategic direction as an essential element (Kim et al. 2014; Hallgren and Olhager 2006; Scherrer and Deflorin 2017; Rudberg 2004).

Competitive priorities and capabilities were already described in Section 2.1.1. In this context, it is crucial to mention that the production network is able to gain additional, specific capabilities that result from the global management of and strategic decision making within the network, which provide a superior competitive advantage (Shi and Gregory 1998; Lohmer et al. 2021). These targeted network capabilities are an integral part of the network strategy (Thomas et al. 2015; Lohmer et al. 2021).

Decision categories

The decisions necessary for achieving the desired capabilities constitute a highly complex web and must be merged into analyzable pieces – namely decision categories (Rudberg 2004). Decision categories are usually divided into structural and infrastructural decisions, as proposed by Hayes and Wheelwright (1984) (Rudberg and Olhager 2003). Considering GPNs, decisions are often classified into the areas of configuration and coordination (Rudberg 2004). Achieving the targeted network capabilities is determined by appropriate configuration and coordination decisions (Rudberg 2004; Rudberg and Martin West 2008; Lohmer et al. 2021).

A fundamental question in the design and management of GPNs is where to allocate resources and products (Lanza et al. 2019; Ferdows 2014). Configurational decisions influence the network in the long term through process and technology selection, capacity planning, plant design, and vertical integration and typically require a substantial financial investment (Lohmer et al. 2021). At a network level, these are decisions regarding the network structure, network and site specialization, resource allocation, and internal supply chain. Table 4 summarizes the configurational and structural decision categories at the network and plant levels. The categories that have the greatest impact on the design of manufacturing networks and supply chains are facilities and vertical integration, which are two structural decision categories (Rudberg and Olhager 2003).

Table 4: Configurational decision categories.

Decision Category	Article
Process and technologies	Lohmer et al., 2021; Olhager and Feldmann, 2018; Rudberg, 2004; Scherrer and Deflorin, 2017; Costa Ferreira Junior and Fleury, 2018
Capacity	Lohmer et al., 2021; Olhager and Feldmann, 2018; Rudberg, 2004; Scherrer and Deflorin, 2017
Plant design (facility characteristics)	Lohmer et al., 2021; Olhager and Feldmann, 2018; Rudberg, 2004; Scherrer and Deflorin, 2017; Miltenburg, 2009
Vertical integration	Lohmer et al., 2021; Olhager and Feldmann, 2018; Rudberg, 2004; Scherrer and Deflorin, 2017; Miltenburg, 2009
Geographic dispersion	Miltenburg, 2009; Costa Ferreira Junior and Fleury, 2018

An essential success factor in the network configuration is a clear focus of the sites. This focus ensures that production requirements are as conflict-free as possible. Schmenner (1982) laid the foundation for this focus with his multi-plant strategy, which has been taken up by authors in this literature review (Shi and Gregory 1998; Rudberg 2004; Lohmer et al. 2021). The multi-plant strategy determines the specialization and organization of the GPN and can be characterized as follows:

- Product plant strategy (production of a product is assigned to one plant exclusively);
- Market area plant strategy (product of product line for a specific geographic market);
- Process plant strategy (the process step is assigned to one plant exclusively);
- General purpose plant strategy (high flexibility regarding processes, products, and markets);
- Volume strategy (focusing on order lot sizes).

A combination of these strategies may be used, which increases the complexity (Hayes et al. 2005).

On the one hand, the multi-plant strategy also influences, among other things, the internal supply chain, which can generally be divided into five network types, namely world factory, local for local, hub and spoke, chain, and web structure (Lanza et al. 2019; Verhaelen et al. 2021), which are based on Abele et al. (2008). On the other hand, the multi-plant strategy influences each individual plant and its specialization. To strategically align sites to the overall network target, the global manufacturing strategy is broken down into site-specific manufacturing strategies and different plant roles are assigned (Thomas et al. 2015; Lohmer et al. 2021). The authors identified by this literature review have mentioned well-established approaches from scholars in the field of operations management, as indicated in Table 5.

Table 5: Plant roles.

Plant Roles	Article
Offshore, source, server, contributor, outpost, and lead	Ferdows, 1997
Isolated plant, receiver plant, hosting network player, and active network player	Vereecke, Van Dierdonck, and De Meyer, 2006
Leading plants (class A), supporting plants (class B), and following plants (class C)	Norouzilame and Wiktorsson, 2018
Star plant, old school plant, expert plant, and replaceable plant	Cheng and Farooq, 2018; Cheng, Farooq, and Jajja, 2020
Lead plant (global/regional/product), special task plant (production process specialist, product specialist, and sourcing outpost), generalist plant (source and contributor), and dependent plant (server, offshore, and satellite)	Blomqvist and Turkulainen, 2019
Net receiver plant, active receiver plant, balanced actor plant, and net sender plant	Szász et al., 2019
Plant types: component, assembly, integrated. Two new roles complementing the typology of Ferdows: strategic feeder plant and full lead plant	Feldmann and Olhager, 2019

Infrastructural decision categories describe the systems, policies, and practices that

determine how the organizational aspects – the physical and nonphysical flows between sites in the network – are designed and managed (Scherrer and Deflorin 2017; Olhager and Feldmann 2018). Table 6 summarizes the coordinative and infrastructural decision categories at the network and plant levels. One of the central aspects of network coordination is the level of autonomy given to the plants by the headquarters, which is discussed in the next subsection (Golini et al. 2016; Olhager and Feldmann 2021).

Table 6: Coordinative decision categories.

Decision Category	Article
Organization (autonomy of the sites)	Lohmer et al., 2021; Olhager and Feldmann, 2018; Rudberg, 2004; Scherrer and Deflorin, 2017; Vereecke and van Dierdonck, 2002; Miltenburg, 2009; Alberto De Toni, 1992
Quality	Lohmer et al., 2021; Olhager and Feldmann, 2018; Rudberg, 2004; Scherrer and Deflorin, 2017
Production planning and control	Lohmer et al., 2021; Olhager and Feldmann, 2018; Rudberg, 2004; Scherrer and Deflorin, 2017
Coordination mechanisms	Costa Ferreira Junior and Fleury, 2018; Miltenburg, 2009; Alberto De Toni, 1992
Knowledge transfer	Alberto De Toni, 1992; Miltenburg, 2009
Capability building, resource allocation	Miltenburg, 2009; Scherrer and Deflorin, 2017

Decision making

The manufacturing network strategy process refers to how strategic decisions are made for developing network capabilities and enabling the realization of competitive advantage (Olhager and Feldmann 2021; Fukuzawa 2019). Olhager and Feldmann (2018) analyzed the distribution of strategic decisions in the network and identified three general clusters, namely centralized, integrated, and decentralized, as depicted in Figure 13.

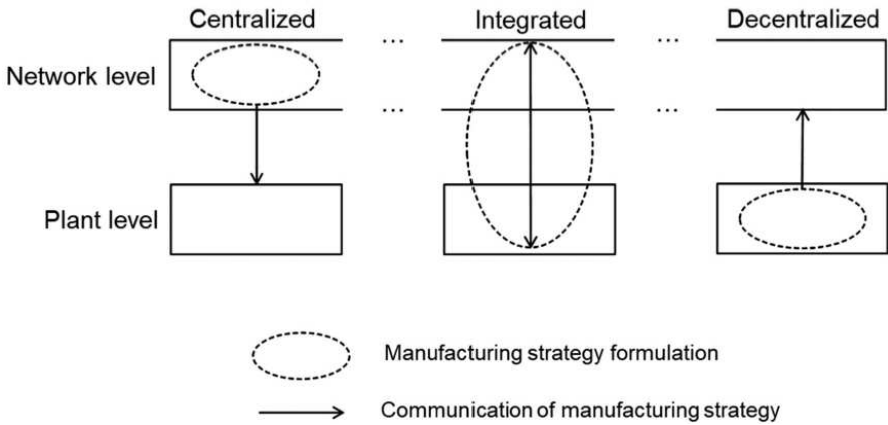


Figure 13: Manufacturing network strategy decision-making structures. Reprinted from “Distribution of manufacturing strategy decision-making in multi-plant networks.” By Olhager, J., and Feldmann, A., 2018, *International Journal of Production Research*, 56(1-2), 701.

In a centralized cluster, all production strategy decisions are made at a network level. In an integrated cluster, knowledge at the network and plant levels is combined to reconcile globalization pressures with local responsiveness requirements. A decentralized cluster allows the plant to make all of the decisions. Furthermore, the authors’ results revealed that all decision categories follow the same structure; that is, if some decisions are centralized, all other decision categories are also centralized. Consequently, the three patterns were characterized as fully centralized, fully decentralized, and fully integrated (Olhager and Feldmann 2018). Based on that study, Olhager and Feldmann (2021) later considered whether the strategic role of each site influences the decision-making authority in the network. They observed that higher levels of site competence correspond well with higher levels of decision autonomy (Olhager and Feldmann 2021).

However, a general recommendation for the decision distribution could not be derived since the studies did not consider contingency factors and focused on Swedish companies (Olhager and Feldmann 2018, 2021). Yet, there seemed to be a consensus on some aspects of centralization and decentralization: Overall goals and long-term strategic decisions are usually made by top management as they affect the company’s core business and sales. Centralization promotes standardization, ensures consistent product quality, and avoids coordination problems due to cultural

differences. It also maintains a clearly defined network structure and enables maximum efficiency. By contrast, a decentralized organizational structure encourages bottom-up initiatives and different perspectives and ideas, which are necessary for creativity and innovation. Decentralization also enhances responsiveness to local requirements (Kim et al. 2014; Lohmer et al. 2021; Wang and Zhang 2019).

Unfortunately, due to the drastically changing environment, it is necessary to regularly adjust decisions and decision-making responsibilities to achieve the strategy of the production network (Olhager and Feldmann 2021; Szejcowski et al. 2016; Scherrer and Deflorin 2017).

The more consistent the pattern of decisions in supporting the targeted network capabilities, the more effective the manufacturing strategy (Olhager and Feldmann 2018; Rudberg 2004). In order to ensure coherence, alignment is necessary, which is described in the following subsection.

Alignment

Any incoherence in strategic decision-making will dramatically impact a well-designed and -managed production network as well as the alignment between business strategy and production network strategy (Cheng et al. 2019; Dangayach and Deshmukh 2001). The importance of business strategic alignment is already recognized by scholars (see Section 2.2; Christodoulou et al., 2019; Lohmer et al., 2021; Olhager and Feldmann, 2018; Dohale et al., 2021; Shi and Gregory, 1998), which implies that any incoherence will also negatively affect the competitiveness of the company (Dohale et al. 2021; Cheng et al. 2019; Fukuzawa 2019). A critical link between business strategy and network strategy is the network mission, that is, the overall network goal, which guides the design and management of the production network (Fleury et al. 2015; Kim et al. 2014; Kulkarni et al. 2019). Yet, making decisions in a production network that are always aligned with the overall goal is very challenging due to the wide range of choices and multiple influencing factors (Olhager and Feldmann 2018). Besides the numerous decisions that must be made, a wide range of functions is also involved. As mentioned in the previous sections, any change in the configuration of a GPN inevitably involves significant financial commitments, which have legal, labor, commercial, and other implications. These result in a complicated interaction with almost all functions of a company (Cheng et

al. 2011; Christodoulou et al. 2019). The manner in which decisions are made at this level depends on the role of global production, as summarized by Lanza et al., who are paraphrased as follows: If the role of the production network receives little attention in a company, the focus is on short-term, easily tangible benefits, whereas intangible benefits are also in focus among companies that attribute an important role to the production network (Lanza et al. 2019). When decision-making processes pass from business strategy from a top-down perspective, organizational culture, political factors within the company, or personal factors (e.g., manager's personality, knowledge, and experience) influence the global manufacturing strategy (Fukuzawa 2019).

Considering the bottom-up perspective, it is crucial to keep in mind that network and plant decisions are strongly interrelated and must be considered in an integrated manner (Fleury et al. 2015; Feldmann and Olhager 2013; Olhager and Feldmann 2021). Decisions affecting both plants and the network should ideally be made by a network management team (Lohmer et al. 2021) as well as regularly assessed, especially to avoid conflicts between central organization and national subsidiaries (Lanza et al. 2019). Moreover, conflicts between plants can occur due to competitive disputes that result from individual business interests and asymmetrically distributed information or resources (Lanza et al. 2019). Often, the network strategy is broken down into specific plant strategies, and strategic performance measurement is used to align management processes and decision making (Costa Ferreira Junior and Fleury 2018; Thomas et al. 2015). The measurement of plant-specific performance negates the interactions between plants and, in the worst case, can further exacerbate competitive conflict (Thomas et al. 2015; Lanza et al. 2019).

Formulation process

The manufacturing network strategy process embraces the activities and dynamics of strategy formation and implementation (Kim et al. 2014). Many of the articles identified in the literature review refer to an essentially hierarchical process, where corporate strategy drives business strategy, which drives the functional strategies, including the manufacturing network strategy (Lohmer et al. 2021; Hallgren and Olhager 2006; Platts 1994). The formulation of a suitable manufacturing strategy is considered a task for central management (Lohmer et al. 2021).

Kim et al. (2014) identified a discrepancy between top management's strategic

intentions and the actions of the organization's employees. They suggested a strategy formed through an iterative process including top-down planning, partly emerging from bottom-up learning, to include lower-level managers' expertise and reduce coordination issues. They determined that decentralized organized companies, adopt relatively more bottom-up actions than centralized organizations (Kim et al. 2014). Platts also emphasized the need to gain acceptance from employees, ensure appropriate communication, maintain coherence among managers, gain support from top management, and develop an appropriate leadership style to successfully implement the strategy (Platts 1994). Also viewed as a particularly crucial enabler for aligning and integrating the network strategy is a shared understanding of the role of management (Alberto De Toni 1992). In addition, communication channels for developing new ideas and involving lower-level organizational members in joint decision making and problem solving are considered particularly critical (Kim et al. 2014). Competency groups provide platforms for communication and coordination, potentially resolve the need for large central staff functions, and greatly reduce the duplication of effort within the organization (Rudberg and Martin West 2008). To identify strategies that have the greatest potential to achieve the desired network capabilities, strategic performance measurements provide important information (Costa Ferreira Junior and Fleury 2018).

Context

Companies face a multitude of choices due to rapidly changing product and process technologies as well as a multitude of challenges due to the global competitive environment, along with ecological and political factors (Miltenburg 2009). The competitive position of manufacturing companies is based on their ability to create a strategic alignment between market opportunities and manufacturing capabilities, with structures and the management process that adapt to the environment (Rudberg 2004; Hallgren and Olhager 2006).

Industry and market strategic requirements have changed such that one-dimensional strategies are no longer appropriate, and companies are now required to demonstrate a variety of capabilities (Rudberg and Martin West 2008). Instead of just reactively responding to the changing environment, it is more crucial to proactively achieve competitive influence by building unique capabilities (Shi and Gregory 1998). Network capabilities represent distinctive capabilities that can provide the necessary competitive advantage, but achieving them effectively requires a holistic perspective

on the network and its influencing factors (Vereecke and van Dierdonck 2002). Different dimensions exist within a production network, where influencing factors must be considered. The strategic, the configurative or coordinative, and the site-specific dimension can all influence each other. The numerous internal and external factors include customers, suppliers, financial resources, governments and other institutions, trade agreements, inflation, mergers or acquisitions, and internal capabilities and weaknesses (Miltenburg 2015a; Lanza et al. 2019).

Avoiding a competitive disadvantage requires the global network strategy to be regularly adapted to internal and external factors, threats, and opportunities (Christodoulou et al. 2019; Miltenburg 2009).

2.5 Implications

The purpose of the literature review was to identify and review studies that have addressed the interface of the two research streams of IMNs and production strategy. Within this intersection, the review focused on studies that have described and analyzed GPNs as an integral part of strategic decision making. Several publications were identified that have dealt with the global production strategy, but none were identified that have sufficiently considered the defined problem.

In the literature, network strategy is often a part of production strategy. However, the network-relevant additions to the content, process, and context are crucial. The identified studies have clearly described the content of network strategy, network targets, and decisions that act as levers for achieving the intended target state. Fewer studies were identified on the topic of strategy process. The general opinion is that according to a top-down process, network strategy is derived from the overall corporate strategy. Long-term, financially intensive decisions tend to be made centrally by top management. A few authors here have emphasized the importance of involving middle management to ensure more successful strategy formulation and implementation. The strategy context of global manufacturing companies, as expected, has been found to be influenced by a variety of internal and external factors that complicate strategic decision making. Although many authors agree that the alignment between corporate, business, and network strategy is critical for corporate success, few suggestions have been made regarding how to ensure this alignment.

The research framework presented in Figure 14 guided the dissertation project in identifying methods for ensuring the integration of GPNs in strategic decision

making.

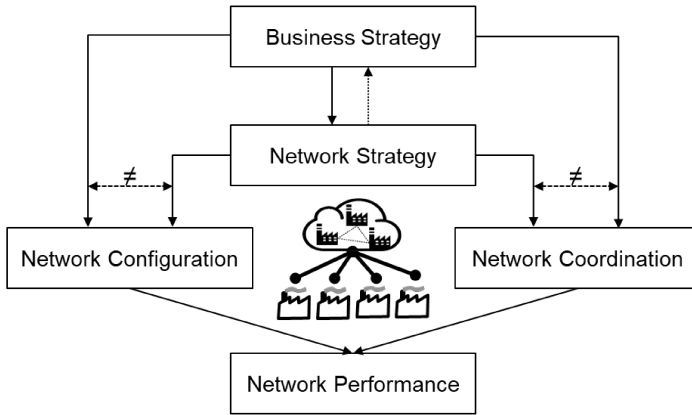


Figure 14: Research framework (own illustration).

In this framework, as described earlier, the strategy process is also illustrated as a top-down approach. The corporate strategy and/or the business strategy determines the network strategy, which in turn achieves network performance through configurational and coordinative decisions. Some top management decisions, however, directly affect the network configuration or coordination. These decisions can also counteract the actual network strategy and cause a misalignment and consequently poor network performance. The focus of this thesis was on the arrow pointing upwards from the network strategy to the overarching strategy. The objective was to understand how global production can and must be integrated into strategic decisions to prevent any strategic misalignment. Whereas a theoretical framework guides the research process through the use of a formal theory, the conceptual research framework, as illustrated in Figure 15, is valuable for ensuring that the concepts selected for study – and any expected relationships between them – are appropriate and useful given the research problem under investigation (Lester 2005).

In conclusion, the literature review fulfilled its purpose by

- contributing to the design of the research framework;
- delineating the initial research proposal, with an increased focus on methods and structures that support alignment; and

- answering the first sub-research question regarding strategic decisions, which have been covered in detail in the literature – namely “What are strategic decisions in the context of GPN management?”

Despite the fact that the literature has thoroughly addressed the strategically relevant decisions in a production network, the issue of decision distribution is controversially discussed. Hence, the following chapter investigates the second sub-research question – namely “How are strategic decisions made in the production network?”

3 State of Practice

The purpose of this chapter is to complement the findings of the theoretical analysis in Chapter 2 with the actual practice, according to the recommendation of Benbasat and Zmud (1999). Following the research framework (Figure 14), a questionnaire was developed to capture the decision distribution in a global production company. In addition, the contextual factors that are relevant to the global production strategy were identified along with how the voice of production should be considered. The data collection process is explained in Section 3.1. Section 3.2 and 3.3 explains the data analysis methods and provides information on the applied measurement scales. Section 3.4 provides the analysis results, which are then discussed in Section 3.5.

The survey process and results in the present chapter have been partly incorporated into the theoretical and practical discussions of the following publications:

- Friedli, Thomas; Miedler, Philipp; Kaiser, Jens; Helbling, Jessica:
Benchmarking 2022: Global Production Strategies. General Report. St. Gallen: 2022

3.1 Data Collection

The Orbis database was used to identify suitable companies for the survey. The questionnaire was sent to all manufacturing companies that matched the following criteria:

- Headquarters located in Austria, Germany, or Switzerland;
- Manufacturing firm of classes 25, 26, 27, 28, and 29 according to the NACE Rev. 2 industry classification scheme – primary codes only;
- Minimum of three subsidiaries;
- Minimum of 51% of subsidiaries owned;
- Operating an IMN

In total, 895 companies were contacted in 2021. After two reminders, we received 69 usable responses for a response rate of 12.97%. In general, response rates decrease when surveying corporate managers compared with other survey groups (Cycyota and Harrison 2006; Peng and Lai 2012). Cycyota and Harrison (2006) analyzed 231 studies from 1992 to 2003, which included questionnaires sent to top executives, and identified an average response rate of 32%, with a standard deviation

of 17%.

The survey was conducted at the network level, providing a top-down perspective on the manufacturing network. Therefore, people who worked with manufacturing and logistics and were responsible for several sites of a manufacturing company were contacted and asked to respond to the survey by email or telephone. The results presented in this chapter are all based on the results of the survey conducted between 24.08.2021 and 31.01.2022. In the first step, data were collected and validated, meaning that incomplete and incorrect survey results were removed to obtain a complete and meaningful sample.

The questionnaire was pretested by industrialists from four different companies and researchers from the University of St. Gallen with experience of survey research, resulting in a few changes being made to the phrasing of questions as well as a few items being added. The questionnaire addressed both general information and contextual factors of the company as well as the strategy content and processes of the production network. Most questions were perception-based and used a seven-point Likert scale, except where a percentage distribution or absolute number was required. The use of perception-based Likert scales can improve response rates because respondents can estimate more easily and do not have to verify the exact value. Furthermore, the respondents were not required to share sensitive information about performance, which could have reduced response rates. Previous research findings (c.f. Vickery et al., 1993; Klassen and Whybark, 1999) have demonstrated that perception measures are useful for empirical studies related to managerial evaluations. The full questionnaire can be found in Appendix A.

Table 7 presents the descriptive statistics of the companies involved in the survey. The participants were composed of different units of analysis. Almost 70% of the participating companies had a company-wide network, followed by a business-unit-wide network at 22%. One company set the scope of the survey on the regional network of its company, including Switzerland and Liechtenstein. Another company chose “Other type of network” because the participant focused on a business sector. However, he commented that the network is comparable to a division. The following data always refer to the unit of analysis indicated by the participating companies.

The sample covered a wide range of industries. Approximately four-fifths of the

sample was active in industrials, other manufacturing (e.g., automation, additive manufacturing, building materials, and high-tech), and automobiles & parts. A similar diversity was evident among the employees. Yet, the majority belonged to companies that had 1,001–5,000 employees in their unit of analysis in 2020. These companies represented slightly more than one-third of the participants. Considering the total number of production sites worldwide, most of the participants (30%) had on average fewer than five production sites or between five and nine (23%). The sites were generally located in Western Europe, the USA & Canada, or China. Make-to-order, where the purchase of raw materials is based on forecasts and production that are in turn based on customer orders, was the most popular manufacturing principle among the participating companies (41%). Engineering-to-order, where goods are designed, engineered, and manufactured according to the customer's order, was the second most common at 27%.

Table 7: Overview of the survey sample.

	No. of companies	Share
Unit of Analysis		
Company-wide network	45	66%
Division-wide network	6	22%
Business-unit-wide network	15	9%
Other type of network	2	3%
Industry		
Automobiles & Parts	13	19%
Chemicals	4	6%
Food & Beverage	2	3%
Health Care	3	4%
Industrials	25	37%
Oil & Gas	1	1%
Personal & Household Goods	2	3%
Other manufacturing	18	26%
Employees		
<250	9	13%
250–500	4	6%
501–750	4	6%
751–1,000	1	1%
1,001–5,000	25	37%
5,001–10,000	11	16%

10,001–50,000	4	6%
>50,000	10	15%
Total number of production sites		
<5	21	30%
5–9	16	23%
10–14	9	13%
15–19	12	17%
>19	11	16%
Continental presence with manufacturing facility		
Western Europe	59	86%
Eastern Europe	37	54%
USA & Canada	45	65%
Central & South America	27	39%
Middle East	9	13%
Russia & (former) CIS	15	22%
Africa	11	16%
India	27	39%
China	44	64%
Japan, Singapore, & South Korea	11	16%
Rest of Asia	14	20%
Australia & New Zealand	4	6%
Oceania	0	0%
Manufacturing principle		
Engineer-to-order	18	27%
Make-to-order	28	41%
Assemble-to-order	5	7%
Make-to-stock	10	15%
Make- and distribute-to-stock	7	10%

Make-to-stock, where goods are produced regardless of the orders, was applied by 15% of the surveyed participants. Next, 10% applied the make- and distribute-to-stock concept, which involves production and distribution to a stocking point in the distribution system. Finally, 7% used assemble-to-order, where pre-manufactured components are assembled according to customer orders.

3.2 Data Analysis

Descriptive analysis is a critical step in any data analysis. It serves to describe a data set on the basis of individual characteristics and helps to detect possible errors in the data collection and outliers in the data set. The arithmetic mean, identical to the

mathematical average, is the most common measure of central tendency. In principle, a metric scale level is required to calculate the mean. In practice, however, it is often calculated on the basis of ordinal scaled data (e.g., for Likert-scale items). Ordinal scaled data follow a rank order. Therefore, instead of “ordinal scale,” the term “rank scale” is also used. No statements can be made about the absolute distances between the values (Bortz and Schuster 2010). The standard deviation(s) is defined as the positive square root of the variance. The measure is easy to interpret because it has the same unit as the measured values and can thus be directly related to the data. It can be interpreted as a representative deviation from the center of the distribution (Howell 2016).

To calculate the degree of correlation, the nonparametric rank correlation coefficient introduced by Kendall (1938) was used. The coefficient is arithmetically bound between -1 and $+1$, and its value characterizes the degree of agreement between two ordinal variables or an ordinal and a cardinal variable. Kendall’s tau test has, compared with the Spearman rho test, an advantage when the same rank is occupied by several data sets (Akoglu 2018), which was true for the present study’s data set.

3.3 Measures

Measurement scales provide the foundation for statistical analyses. In this study, existing successfully applied scales were consolidated and refined, and new scales were also developed. This section presents the constructs used to capture and measure decision distribution, the involvement of global production, performance, and the contextual environment of the network.

Decision distribution

To measure the distribution of decisions in a global manufacturing company, several decision categories can be evaluated as individual elements. Thus, as suggested by Hayes et al. (2005), it is possible to verify whether the whole set of decision categories follows the same pattern or the choice of decisions is made in the individual categories. The choice of decision categories was based on those already verified by Diaz Garrido et al. (2007), which were further refined by Olhager and Feldmann (2018) and the findings identified in Section 2.4. All 19 decision categories were measured on a four-point perceptual scale of “Site-Level” (= 1), “Selected Sites” (= 2), “Network Management” (=3), and “Top Management” (= 4).

In contrast to Olhager and Feldmann (2018), we did not seek to measure the degree of centralization; rather, we sought to precisely determine the organizational level at which decisions are made.

Involvement of global production

The network manager's involvement in strategic decisions was evaluated using five statements. A seven-point Likert scale was used to measure each statement, ranging from "Strongly disagree" (= 1) to "Strongly agree" (= 7). The statements were formulated with reference to Anderson et al. (1991). The same scale was used to assess whether the company has a clear and detailed formulated strategy for the GPN. To evaluate how well the global production strategy is embedded in the overall company strategy, a seven-point Likert scale ranging from "Very poor" (= 1) to "Very good" (= 7) was used.

Performance

Company performance was measured according to profitability, cost efficiency, quality, on-time delivery, speed of delivery, volume flexibility, product mix flexibility, after-market service, and rate of new product introductions (cf. Boyer, 2002; Hallgren and Olhager, 2009; Feldmann et al., 2009). Respondents were asked to indicate how their unit of analysis compares to competitors in their industry in various dimensions using a seven-point Likert scale that ranged from "Much worse" (= 1) to "Much better" (= 7).

The performance of each unit of analysis' production network was measured using the 15 network capabilities described in Sections 2.1 and 2.4.2. Participants were asked to what extent the network is able to utilize each capability. This assessment also used a seven-point Likert scale, which ranged from "Strongly disagree" (= 1) to "Strongly agree" (= 7).

The nine performance measures as well as the 15 network capabilities were considered separately because performance was a multidimensional construct (cf. Hallgren and Olhager, 2009). Furthermore, the split allowed for a detailed examination of the extent and nature of the potential impact of decision structures on performance.

Contextual factors

This study assessed both internal and external contextual factors of the companies. The external contextual factors were based on a recent PESTLE analysis by Fornasiero et al. (2021). For the internal contextual factors, this study queried which company-internal departments were relevant. The selected departments were based on the scientific work of Anderson et al. (1991). For each category, the participants assessed the influence on the production strategy on a seven-point Likert scale ranging from “Not at all” (= 1) to “Extremely” (= 7).

3.4 Survey Results

Based on the research framework (Figure 14), the analysis results in the areas of contextual factors, production strategy content, decision distribution, and involvement are elaborated in the following sections.

3.4.1 Contextual Factors

As stated earlier, global manufacturing companies are exposed to a variety of influencing factors that can change rapidly. Hence, as a first step, it was critical to determine which current megatrends are influencing the global production strategy. The analysis results are presented in Table 8.

The analysis indicated that all megatrends have a medium to strong influence on the global production strategy. “Supply chain disruptions,” “Technology development and automation,” and “Environmental” trends have the greatest influence. Moreover, those three trends were the only factors not indicated by any company as having absolutely no influence on the production strategy on the seven-point Likert scale.

Table 8: Megatrends and their influence on the global production strategy from “Not at all” (= 1) to “Extremely” (= 7).

Influencing Megatrend	Mean	Rank	N	Min.	Max.	s
Supply chain disruptions	5.61	1	66	2	7	1.094
Technology development and automatization	5.28	2	68	2	7	1.325
Environmental trends	5.27	3	67	2	7	1.238
Global trade shift	5.13	4	68	1	7	1.245
Digital transformation	4.93	5	68	1	7	1.418
Protectionism	4.82	6	67	1	7	1.537
Change in consumption patterns	4.72	7	68	1	7	1.359
Legal trends	4.58	8	67	1	7	1.316
Political stability	4.20	9	66	1	7	1.372
Social changes	4.18	10	68	1	7	1.338

Next, the influence of various stakeholders on the global production strategy was examined. Table 9 indicates that the customer has a very strong influence on average. Compared with the evaluation of megatrends in Table 8, the difference in the average and standard deviation from ranks 2–4 are more obvious here. The factors of “suppliers,” “competitors,” and “investors/shareholders” were found to exert only a moderate influence.

Table 9: Stakeholders and their influence on the global production strategy from “Not at all” (= 1) to “Extremely” (= 7).

Influencing Stakeholder	Mean	Rank	N	Min.	Max.	s
Customers	5.82	1	67	2	7	0.952
Suppliers	4.47	2	66	1	7	1.600
Competitors	4.06	3	67	1	6	1.424
Investors / Shareholders	3.99	4	67	1	7	1.656

The next analysis addressed the internal contextual factors. Table 10 presents the influence of the functional areas on the global production strategy.

Table 10: Functional areas and their influence on the global production strategy from “Not at all” (= 1) to “Extremely” (= 7).

Influencing Area	Mean	Rank	N	Min.	Max.	s
General / Top Management	5.77	1	66	2	7	0.908
Marketing and Sales	5.06	2	66	1	7	1.226
Quality Management	4.50	3	66	1	7	1.562
Research and Development	4.38	4	65	1	7	1.486
Accounting and Finance	4.00	5	65	1	7	1.381
Human Resources	3.59	6	66	1	6	1.488
Legal	3.50	7	66	1	7	1.339

The greatest influence is exerted by general/top management, followed by marketing & sales as well as quality management. By contrast, human resources, accounting & finance, and legal were found to exert little influence.

3.4.2 Global Production Strategy

The contents of the global production strategy have already been thoroughly described in the literature. Over the course of the survey, we attempted to discover how clearly and comprehensively the global production strategy is formulated. Based on an arithmetic mean, the production strategy is formulated very clearly and in detail. However, the analysis indicated a fairly high standard deviation. Notably, 13.2% of the companies surveyed disagreed with the following statement: “We have a clearly formulated and detailed strategy for the global production network.” The analysis of the rating of how well the network strategy is embedded in the overarching strategy indicated a similar result. In this case, 11.7% of the companies rated their global network strategy as “rather poorly” to “very poorly” embedded in the overarching strategy. Table 11 presents the results of both analyses in detail.

Table 11: Clear and detailed formulation of the global network strategy, from “Strongly disagree” (= 1) to “Strongly agree” (= 7), and its embeddedness in the overall corporate strategy, from “Very Poor” (= 1) to “Very good” (= 7).

	We have a clearly formulated and detailed strategy for the global production network	Please assess to what extent the network strategy is embedded in the overall company strategy	
Value	1	—	2.9%
	2	4.4%	4.4%
	3	8.8%	4.4%
	4	7.4%	7.4%
	5	22.1%	29.4%
	6	33.8%	33.8%
	7	23.5%	17.6%
Mean	5.43	5.28	
N	68	68	
s	1.396	1.454	

An interesting result was obtained through analyzing the correlation between the two

statements and the arithmetic mean of the network capabilities, as presented in Table 12.

Table 12: Kendall's tau correlation coefficient between the average network capabilities and the clear, detailed formulation of the global network strategy and its embeddedness in the overall corporate strategy.

Variable	Avg. Network Capabilities
We have a clearly formulated and detailed strategy for the global production network	.335**
Please assess to what extent the network strategy is embedded in the overall company strategy	.409**

** Correlation was significant at the 0.01 level (two-tailed).

Based on the evaluation of the Kendall's tau correlation coefficient, it appeared that a clear and detailed network strategy correlated with higher network capabilities. The correlation was highly significant, and the magnitude was medium with a strength of 0.335 (Cohen 1992). Also highly significantly was the correlation of the average existing network capabilities with the embedding of the network strategy in the overarching corporate strategy. The correlation was even stronger in this case at 0.409, which is close to the threshold value of 0.5, above which a large correlation is deemed to exist (Cohen 1992).

In addition, the analysis examined the correlation between the clear, detailed network strategy and its embedding in the overarching corporate strategy with the average of the nine performance categories (i.e., profitability, cost efficiency, quality, on-time delivery, speed of delivery, volume flexibility, product mix flexibility, after-market service, and rate of new product introductions). Yet, the results of the calculations did not reveal any significant correlations. It is vital to mention that no causality could be concluded from the correlation analysis.

3.4.3 Decision Distribution

As already elaborated in the literature review (Chapter 2), the distribution of strategic decisions in the GPN is controversially discussed. Investigations have also examined whether certain decision categories are more likely to be made centrally or decentrally (c.f. Olhager and Feldmann, 2018). In this study, we sought to identify at exactly which organizational level decisions are made. Participating

companies could choose between “Site,” “Selected Sites,” (e.g., lead factory), “Network Management,” and “Top Management.” The results of the survey are presented in Table 13. The percentages in bold and marked with an “*” indicate the top five decision categories per organizational level.

The first decision, “Choice of products manufactured at the plant,” was made at the organizational level of the network manager or above in 89.1% of the companies surveyed. Here, there was a high level of agreement among the participants and the lowest standard deviation compared with the other categories. The next decision, “Choice of manufacturing layout,” exhibited a tendency toward decentralized decision distribution. This category is marked with “*” both at the “Site” level and for “Selected Sites.” Noteworthy, this decision was made by a network manager in 27.3% of the companies. Moreover, “Choice of manufacturing technology” was decided by the network manager in more than half of the companies, whereas in 19.4% of the companies surveyed, a selected site was responsible. The next decision, “Capacity levels relative demand,” was made by many companies at the network manager level as well as at the site level. The distribution was similar for the second capacity-related category of “Timing of capacity acquisition,” with a difference being that here top management had more influence on the decision in 25.8% of the companies surveyed. For the categories “Choice of plant focus” and “Choice of plant specialization,” the decisions were made by the network manager in most companies or even more often by top management. The decision most frequently assigned to the network manager by the participating companies (55.6%) was the “Make-or-buy decisions” category. This was generally highly centrally focused and made by top management in a further 30.2% of the companies. A decision that was very clearly assigned to the top organizational level was the “Choice of organizational structure” category, at 63.1% of the companies surveyed. The category “Employee competence development” was the decision most frequently made at the site level. At both the site and network manager levels, the category “Selection of quality tools” was classified frequently. The category of “Selection of improvement programs” was decided by the network manager or top management in most companies. A similar trend existed in the category “Choice of longer-term planning and control principles,” which was decided by the network manager by 89.3% of the surveyed companies or above. By contrast, in 76.5% of the companies, the decision was made at the site level or at selected sites for the category “Choice of shorter-term planning and control

principles.” The last two categories, “Choice of data & IT infrastructure systems” and “Choice of KPI/performance measurement system,” were both centrally assigned decisions for over 90% of the companies (i.e., the responsibility of network or top management).

Table 13: Decision distribution of global production strategy-relevant decisions.

Decision Distribution	Value					s
	1	2	3	4	N	Mea
Choice of products manufactured at the plant	4.7%	6.3%	43.8%	45.3%	64	3.30
Choice of manufacturing layout	42.4%*	21.2%*	27.3%	9.1%	66	2.03
Choice of manufacturing technology	16.4%	19.4%*	53.7%*	10.4%	67	2.58
Capacity levels relative demand	30.2%*	14.3%*	47.6%*	7.9%	63	2.33
Timing of capacity acquisition	22.6%	9.7%	41.9%	25.8%	62	2.71
Choice of plant focus	4.9%	8.2%	42.6%	44.3%	61	3.26
Choice of plant specialization	3.2%	12.7%	31.7%	52.4%*	63	3.33
Make-or-buy decisions	9.5%	4.8%	55.6%*	30.2%	63	3.06
Choice of organizational structure	10.8%	7.7%	18.5%	63.1%*	65	3.34
Employee competence development	57.6%*	15.2%*	22.7%	4.5%	66	1.74
Selection of quality tools	26.2%*	7.7%	47.7%*	18.5%	65	2.58
Selection of improvement programs	17.5%	11.1%	39.7%	31.7%	63	2.86
Choice of longer-term planning and control	4.6%	6.2%	38.5%	50.8%*	65	3.35
Choice of shorter-term planning and control	53.1%*	23.4%*	20.3%	3.1%	64	1.73
Choice of data & IT infrastructure systems	4.6%	3.1%	38.5%	53.8%*	65	3.42
Choice of KPI/performance measurement	3.1%	3.1%	47.7%*	46.2%*	65	3.37

3.4.4 Involvement

The final part of the survey analyzed the involvement of operation within the global strategy in more detail, starting with the importance of the network manager. In the majority of the companies surveyed, the network manager was involved in specifying the corporate strategy. However, this statement was not true for 17.5% of the companies. Regarding the statement on whether top management pays sufficient attention to global production-related issues, 39.1% of the companies agreed and 29.7% agreed strongly. Table 14 presents a summary of the analysis results.

Table 14: Involvement of network manager in the specification of the corporate strategy and the attention of top management to issues relevant to the production network in their strategic decisions, from “Strongly disagree” (= 1) to “Strongly agree” (= 7).

	The network manager is totally involved in specifying the strategy of the firm	Top management gives sufficient attention to issues relevant to the production network in their strategic decisions	
Value	1	4.8%	1.6%
	2	3.2%	3.1%
	3	9.5%	7.8%
	4	4.8%	4.7%
	5	19.0%	14.1%
	6	38.1%	39.1%
	7	20.6%	29.7%
Mean	5.27	5.63	
N	63	64	
s	1.628	1.453	

Finally, we tested for a correlation between the arithmetic mean of production network capabilities and involvement of the network manager and/or the attention

of top management to global production. The findings are presented in Table 15. In both cases, a highly significant correlation with the network capabilities was observed. The Kendall’s tau correlation coefficient was similarly high and could be rated as “medium” according to Cohen (1992).

Table 15: Kendall’s tau correlation coefficient between the average network capabilities and involvement of the network manager and/or attention of the top management to global production.

Variable	Avg. Network Capabilities
The network manager is totally involved in specifying the strategy of the firm	.346**
The top management* gives sufficient attention to issues relevant to the production network in their strategic decisions	.352**

** Correlation was significant at the 0.01 level (two-tailed).

The analysis also examined the correlation between the involvement of the network manager and/or the attention of top management to global production with the average of the nine performance categories (i.e., profitability, cost efficiency, quality, on-time delivery, speed of delivery, volume flexibility, product mix flexibility, after-market service, and rate of new product introductions). However, the calculation results did not reveal any significant correlations. It is vital to mention that no causality could be concluded from the correlation analysis.

3.5 Implications

The results presented in the previous sections provide a broad overview of global production strategies. A total of 69 participants from different industries completed the survey, representing a broad range of company sizes, organizational structures, and business models. In the area of strategy context, it was observed that supply chain disruptions have an extreme influence on the global production strategy and should therefore be considered in the strategy process. In addition, top management as well as marketing & sales have a major influence on the production strategy. Therefore, a regular alignment is particularly critical here.

A clearly structured network strategy correlates with network capabilities, even

more strongly correlation is indicated between the aligned strategy with the overarching strategy. Although a causal relationship could not be established with certainty, the statement underscores findings from the literature that alignment is essential to a company's performance or, as demonstrated in our study, that companies with an aligned strategy have significantly superior network capabilities. From the analysis of the decision distribution, certain tendencies were observed among the participating companies. Decisions concerning the categories of "Choice of products manufactured at the plant," "Choice of plant focus," "Choice of plant specialization," "Make-or-buy decisions," "Choice of organizational structure," "Choice of longer-term planning and control principles," "Choice of data & IT infrastructure systems," and "Choice of KPI/performance measurement system" were primarily made centrally by the network manager or top management. By contrast, decisions in the categories of "Choice of manufacturing layout," "Employee competence development," and "Choice of shorter-term planning and control principles" were primarily the responsibility of the sites or selected sites. However, the data analysis did not indicate which distribution in particular promotes attention to global production-related issues when making strategic decisions. There was no indication from the data of, for example, exactly how decisions are made. Even if the decision is not the responsibility of the global production manager, he or she may still be involved. The companies that involved the network manager more in strategic discussions were also those companies that indicated significantly better network capabilities.

In summary, the findings of the literature review were confirmed and extended by the results of the survey. It is difficult to elucidate all contextual factors (Ferdows 2018). Although the evaluations offered good indications, it was necessary to go into more depth to be able to precisely understand the processes and contexts, which is the purpose of Chapters 4–6.

4 Expert Interviews

The purpose of Chapter 4 is to gain deeper insight into strategic decision making as well as opportunities to focus more attention on global production. To identify the key aspects necessary for ensuring alignment between business strategy and production strategy, this study employed a qualitative research design. Semistructured interviews with experts from various manufacturing companies were conducted to examine the internal view on the current formulation process at a top level as well as a network level. In addition, specific insights into the participants of the process as well as the methods for ensuring good alignment were investigated. Sections 4.1 and 4.2 describe the research design and data collection in more detail, respectively. Then, Section 4.3 presents the analysis and findings. Lastly, implications for the remainder of the research project are provided in Section 4.4.

4.1 Research Design

The open-minded investigation of the research matter, as well as understanding how GPN managers explain their approach to aligning the business and production strategy within their work environment and their involvement in strategic decision-making at the top management level based on their experience, form the basis for the formulation of the research questions (Saldaña 2015). To be able to understand the perceptions, approaches and actions of GPN managers in the field of global production strategy, an interpretative approach was taken (Miles et al. 2014).

The key benefits of interviews is the fact that they are “an open-ended yet directed, shaped yet emergent, and paced yet unrestricted method to gather relevant insights” (Charmaz 2006). According to Mayring (1991), this approach to research focuses primarily on formulating theory or establishing hypotheses, instead of on testing them. Taking an open approach, including semi-structured interviews, is especially suited to identifying problems and understanding interdependencies (Atteslander 2010), and it is therefore a frequently applied qualitative and explorative research method (Atteslander 2010; Bernard 2013).

The development of a semi-structured interview guideline enabled a suitable degree of comparability, based on the outcome of the literature review and the particular research question (Flick 2018). This guideline, which is presented in Table 16, includes both structured and optional questions in order to gain and explore further

insights, as well as to provide the opportunity for an unhindered narrative flow (Cachia and Millward 2011; Saunders et al. 2019).

Table 16: Semistructured interview guideline.

Main Theme	Sub-Item
Introduction	Career and background
Top Level	Business and corporate strategy content
	Business and corporate strategy formulation process, with a focus on the involvement of global operation managers
	Tools, methods, or processes for involving global production managers (e.g., information channels, exchange platforms, and workshops)
Network Level	Global production strategy content
	Global production strategy process, with a focus on alignment with the business strategy
	Management of the global production network
	Tools, methods, or processes for raising the attention of top management
Site Level	Site strategy content
	Site strategy process with a focus on alignment with the network strategy
	Bottom-up involvement of site managers
Ending	Any essential topics to add to the discussion of global production strategy and its alignment with the business strategy

The guideline was not applied strictly, as it was more likely that production managers would express their opinions in an open interview format, rather than in a standardized interview or questionnaire (Flick 2018; Meuser and Nagel 2009). The objective of the questionnaire, according to the ABV (see Section 1.5), was to

explore where attention was focused when formulating a business or production strategy and ways in which this attention could be directed. Semi-structure interviews are generally perfectly suited to the purpose of the research question, as they record what the interviewees consider to be relevant or worth mentioning regarding the respective topic (Honer 1994).

4.2 Data Collection

In total, 10 interviews were conducted through video conferencing, which allowed expressions, gestures, and other evidence of the interviewee to be recognized (Rosenthal and Rosnow 2008). Depending on the company, the interviews occurred between January 10 and February 2, 2022; lasted for approximately 60 minutes on average; and were fully recorded and transcribed. The interviews were conducted in the interviewees' native language to promote openness and allow the experts to talk freely and at their desired level of detail (Gläser and Laudel 2010). A major benefit of recording and transcribing interviews is that the interviewer can focus on what is being said and not be constantly distracted by taking notes; therefore, all interviews were taped and fully transcribed (Bortz and Döring 1995) before the German scripts were translated into English. This procedure was essential for reasons of internal validity and reliability (Strang 2015). Furthermore, to increase the persuasiveness of the findings and the likelihood of uncovering new insights, all interviews were conducted with an additional researcher (a research associate at the Institute for Technology Management, University of St. Gallen) (Eisenhardt 1989). Each interview was conducted with one or two experts from different functions (e.g., strategy, manufacturing, technology, business development, and logistics) and at different positions in the hierarchy (e.g., board member, managing director, director of global production excellence, vice president (VP) of operations, chief technology officer (CTO), and head of factory planning). Experts are often members of the management level of a company who possess exclusive knowledge. The knowledge of personnel in key operational positions is of particular interest to a scientific study as they can reflect on their informal knowledge regarding the processes, intentions, and decision-making structures of their organization, thus making the knowledge accessible to research (Gläser and Laudel 2010). The respondents had an overview of strategy, management practices, as well as day-to-day operations and represented 10 different companies. The selection of companies would have a certain influence

on the quality of the research (Yin 2009), and therefore, purposive sampling was employed (Bernard 2013; Flick 2018). Experts from companies that participated in the study, described in Chapter 3, were selected and met the following criteria, consistent with the research objective:

- The existence of a clearly formulated network strategy;
- The involvement of production managers in the overall strategy.

Table 17 presents an overview of the interviews conducted, including the positions of the interviewees. The semistructured interviews covered five main themes with 12 distinct subthemes (Table 16). Each interview started with a round of introductions and an initial briefing on the professional background of the interviewee. This part was mostly kept short since the researchers already had experience with the companies and most of the interviewees. The second part focused on the formulation and content of the corporate strategy and business strategy. In particular, the role of global production was questioned in terms of the extent to which and how production managers are involved. Subsequently, the network strategy and its formulation process were explained before its alignment with the overarching strategy was discussed along with the methods and processes for directing the attention of top management to issues relevant to the production network.

Table 17: Overview of the semistructured interviews.

Company	Date	Duration	Position of the Interviewees	Language
A	01.14.2022	40 min	Managing Director	German
B	01.19.2022	60 min	Member of the Executive Board & Director Global Production Excellence	English
C	01.26.2022	60 min	Managing Director & Vice President Operations	German
D	02.02.2022	60 min	Head of Global Manufacturing Technology	German
E	01.20.2022	60 min	Executive Vice President – Head of Global Operations & Director Operational Excellence	German
F	01.10.2022	50 min	Head of Strategy & Corporate Development	German
G	01.14.2022	45 min	CTO	English
H	01.27.2022	60 min	Vice President Global Operation	German
I	01.26.2022	60 min	Senior Vice President Global Logistics	German
J	01.19.2022	45 min	Head of Factory Planning & Strategist Corporate Development	German

The fourth part focused on the strategy of each site and the role of the site manager in the company. Finally, the interviewee was given the opportunity to mention issues

which, from his point of view, are essential to the topic of global production strategy but had not yet been mentioned during the interview.

Anonymity was assured to all interviewees, so that none of their statements could be personally attributed to them until they had received the transcript and approved it (Leonard-Barton 1990). Interviewees were requested to indicate any parts of the transcript they disagreed with, so they could be amended or deleted in the final version. In terms of the methodology, the accuracy of the study and the validity of the results were improved by verifying all the collected data (Yin 2009).

4.3 Data Analysis

The analysis was a two-part process, comprising a within-case analysis (Section 4.3.1) and a cross-case analysis (Section 4.3.2). Both of these were facilitated by the structure and contents of the interviews, based on a cycle of reading and rereading (Strauss and Corbin 1991). The development of an initial deductive coding system, or first-cycle coding, as a starting list allowed the breakdown of the data into modest parts (Mayring 1991; Saldaña 2015). Relevant excerpts were extracted from the transcript, comprising answers to the research question and important contextual aspects, by assigning codes. The required flexibility was provided by means of inductive coding, or second-cycle coding, carried out as an ongoing analysis and instrumentation procedure while gathering the data (Miles et al. 2014). A systematic set of explanations was provided by the resulting formalization of content categories, theoretical constructs and emerging topics as a summary of individual analytical observations (Miles et al. 2014; Charmaz 2006; Glaser and Strauss 2017; Gioia et al. 2013). The interviews were read multiple times and codes were reassigned. A different experienced researcher checked the developed coding system and the conclusions of the analysis, making sure that the interpretations were understandable and the concepts were applicable, in order to ensure intercoder reliability and agreement, as well as internal validation for all the interviews and questions (Miles et al. 2014; Mayring 1991; Campbell et al. 2013; Archibald 2016). Table 18 illustrates the coding system used for the within- and cross-case analyses.

Table 18: Main code groups and subcodes used for the data analysis.

Main code group	Subcodes
Top-level	Strategy content
	Strategy process
	Involved roles
Network-level	Strategy content
	Strategy process
	Involvement network manager
Site-level	Strategy content
	Involvement site manager
Alignment	Meetings
	Communication
	Organizational structure

The coding and analysis were performed using ATLAS.ti.

4.3.1 Within-Case Analysis

The aim of the within-case analyses was the identification of patterns in the strategy process of each company, for which detailed case descriptions formed the basis. The within-case analyses focused on the same categories specified in Table 18, in order to make the large volume of information more manageable. The description and analysis of 10 strategy formulation processes was aimed at developing a comprehensive understanding of the role that the production network manager plays at the top and network levels, by affording insights into which forms and processes attract the attention of the top management within the 10 companies to production network issues. The relationship between the constructs in question was explored by means of an explanatory approach (Yin 2009). A brief profile of the participating companies formed the beginning of each case, followed by four main sections to introduce each individual case independently (Eisenhardt 1989). This enabled the identification and explanation of unique patterns in each case before performing a cross-case analysis. The semi-structured interview questionnaire formed the basis for the chosen framework for the within-case analysis. In some cases, designated parts such as a business unit (BU) were represented by the unit of analysis, rather than the company as a whole. Table 19 presents all the data regarding the industry, number of employees, number of sites and the applied manufacturing principles,

referring to the specified unit of analysis, which covered a variety of industries, sizes and production principles in order to provide the widest possible insights into the current state of practice.

Table 19: Overview of case companies.

Comp.	Unit of Analysis	Industry	No. of Employees	No. of Sites	Manufacturing Principle
A	Company	Industrials	3,200	26	Make-to-stock
B	Company	Cable systems	4,600	10	Make-to-stock
C	Company	Automobiles & Parts	3,100	14	Engineer-to-order
D	Company	Water & Gas Utility	14,100	51	Make- and distribute-to-stock
E	Business-unit	Health Care	16,500	13	Make-to-order
F	Division	Factory Automation	14,000	8	Make-to-order
G	Company	Health Care	7,000	21	Engineer-to-order
H	Business-unit	Industrials	4,500	34	Make-to-order
I	Company	Industrials	20,000	16	Make- and distributed-to-stock
J	Company	Automobiles & Parts	24,500	53	Make-to-order

Company A

“Every strategy depends on everyone in the company understanding what the strategy means – what is our value proposition and what can each individual contribute to achieve the strategic targets?”

Company A is an internationally active Swiss group specializing in the insulation, sealing, and protection of entire building envelopes. It produces in 26 manufacturing plants, which are localized in Switzerland and Europe. The company considers itself to be well above the benchmark and is striving to further expand this position. The interviewee has a manufacturing background and had been with the company for 3.5 years at the time of the interview. He is the Managing Director of Switzerland and is deeply involved in the strategic activities of the group.

The company’s superior strategic vision is to be perceived in the market as a full-range supplier of systems for buildings (e.g., roofs and facades). In addition, the company has defined a “value proposition” through which it wants to differentiate itself from the competition. It states that all systems and products are available and can be delivered instantly on demand. The mission is to be more profitable than the industry average. The overarching corporate strategy is critical for having a clearly defined common understanding, which facilitates coordination between the divisions and thus supports the leveraging of synergies. This strategy is broken down into different business and functional strategies, which are broken down into individual activities.

The contents of the corporate strategy are developed and formulated by the executive management. If required, individual functional areas are consulted to obtain a bottom-up perspective and to assess the feasibility or potential benefit. Significant attention is paid to ensuring that the strategic decisions coming from executive management are fully communicated down to department heads, thus achieving the same mindset at all levels. Every person in the company is expected to know what decisions he or she must make to deliver into the overall strategy. The Swiss market is often used as a test market for specific business strategies, which are rolled out globally, including a localization of the value proposition once their effectiveness has been proven.

The focus of the network strategy is on designing the network to generate optimal

earnings before interest, taxes, depreciation, and amortization (EBITDA). This is achieved mainly through a defined multi-plant strategy and make-or-buy processes. The network managers have the task of continuously driving improvements in the plants. Through bottom-up initiatives, productivity is increased throughout the entire network of plants. The network strategy is triggered by the business strategy as well as decided at the business manager level.

External contextual factors, such as trends and competition, are monitored and analyzed by a business development team. Once a month, a meeting is held with the executive management to decide, based on internal and external key performance indicators (KPIs), whether a need exists for action and whether the ongoing strategy requires adjustment. Quarterly meetings are held within functional areas to review the implementation of the strategy. The results of the discussions are then gathered together and presented to executive management. This platform offers the opportunity to propose bottom-up strategic adjustments. In general, horizontal and vertical communication are encouraged to be very open, enabling everyone to be involved and participate.

In summary, the strategy of company A addresses the following six essential questions:

How does my value proposition differ from the competition? What does the value chain have to look like to deliver the full value proposition as efficiently as possible? How do I achieve a fit of activities within the value chain? Which waivers (value proposition and value chain) do I choose so that my value proposition and value chain do not become diluted? How do I ensure innovative durability in the value proposition? How do I achieve above-average industry profitability?

Company B

“The cooperation amongst the sites in a region is quite close. They have one regional COO or CTO role, and that cooperation is also quite close. And I [Executive Board Member] also try to maintain a close cooperation amongst the three regionals.”

Company B is an internationally operating system provider of electrical industrial products with sales of approximately EUR 1.128 million and nearly 4,600 employees (as of 2020). The company is headquartered in Germany. This family-owned company offers a broad product portfolio, including cables, glands, connectors,

fuses, and fuse holders as well as tools and machines. The products are used in the automotive, food & beverage, machinery, plant construction & engineering, and robotics industries among many others. To ensure high availability as well as short delivery times, the company maintains extensive warehouses at the respective locations. The two interviewees were a member of the executive board and the CTO of a region.

After a 2-year process, the new strategy was communicated in October 2020. It was developed in several stages, starting with the involvement of the top 20 senior executives, who formulated the basic framework. In particular, the focus was on the differentiation of the business model as well as on growth, service management, and digitalization. To consider the voice of production as early as possible, the plant managers had the opportunity to share their thoughts during the framework creation process. After the strategic framework was finalized, three global project groups were formed (customer type & classification, reporting, and supply chain, including production, purchasing, and logistics) to establish globally applicable guidelines. Thereafter, the regions were tasked with elaborating the regional and functional strategies within the given directives. To anchor the strategy at all levels, much effort was invested into communication.

The three annual meetings between members of the executive board and the regional supply chain managers provided an opportunity to identify potentials and undertake strategic adjustments.

The network strategy is developed in an iterative process, with the regions as the starting point, and forecasts regarding future demands are made. Based on this, each site develops a roadmap that covers a time span of 7 years. The main focus is on the product groups or product families that will be manufactured in the future as well as their volumes and the resources required.

To ensure alignment between sites, each plant has an annually revised one-pager, which includes respective strategies, capacities, a growth plan, as well as KPIs. The inclusion of these target–actual comparisons from the plants' point of view enables global harmonization.

Moreover, close cooperation between plant managers, regional supply chain managers, and members of the executive board ensures that top management is aware of the potentials within the network. However, no specific procedure exists for bringing issues directly to the attention of top management.

In general, the regions benefit from a high degree of autonomy, although the authority of the plant managers has been somewhat restricted in recent years. Since the regions and plants are well networked with each other, most arrangements are conducted directly between the regions without the involvement of the top management.

Company B's strategy process is characterized by an iterative approach in particular. While the framework of the strategy is specified from the top down, the detailed formulation occurs at the various levels. This leads to a coherent strategy that is comprehended at all levels.

Company C

"We work with a great deal of trust and strategic guidelines. There is quite a lot of operational autonomy within the business units. But in terms of permeability of strategy and decision-making, and speed, this is obviously excellent."

Company C is one of the leading companies in gear and transmission technology and is internationally positioned with 14 production sites worldwide. It develops and manufactures components, assemblies, and gears made of plastic and metal. The core business (90%) is in the automotive sector at the Tier-2 level. With 3,100 employees, EUR 460 million in sales were generated in 2021. Profound engineering know-how, a wide manufacturing range, process competence, and internationalization are key factors in the success of this German company. Both standard components and complete transmission solutions are implemented from design to manufacturing and logistics. The company is able to transfer complete production lines to other locations without any adaptation effort. In Germany, it develops, validates, and optimizes the processes and manufactures the necessary tools.

The interview was conducted with the Managing Director and the VP of Operations. The Managing Director possessed 27 years of experience in the company and was able to provide deep insight into how the company works as well as the overall strategy.

The vision, based on three mission objectives, sets the long-term, overarching direction. Family-owned company, Technology, and Culture are the essential elements of this vision. Seven strategy statements are derived from it, from which

the strategy is built. The strategy discussions are conducted at the first and second organizational levels, that is, by the executive board plus all corporate functions (i.e., sales, development, finance, and also operations). A rough picture for the next 10 years has been defined and broken down into concrete measures for the next few years, from which the respective functional strategies are also derived. Annual strategy reviews are used to review progress and discuss changing external contextual factors. The company is in a strongly changing market environment; therefore, it is necessary to adjust the strategy if a risk exists of leaving a target corridor. In the management circle, which consists of 25 people, operations is very well represented with seven participants.

The operations strategy consists of the topics of Improvement, People, Smart Factory, Culture, Agility, and HSE (Health, Safety, and Environment). The themes were defined by the VP of Operations and the board of directors. The strategic and business objectives include quality, delivery reliability, and sustainability. Various interdisciplinary teams devise measures for each topic to implement the strategy. In the process, a strong integration of the different functional strategies is pursued. There are four hierarchical levels from the board of management to the machine operator, resulting in a very short communication chain and very high responsiveness. The operations strategy is then broken down to the BUs. In Company C, the BUs are small, entrepreneurially managed units that cover the manufacture of products in a closed value chain and involve 50–150 employees. There is no “plant level” in the company. The operations managers and BU managers are very well networked and work intensively together to identify efficiency levers at the network level.

Any mid- or long-term changes within the network are discussed monthly with operations, control, and sales. In addition, a weekly Break Steering Committee convenes, which consists of sales, development, industrial engineering, operations, and the executive board, to discuss current market developments and opportunities.

Due to the flat hierarchy, it is easy for Company C to ensure consistency from vision to BU strategy.

Company D

“...where you formulate best practice exchanges, where you try to get the plants to talk to each other. Organize exchanges and also develop a joint strategy with each other, that is an essential element of the strategy.”

Company D is an internationally operating expert in the areas of the safe transport of liquids and gases, lightning components, as well as high-precision manufacturing technologies with sales of approximately EUR 3.184 million and nearly 14,100 employees (as of 2020). The company is headquartered in Switzerland. The considered division is focused on maintenance-free and durable plastic piping systems. Its portfolio includes fittings, valves, pipes, and automation and connection technologies covering all applications of the water cycle. The company offers customers comprehensive support in all phases, from planning to commissioning, as well as a complete system solution, ensuring coordinated solutions from a single source. The interviewee was the Head of Global Manufacturing Technology.

Every 5 years, the group's executive board drafts the corporate strategy. Focus topics are also defined by the executive board, such as growth with high-value solutions, increased customer proximity, a strengthened global setup, profitable growth, global collaboration, and sustainability targets. Since the Head of Operations can exert a considerable influence on the focus topics through proactive communication, the approach can be described as medium-bottom-up. However, there is no structured process for including the voice of production at this level. As only a rough strategic framework exists at this level, hardly any adjustments are made to the corporate strategy within the 5-year cycle.

In parallel to the corporate strategy, the three divisions develop their own strategies, which are in line with the overarching orientation.

The network strategy is based on the corporate goals and focus topics. Based on this, an operations program is developed in a project-based approach, which deals with topics such as global collaboration, best practice exchange, and the institutionalization of technology management. The main focus here lies in the transfer of knowledge. The strategy department manages this operations program to ensure an overall view as well as the inclusion of as many stakeholders as possible. The process is supported by a team in which practically all disciplines are represented, such as the supply chain, sustainability, global operations, and

operational excellence.

Currently, the focus is on best practice exchange, which fosters global collaboration. Another focus is on a lead plant concept, where plants are identified that are particularly strong in one area and have much expertise in several topics. If the plant is defined as a lead plant by the decision board consisting of the global chief operating officers (COOs), it receives resources to, for example, develop standards for plants worldwide. A review of the lead plants should be conducted once a year.

The regional COOs ensure top management's attention to potentials within the network as well as to the alignment between the regional initiatives and corporate strategy.

In general, many strategic initiatives are currently in the rollout phase, with a focus on global collaboration as well as operational excellence. The aim is to pay more attention to feedback from lower levels and to ensure the transfer of knowledge.

Company D's strategy process is characterized by the proactive involvement of the various levels as well as a strong focus on best practice topics. The intention is to establish certain standards in the network to improve overall performance.

Company E

"... this clean link [...] between network strategy and site strategy. So, we don't only have to address the network level, but also really apply this organizational level in the plant to link them neatly with each other."

Company E is a leading global manufacturer in the field of special glass, glass ceramics, and other high-tech materials with sales of approximately EUR 2.24 billion and nearly 16,500 employees (as of 2020). The company is headquartered in Germany. Thanks to its high technological competence, it can offer customized glass solutions in numerous industries, such as automotive, aviation, consumer electronics, health, home & living, and optics. As glass is a versatile raw material, the company focuses intensively on research and development among other areas. The interviewees were the Executive VP – Head of Global Operations, the Head of Bulk Solutions, as well as the Director Operational Excellence. The focus of the interview was on the area of pharmaceutical packaging.

An overarching corporate strategy exists, which is defined by the public corporation and affects general strategic topics, group-wide initiatives, and corporate governance. Specific business strategies are defined by the BUs. The main target of the pharmaceutical packaging BU is to achieve profitable growth. As the BU strategy is not sufficient due to the complex environment and different markets, the BUs are divided into strategic business fields (SBFs), each with its own strategy book. The starting point of these SBF strategy books is the market. An annual review occurs that involves global functions, such as sales, quality, and product management. The board level approves the developed strategy books with a focus on a 5-year perspective. The SBFs are relatively autonomous in their strategy-making, with production, operations, and sales being regulated centrally.

The described framework is visualized and communicated as a house, with the overall BU target as the roof, the drivers of growth (SBFs) as pillars, and the joint framework of leadership, costs & quality, people, and sustainability as the basement. Within the pillars and the basement, strategic initiatives are defined to support the achievement of the respective element.

The network is divided into different regions. In 2017/18, there was an increased focus on strategy at the network level for the first time. A project team consisting of plant managers, operations, and supply chain derived the strategy. Workshops were held at the plant level to analyze how the implementation and realization of the strategy could be designed. Based on the plant roles, plant roadmaps were created to ensure that the overarching strategy could be broken down and implemented worldwide. The documents created for this purpose are revised once a year together with the plants.

In addition to the activities at the global network level, the strategy also addresses the local level of the plants within the network. With the so-called ZeroBase approach, a standard (named “Northstar”) for a future plant organization was developed jointly with the sites. Based on this standard, each plant generated a roadmap to develop toward the future standard organization. The realization of this concept provided an essential contribution for decoupling the development of volumes and personnel and reducing manufacturing costs.

Moreover, a high degree of transparency exists with regard to capacities, machine utilization, and technologies for the individual plants, which allows for a flexible and rapid response to changing conditions.

Moreover, communication between the individual levels is ensured, on the one hand, by the flat hierarchy and, on the other hand, by the management circles of the individual SBFs, which have monthly meetings. In addition, strategy meetings and weekly management team meetings are held. Furthermore, overarching goals and common incentives are used to strengthen cohesion.

In general, the structural organization of the company with the four SBFs enables a precisely fitting strategy development for the various market segments. Due to the flat hierarchies, a high level of cooperation is achieved within the network, which allows potentials to be exploited.

Company E's strategy process is particularly characterized by the structured breakdown of the strategy at all levels. This approach enables a common understanding of the overarching goals as well as a fast response capability.

Company F

"...the result greatly depends on the level of involvement. And only if the manager himself pushes the topics voluntarily and is convinced of it, one can speak of involvement. Then you really get a result."

Company F is an internationally operating automation corporation with sales of approximately EUR 2.6 billion and nearly 14,000 employees (as of 2020). The company is headquartered in Germany. As one of the world's leading suppliers of intelligent automation solutions, the company offers customers everything from a single source: from robots and cells to fully automated plants and their networking in various markets. The company's core expertise lies in the development, production, and sale of industrial robots, controllers, and software. The focus of the interview was on the robotics division. Robotics focuses on the manufacture and international sale of industrial robots and automated production solutions for all kinds of industries. The interviewee was the Head of Strategy & Corporate Development and was involved in the strategy process from the top level down to the individual functional levels.

Every 4–5 years, the company reviews and sharpens its vision and objectives, which serve as a target for 4–5 years into the future (at the time of the interview, the targets

were for 2025). In the vision and ambitions, themes such as gaining market share and expanding in certain regions are roughly defined. The vision is considered critical for ensuring a common target picture and is formulated by the board and management. The voice of production is strongly represented here as the company's CEO has a long history in production and the company has a culture of "delivering on our customer commitments whatever it takes."

The vision also forms the basis for the corporate strategy and business strategy. Every year, the vision and ambitions are aligned with external and internal contextual factors to define specific focus topics for the coming year. The business strategy is discussed and formulated by the Executive Leadership Team, which consists of the top 14 executives within the divisions, who are all functional leaders, including management. The operations division is represented in this exercise by the CEO, production manager, supply chain manager, and quality manager. Strategy implementation is reviewed and discussed monthly, operational functional strategy bi-weekly within the same circle. Each quarter, a major meeting of the Executive Leadership Team is held to make strategic and organizational adjustments based on current events and changing contextual factors. Based on the focus topics, each functional area develops its own strategy with concrete steps for the year ahead.

The network strategy is derived from the vision, concrete focus topics, and network plan. The network plan consists of a forecast analysis by production families and production sites up to 2025 (the next 5 years). The strategy includes the target picture for the GPN, with specific steps for the year ahead to achieve it. Consequently, there are implications for network configuration and coordination and specific guidelines for the individual sites. The strategy development involves the production areas (production, supply chain, and quality managers) and the site managers. If necessary, the Head of Strategy is involved to facilitate alignment with the corporate strategy and business strategy, or other functional managers are involved to ensure alignment with overlapping functions.

The network manager ensures top management's attention to potentials within the network through his proactive communicative and direct attitude. However, there is no process in place for bringing issues directly to the attention of top management.

In general, there is a very strong principle of empowerment in implementation. This means that if departments can resolve issues on their own, then they are of course allowed to resolve everything on their own. Top management is only involved when

there are limits, such as those imposed by conflicts with other stakeholders.

Company F's strategy process is particularly characterized by its holistic approach. The next level is always involved in strategy formulation. This promotes involvement and communication and ensures a common understanding of the strategy from the top to site level.

Company G

"It is a democratic process and also people who are going to be affected by it are also involved at the early stages, which is a good point. [...] We are not only developing a strategy that is good and nice to read, but the objectives and key results give us a really clear direction for how we execute it."

Company G holds a leading position in the markets for high-quality, system-critical elastomer components. Due to its expertise and many years of experience in materials development and engineering, it offers customized yet cost-effective approaches for even complex problems. The company is characterized by clear core competencies and a consistent focus on well-defined global market segments. In the health care, mobility, food & beverage, general industry, and civil engineering sectors, it offers technology and process know-how, unique materials expertise, and global services. In doing so, it focuses on niche markets with growth potential that enables an increase in value-added as well as sustainable profitable growth. Headquartered in Switzerland, the company generates annual revenue of more than CHF 1,000 million with 21 operating companies, sales in over 100 countries, and approximately 7,000 employees. The interview was conducted with the CTO and Senior VP (SVP) of Operations of a BU. Both have a long-standing working engagement with their employer as well as profound knowledge in the area of production and innovation management.

The board of directors approves the strategy annually. The corporate strategy is one element of this and includes general objectives that apply to all BUs. There are four main overarching themes: Profitable Growth, Sustainability, Digitalization, and Agility. There is a separate strategy for each BU based on the main themes.

A strategy team is in place, which organizes several meetings across functions and with different levels, from site managers to top managers, to elaborate issues. Here, the strategy is created in an iterative process. In the meetings, global production has

the opportunity to highlight potentials or possible obstacles. The finished draft is subsequently presented to the board for final approval. Objectives are assigned to the topics, where there are six sets of objectives that, in turn, are subdivided into individual key objectives that contribute to the set. Objectives are cascaded down to the site level. Quarterly meetings with the management board are used to discuss strategic issues and review progress. The regular meetings are necessary to be able to respond strategically in an agile manner to changing external contextual factors. The goals and current values are regularly communicated throughout the company.

Furthermore, the network strategy is fully integrated into the BU strategy. Thus, in the SVP's BU, two out of five key strategic initiatives are directly related to the network: the expansion of the production footprint and the improvement of the service level. In addition, there is a team that focuses on global capacity balancing and analyzes potentials in the network.

In Company G, the site managers have serious high authority. They are also present in the quarterly meeting with the management board. Moreover, the hierarchy is flat. The network manager has more of an advisory role, whereby the influence strongly depends on the region. For example, the network manager in India has much more decision-making power than that in Europe.

In addition, the primary objectives of the sites are the broken-down key objectives. Depending on the complexity and size of the site, a separate site strategy is in place. Each site manager can exchange information directly with other site managers in a simple and straightforward manner. Know-how and best-practice sharing are strongly encouraged. A dashboard provides an overview of who can demonstrate innovative approaches in certain topics, ensuring a high degree of transparency.

In summary, the company is characterized by an iterative strategy process in which 10 different departments are involved.

Company H

“When we talk about resilience, [...] our production network has resilience precisely because I can react regardless of the influencing factor. [...] whether it's capacity, whether it's qualification, whether it's purchasing parts, [...] or whether it's politics [...].”

Company H is a globally operating technology group active in three photonics-based

divisions as well as in the area of mechatronic solutions with sales of approximately EUR 767 million and nearly 4,500 employees (as of 2020). The company is headquartered in Germany. Optical technologies form the basis of the company's business. The portfolio includes laser technology, image processing, sensor technology, measurement technologies, and mechatronic products, among many others. In addition to photonics, other markets such as automotive, semiconductor equipment, medical technology, mechanical engineering, and security & defense technology are served. The company seeks to help its customers to take the lead, which is why early client involvement is sought at the development stage. The interviewee was the VP of Global Operations of the Division of Light & Production. The board of directors, supported by a working group and a consulting firm, develops the corporate strategy, which has the market as its starting point. The evolved strategy, which includes topics such as growth, strengthening of financial power, and international value creation, is then approved by the executive management board, including the three division managers. The BUs are then tasked with refining the strategy, specifying points such as value creation level, production location, and type of product lines.

The voice of production is hardly considered at this level. By contrast, the shareholders exert considerable influence on the strategy.

The network strategy is based on the corporate strategy, with no bidirectional exchange or specific methods for ensuring alignment. The VP of Global Operations, together with an advanced production manufacturing team of two people, develops the global production strategy, which pursues a hub-and-spoke approach. This means that the company operates in three parts: technology-oriented centers, centers close to customers, and centers that take care of customized applications. Consistency between the three types of centers is ensured by the leading factory and a written document that defines the obligations, tasks, responsibilities, and key figures of the different centers.

Additionally, the director of operations and the general manager of each individual plant are involved in the strategy process, especially in assigning site roles, which also define the site strategy. While the directors of operations meet once a year, the general managers are involved for information purposes only.

A division management team ensures top management's attention to potentials within the network. The committee consists of the Head of Division for Production

Management, the VP of Sales, Operations, and Service, as well as the three BU managers. Every third Monday, a meeting is held to discuss either operational or strategic issues.

In general, the company has a tried-and-tested production allocation model and a system of KPIs adapted to it, which ensures an overall view. Thus, coordination across all levels can be ensured despite the complex organizational structure.

Company H's process is characterized by the involvement of working groups at the respective levels. Through this inclusion of numerous perspectives, environmental changes are recognized at an early stage, including possible potentials. In addition, an awareness of strategy is fostered at all levels.

Company I

"In order to be able to steer a strategy process through change over a longer or medium-term period, I need [...] compellingly measurable KPIs, that have been defined in change. [...] It gives me a clear indicator of whether I am achieving the strategy goals [...]."

Company I is a global player in automation and didactic with sales of approximately EUR 2.84 billion and nearly 20,000 employees (as of 2020). The company is headquartered in Germany. The product portfolio of this family-owned company includes drives, motors, pneumatic devices, sensors, and connection technologies and is geared toward the smart production of the future. In addition to the products, the company has competencies in the area of technical education, which seeks to prepare organizations, companies, and people for the digital future of production as well as new technologies. Both in automation and didactic, artificial intelligence and machine learning play decisive roles. The interviewee was the SVP of Global Logistics.

Every 5 years, a new corporate strategy is defined, which in this case forecasts until 2025 (i.e., 5 years ahead). At this level, without coherence in depth, the most critical strategic directions are defined, such as the move away from a headquarters-based and centrally controlled organization to a regionally controlled organization with BUs. In other words, the BUs should be able to operate as independently as possible in the future to strive for regionalization.

The foundation of the corporate strategy is developed in workshops in which a

strategy group (a small internal “consulting group” that analyzes the development of markets, competitors, and technologies etc.), board of directors, and individual stakeholders are represented. The board of management co-determines the strategy and finally releases it. The voice of production is present on the Board of Management through a representative of global production, but this representative barely participates in the strategic decision-making process.

The network strategy is developed relatively independently of the corporate strategy; that is, the regions and functions are given a high degree of freedom in formulating the strategy. Analogous to the formulation process of the corporate strategy, a 5-year cycle is targeted, whereby the initiatives contained within are adjusted annually. Topics such as locations today and in the future, relocations, as well as keeping technology and value creation together are addressed. A management team, which works closely with the assistant of the board of directors and various business partners from HR, finance, and quality among others, is responsible for the formulation of the regions’ overarching operations strategy. However, the main drivers are production, logistics, and procurement. In addition, each plant has its own strategy, with large differences in quality depending on the location.

Top management’s attention to potentials is ensured through the recording of KPIs, which are measured on a monthly, quarterly, or annual basis. In the process, both internal and external KPIs are combined in a dashboard. Besides this, there are no other concrete processes for bringing issues directly to the attention of top management.

In general, regions benefit from a high degree of autonomy regarding strategy formulation, although the corporate strategy is developed in a top-down process. A holistic overview is ensured by the existing data consistency and the careful analytical preparation of KPIs.

Company I’s strategy process is characterized by the fact that the procedure of the 5-year strategy plan is firmly anchored in the company. The given rough strategic direction is specified relatively autonomously by the lower levels, so that different perspectives are included in the strategy process.

Company J

“In many cases, we have the edge on the competition regarding network planning. Nevertheless, we have to remember that it requires a great deal of manpower. It’s an administrative effort, but I think it’s worth it.”

Company J develops and produces mechatronic components and systems for vehicle doors, seats, and bodywork at 53 locations in 24 countries worldwide. Among its customers are approximately 80 automotive manufacturers as well as some 40 automotive suppliers. The company is headquartered in Germany and employs approximately 24,500 people with sales of nearly EUR 5.3 billion (as of 2020). It ranks among the top 40 automotive suppliers worldwide. The interview was conducted with two employees, the Head of Factory Planning and the Strategist of Corporate Development. Both employees have many years of experience in the company and have already worked in various departments. Thus, not only was the view from the network and corporate perspectives captured but also a holistic impression of the company was created.

At a very high level, the corporate business strategy outlines the target picture in 2025 or 2030, which is necessary for informing the executives. It includes classic business plans, sales, cost developments, investment ratios, and other financial KPIs. In some cases, it also includes developments in the production network structure.

From this overarching strategy, 13 strategy papers are derived for the respective functional areas, BUs, and regions. The strategy papers include an implementation plan with long- and medium-term targets and highly detailed targets for the following year. The individual business areas and regions are primarily responsible for preparing the strategy papers. Once a year, the strategy papers are presented to the board, the status of implementation is discussed, and any necessary adjustments are discussed and approved by the board. Based on the results of the meeting, new issues arise that are then included in the strategy paper.

The strategy process always starts with the strategy papers of the three BUs. The respective managing directors update their sales and customer planning once a year and analyze how the markets in the various regions are changing. A time horizon of 6 years is considered. The changes in each region are then discussed with the respective regional managers. If the requirements per region and business area are available, the production manager participates in order to discuss alternatives for

meeting the market requirements through the production network. The detailing of alternatives is conducted by the network management department.

The network team consists of seven to eight employees. Twice a year, an exact area analysis of each plant is conducted. The result provides precise information on production and logistics areas as well as the associated resources and capacities – for each plant, each region, and the entire Group. These capacities are compared with the forecast for the next 6 years. Considering the corporate business strategy, the network strategy and recommendations for specific actions for the following year are defined. The network strategy is also the basis for planning structural investments, which are brought to the board. This includes network expansions, closures, and relocations and is part of the production strategy paper.

Additional improvement potential is often identified in the course of the area analyses. If the network team finds a potential particularly attractive, an option is worked out, discussed with the managers of the BUs concerned, and then presented to the board. This means that top management can be made aware of potentials in the network at any time.

At the plant level, the strategic direction is heavily determined by the site role. The site role is part of the network strategy and is decided by the network team and the corresponding BU managers. However, the know-how of the site managers is seen as valuable when it comes to assessing regional markets.

According to the company, the great advantage of its strategy process is that all levels, BUs, departments, and regions are included in the process and a kind of early recognition system is available through the area analysis, which allows a view into the next 5 years. An additional enabler appears to be internal communication and transparency, which enables every manager to have access to all strategy elaborations and to pass them on to the team.

4.3.2 Cross-Case Analysis

Now that each respective case has been analyzed on its own using case description and within-case analysis, this section provides a comparative analysis of the 10 expert interviews. Cross-case analysis is crucial for deepening the understanding of and capturing novel findings that may exist in the data (Eisenhardt 1989; Miles et al. 2014). The analytical focus is on the four main code groups described in Table 18.

Top level

The hierarchical process of strategy formulation has already been extensively researched in the literature and was described in Section 2.2. A top-down approach, in which the corporate strategy triggers the business strategy from which the functional strategies are derived, was commonly observed in the companies of the interviewees, albeit in different ways. The purpose of the interviews was to determine the influence of the voice of production at the corporate and business levels. Table 20 provides a brief overview of the strategy processes and how the voice of production is considered in the process. The voice of production is a critical support for many of the companies in formulating their overall strategy. It is particularly helpful in identifying opportunities (companies D, G, and J), evaluating the feasibility of strategic initiatives (companies A, G, and J), assessing capacities and production capabilities in specific markets and regions (companies E, F, and J), and ensuring customer satisfaction through delivery capability and quality specifications (company F).

Two companies distinguish themselves with regard to the involvement of production in the corporate strategy and business strategy process. In companies H and I, production is not considered in the formulation at all. The overall strategy in company H is primarily determined by the market view and production and other function areas must align accordingly. The situation is similar in company I. The result of this approach, however, is that “desire and reality often diverge” (translated from the interview with company I). In this case, the interviewee considered it necessary to give more attention to production to prevent misalignments.

Table 20: Top-level strategy process and the involvement of operations representatives.

Company	Process	Voice of Operations
A	Strictly top-down cascading by the executive management	Limited to a consulting role if required
B	Top 20 executives formulate the vision, based on which three global project groups set guidelines for regional and functional strategies	Represented in one of the global project groups
C	The top 25 managers, board members, and heads of function areas formulate the mission and overall strategy	Represented by seven out of the 25 top managers
D	Three initial separate division strategies are discussed and consolidated by the division heads and board members in one corporate strategy, from which focus topics are again broken-down from the top down	No structured process, although the Head of Operations is very much involved
E	The board of directors defines the corporate strategy; business unit strategies are drawn up individually by the business units in accordance with a standard procedure and approved by top management	Involved from the business unit strategy onwards
F	Vision defined by board of directors and CEO; corporate and business strategy defined by Top 14 executives (all functional strategy leaders, including management)	CEO with ops. Background, MD from operations, and three more representatives in the top 14 of management
G	Strategy teams iteratively develop corporate and individual business unit strategy, which is finally	Through cross-functional and cross-level meetings with the strategy teams

	approved by the executive management board and three division managers	
H	Corporate and business strategy are developed and defined by a strategy project team, the heads of the divisions, and the executive board	No involvement
I	Strategy project teams prepare themes in close collaboration with the executive board, which then also approves the corporate strategy	No involvement
J	Functional areas, business units, and regions prepare strategy papers that are approved by the board of directors	Involved in all strategy papers

Most of the companies have a mission or vision statement as their overarching strategy statement, from which corporate, business, and functional strategies can be derived (companies A, B, C, and F). These overarching objectives often cover a time span of 5 (e.g., company F) to 10 years (e.g., company C). These objectives are broken down into concrete strategic actions, some of them on an annual basis, enabling the companies to align themselves with the rapidly changing contextual factors.

Network level

Among the 10 companies, only two interviewees from companies A and F mentioned a dedicated network strategy. The other companies have embedded the network strategy or network-related issues in their production strategy. The same conclusion was derived from the literature review and described in Section 2.4.2. Table 21 provides an overview of the content and institutionalization of strategically relevant production network issues. Product and process allocations are mentioned most often in the network strategy (five mentions), followed by the network structure and site roles, which are defined in four companies. Furthermore, the topic capacity, mentioned three times, and the topics of multi-plant strategy, make-or-buy, and collaboration are described in the network strategy of at least two companies. No

overlap exists for the remaining issues. Company C is particularly generic in its scope of network strategy content. Even in the interview the content could not be further specified.

Table 21: Network strategy content and institutionalization.

Company	Content	Institutionalization
A	• Multi-plant strategy • Make-or-buy decisions	Top management defines network strategy; network manager is responsible for implementation
B	• Make-or-buy decisions • Capacity planning • Technology • Product allocation	For each region, a separate production strategy is defined, including the network strategy
C	• Culture, agility, and HSE • Improvement, people, and smart factory • Quality, delivery reliability, and sustainability	Operation strategy is broken down into business unit strategies
D	• Global collaboration • Network structure • Best practice exchange • Technology management • Site roles	Operations program for each division with 15 strategic focus initiatives (and network issues) is developed based on the corporate strategy
E	• Site roles • Product and process allocation • Collaboration	Network strategy is part of the production strategy and is organized, centrally for all business units, and based on a rolling forecast

F	• Network structure • Product and process allocation	Network strategy based on forecast and business strategy, primarily elaborated by the supply chain team
G	• Network structure • Improvement of the service level • Capacity balancing	Network strategy fully integrated into the business unit strategy and broken down into objective key results
H	• Multi-plant strategy • Site roles • Value creation level • Production and process allocation	Integrated into the production strategy with consideration of the supply chain strategy
I	• Network structure • Product and process allocation • Technology management	Integrated into the production strategy
J	• Site roles • Resource planning • Capacity planning • Supply chain	Network team with seven to eight people makes suggestions to top management regarding site roles

The formulation of the network strategy and how it is anchored and implemented in the company often depends on the accountability of the network manager. In companies A and H, the network manager receives key figures (EBITDA and cost of goods sold), which are to be improved by efficiency increases within the plant network for which the manager is responsible. The manager can propose strategic initiatives to top management but has little decision-making authority. There is no network manager in companies C and I. Their overall strategy defines strategic guidelines within which the production department is given wide decision-making

autonomy. The network management is organized as a kind of cross-sectional function in the other companies. Instead of having direct decision-making power, the network manager acts as a consultant and suggests concepts. Noteworthy is the network team at company J, which is highly valued by top management and the entire company. Its competence is not questioned and its suggestions are usually implemented immediately.

Site level

The involvement of site managers in the strategy process also differs among the 10 companies interviewed. In companies F and G, site managers are involved in production strategy development and also have a high degree of autonomy. In companies that apply site role concepts, site strategy is defined through their role (e.g., companies H and J). The great advantage of site roles was also mentioned, namely that through them it is easier to provide strategic guidelines to plants, which are harmonized with the overall production strategy.

In the remaining companies, no strategies are defined at the site level or, as is the case in company I, their scope and quality strongly deviate.

Alignment

As already elaborated in Chapter 2, remarkably few approaches have been discussed in the literature for ensuring alignment between production strategy and business or corporate strategy. In this subsection, a few factors are described that, according to the interviewees of the 10 companies, are crucial for alignment. The most critical factors include communication, regular meetings, organizational structure, and individual skills.

Comprehensive communication was seen as particularly essential for good alignment and a common understanding of the strategy. An overarching mission or vision supports the common understanding of the overarching purpose of the company and embodies the values that it aspires to. It serves as a further orientation guideline for employees to make decisions in the interests of the company's success. Horizontal communication and exchange are also encouraged, although not structured in some companies (e.g., company A).

Companies G and F attempt to achieve the fullest possible transparency of the strategy and its objectives using tools, platforms, or intranets, providing each

employee with the opportunity to remain informed on how to participate in the achievement of the strategy. However, this form of communication is rather unilateral and merely informative.

A more interactive approach to exchanging information is through meetings. Regular meetings are particularly useful for ensuring alignment during the implementation phase of the strategy. The companies arrange weekly (companies E and J), monthly (company H), quarterly (companies A, F, and G), or annual (companies B, C, and D) meetings to review the strategy progress and adjust it if necessary. A regular strategy review allows companies to adapt to the constantly changing environment and to consider internal changes or deviations. Some companies (e.g., C) focus on the external factors and include the sales side in the strategy reviews. Other companies focus primarily on the current status of strategy implementation and whether the realized strategy matches the intended one or whether the deviation is so great that it needs to be adjusted. These companies tend to have representatives from all functional areas to enable a vertical exchange and alignment. In the case of strongly disruptive events, ad-hoc meetings are organized with a group of participants depending on the event (companies F and I).

Considering the strategy formulation phase, Company F experiences particularly good alignment if two organizational levels are always involved in strategy meetings. Subsequently, the organizational level further down meets with the next level and thus continues the strategy cascading down to the last level. This ensures an excellent common understanding of the strategy.

In company C, strategy cascading and communication are straightforward because of the flat hierarchy. From the board of directors to the machine operator, there are only four organizational levels, which allows the company to adapt fast to changes in the strategy.

Another factor in ensuring strategic alignment in terms of organizational structure is the employment of strategy teams. Companies D and F, for example, have dedicated staff units focused on strategy development. These strategy teams participate in meetings to develop functional strategies and represent the business and corporate view, respectively. This ensures the alignment of higher-level interests as well as function-specific interests.

How well a global production strategy is formulated and the process behind it depends to a large extent on the individual:

An operations strategy, or I would say a functional strategy in general, depends very much on which board member is responsible for it, and also on his personal way of working and his guidelines. And people like that change more often than they do for strategy periods. Thus, I have already experienced that this actually changes with the person sitting there on the chair. (translated from the interview with company I)

How well the voice of production is heard in the overarching strategy also depends in part on the individual skills of the person responsible for production (companies D and F). In company D, the Head of Operations was able to make a strong contribution to strategy development through his strong proactive communication, anchoring the topics of network coordination and footprint in the overarching strategy. In certain other companies, global production does not have such a high priority and strategy initiatives tend to be dismissed as proposals.

4.4 Implications

The purpose of this chapter was to identify key aspects necessary for ensuring alignment between business strategy and global production strategy. For this purpose, the top 10 companies identified in the survey as particularly successful in this field were invited for an interview. Through within- and cross-case analysis, the strategy processes were analyzed in detail at the top and network levels. In this context, special emphasis was placed on the involvement of production. The analysis revealed the following three strategy process approaches:

- **Strict top-down approach:** Top management develops the strategy and breaks it down into functional areas in the form of key figures. In two companies, global production is not involved in the formulation of the strategy. There are hardly any bottom-up initiatives; therefore, many improvement potentials remain undiscovered.
- **Medium top-down approach:** Top management elaborates strategic guidelines in which the functional areas benefit from a high degree of autonomy and decision-making power. Optimization potential can be increasingly leveraged, but there is a risk that functional areas will implement initiatives that are not coordinated with one another. Cross-functional exchange should be ensured.
- **Integrated approach:** Production is represented in top management and can draw attention to the specific requirements and potentials of global

production, so that network-relevant issues are given sufficient consideration.

For ensuring alignment between corporate or business strategy and production strategy, critical factors are communication, regular meetings, organizational structure, and the individual skills of the global production manager.

Although the interviewees reported that the individual skills of the production manager can have a positive effect on alignment, this point should be examined critically. Companies should not rely on the individual skills of certain key individuals. Only standardized processes or structures enable the continuous, transparent, and sustainable involvement of the voice of production. However, individual skills can provide much support in this context.

The companies were also highly aware of the importance of production involvement: *The problem is that, at the time when the strategy is defined and decided and, in the case of a listed company, also communicated to the capital market, no involvement of operations has yet taken place. This means that to reverse the strategy, it has to be very significant.* (translated from the interview with company H)

Nevertheless, the problem is that the network manager is often considered to be a cross-sectional function. As a result, they miss a certain amount of decision-making power. For infrastructural, non-capital-intensive decisions, this seems to be less of a problem and is more likely to be taken up, but for structural and capital-intensive decisions, the network manager can only make recommendations. Still, there are many decisions embedded in the production strategy that have a significant impact on network capability. These include not only the network structure but also the specialization of the individual plants, partly operationalized by site roles. The necessary authority of global production for ensuring alignment was emphasized, among other things, in the interview with company G:

[I]t is always good if there is someone in the highest authority who really understands it [...]. Only if there is this production leadership, you have the possibility to really establish standards, to level up or to make a network and strategic investment decisions, to enforce footprint decisions. And so it's always associated with the need for alignment. You have to find each other, you have to negotiate, you have to promote things well politically, and you may not always be as efficient as you could be. (translated from interview G)

It is noteworthy that the three companies that do not involve the voice of production

(company H, I) in strategic decision-making in top management, or only do so in an advisory capacity (company A), do not differ in their performance from the other companies. Despite the lack of voice of production in top management, companies A and H have their network strategy clearly formulated and embedded in the overarching corporate strategy. This is presumably fostered in company A by the quarterly meetings in which necessary strategic adjustments can be proposed bottom-up to top management. Company H is characterized by a holistic, integrative, sophisticated network strategy approach, which is based on the given corporate strategy. This approach enables clear formulation and alignment. Considering the contextual factors of the three companies, deviations compared to the other seven companies are also noticeable here. All three companies characterize their market environment as largely stable. In the case of companies H and I, good customer service is the key competitive factor. Their products do not have to meet high quality standards and the production processes tend to be less complex than those of the other seven companies. Chapter 6 examines in more detail the impact of contextual factors on the necessary involvement of production in strategic decision-making.

Subsequently, based on a theoretical perspective, it is elaborated to what extent the preliminary results can improve the necessary alignment between production strategy and business strategy.

5 Conceptual Design

The purpose of this chapter is to answer sub-research question 3 “What practices and methods increase attention to global production-relevant issues?” by consolidating previous research results into a conceptual approach. The conceptual approach presented in this chapter built on the findings from the literature review (Section 2.4), survey (Section 3), and expert interviews (Section 4) and incorporated the underlying research theory (Section 1.5). According to the research framework (Section 1.4) that guided the entire research process, selected categories and constructs are elaborated in this chapter. The emerging research focus and questions build the basis for the subsequent case study research. Section 5.1 reviews the previous findings, considering ABV and strategic agenda building theory. Based on this, a concept is consolidated in section 5.2 and implications for the further research project are derived in section 5.3.

5.1 Linking the Research Theory with the Preliminary Research Results

According to Ocasio and Joseph (2005), it is the pattern of organizational attention inherent in the interacting network of operational and management channels that gives rise to the development of the strategy. Within the context of this study, these channels or attention patterns can be considered as important tools that direct the attention of top management when it comes to strategic decisions involving the production network. Through the establishment of attention structures, strategic decisions that have an impact on the production network can be more effectively integrated into the strategic agenda of top management. A sustained focus of attention on a consistent strategic agenda is necessary for establishing an effective strategy (Ocasio and Joseph 2018). As a result, the alignment of corporate, business, and production strategy is enhanced. As already described in Section 1.5, Ocasio and Joseph (2005) formulated five propositions that serve as a guideline for the development of an attention-based strategy formulation. The discussion of the previous research results is based on these five propositions to elaborate the concepts and categories for the subsequent case study research:

1. ***Decision-making is guided by selective attention to organizational issues and initiatives:*** The primary impetus for action is prompted by organizations interpreting and reacting to issues, problems and

opportunities, thereby responding to circumstances (Dutton and Dukerich 1991). When objectives are not met (Cyert and March 1963) or external events occur (Hoffman and Ocasio 2001), it may lead to problems. How attention is directed within organizations and strategies are formulated is ultimately determined by patterns of response and decisions with regard to the issues (Langley et al. 1995). Issues that are potentially associated with organizational objectives and which require resources to be allocated to them are considered strategic by decision-makers (Chandler 2001). Decision-makers are most receptive to what is within their reference framework and select issues accordingly (March and Simon 1958; Ocasio 1997). Strategic initiatives may result from new combinations of existing individual and organizational capabilities (Burgelman 1991) or from a perceived gap between what is expected and what is required to accomplish the task (Bower 1970). Such initiatives depend on the personality and experience of those managers most closely involved with the problem, in this context (Chandler 2001). The development of a strategy at corporate level is affected by how the initiative is formulated (Ocasio and Joseph 2005). The combination of an initiative in response to an issue, organizational problem or opportunity leads to a decision (Kingdon and Stano 1984). It is the strategic issues and initiative that attract the most attention that therefore guide decision-making and the formulation of initiatives in response to strategic issues (March 1978; Ocasio 1997). The process of building an agenda involves the selection of strategic issues (Dutton 1986) that compete for attention in the organization's decision-making channels. Awareness of and involvement with an issue determines whether it becomes part of the strategic agenda (Dutton 1986). An important role is played by the involved individuals when it comes to setting the organization's agenda, by raising issues (March and Olsen 1976), stirring interest and spreading awareness of issues, either independently or collectively. For those who have a vested interest in including a strategic issue on the agenda, it is key to control the definition of an issue. Understanding that certain individuals identify with strategic issues is essential for understanding the building of an agenda. Interest in including an issue on the agenda and implementing measures accordingly is raised by such involved persons. The role of such sponsors

in the initiation of strategy formulation has been documented by various researchers (e.g., Bower, 1972; Burgelman, 1983; Mazzolini, 1981; Quinn, 1980). The greater an individual's personal commitment to an issue and awareness-raising efforts, the greater the likelihood that it will be taken up by an agency. A high degree of credibility and authority, as well as the ability to provide the group of participants with a simple explanation of a complex issue, will increase the chances of success of these efforts (Lyles and Mitroff 1980). The effect of sponsorship in terms of attention to specific strategic issues can be confirmed by the initial findings of this research. Companies that include a representative of global production in the strategic discussions manage to consider network-relevant topics more effectively (Chapter 3). From the expert interviews, it emerged that a strong presence of global production on the board of directors enables a more effective assessment of the feasibility of strategic initiatives as well as ensures that any potential from the network is more effectively incorporated into overarching strategic initiatives. In addition, alignment between corporate, business, and functional strategy is achieved in the best possible way.

2. ***Selective attention to organizational issues and initiatives is situated in a dynamic network of operational and governance channels:*** Operational channels refer to those where technical operational tasks relating to production, sales, marketing, research and development, amongst others, are carried out (Thompson 2008), with occasional input from executive channels. Management channels refer to those where middle-level and upper-level managers deal with the allocation of resources and the development, supervision and control of business and corporate strategies (Williamson 1985), which are characterized by a higher degree of abstraction of information, allowing those at a higher organizational level to make critical decisions and understand what is happening at an operational level (March and Simon 1958). A variety of factors define the form and context of a company's operational and management channels, contributing to an understanding of how managers deal with issues and initiatives (Teece et al. 1997). Meetings, for example, may occur at specific locations, with specific groups of participants, with specific frequencies and duration, and usually with a specific purpose.

Furthermore, the type and content of communication may be oral, written, synchronous, asynchronous, formal, informal, open, highly political, face-to-face, or through some other means of communication (Ocasio and Joseph 2005). All of these factors matter to the attention of decision makers. The social and economic structures of the company provide the framework for these channels. Differences in these structural variables are reflected in the communication channels, influencing the perceptions of managers. It is especially worth noting the intersections of operational and management channels, as they are important first of all for converting the prompts by decision-makers into specific technical and operational tasks, and secondly for drawing the attention of top management and convincing them of the proposals put forward bottom-up by employees (Bower 1970; Burgelman 2002). The ability to identify problems and opportunities and to evaluate initiatives depends on their position within the organization's dynamic network of operational and managerial channels. In order to implement a strategy, the initiatives and strategies formulated by the managerial channels in response to issues must go hand in hand with cooperation with operational (Ocasio and Joseph 2005).

For the further course of the present research, it is proposed that regular strategy meetings with representatives of the governance and operational channels should be held. This will ensure that the strategy cascades smoothly to the next level while simultaneously ensuring that bottom-up initiatives with potential for improvement have a chance to be heard. The importance of these meetings was often mentioned in the interviews discussed in Chapter 4.

3. ***Formal channels guide the creation of informal channels***: How important informal channels are when it comes to the processes of formulating and implementing a strategy has already been pointed out by various researchers into organizational decision-making (Mintzberg et al. 1976). Informal discussions and brainstorming can often spark ideas, a process that continues until the decision-making process is complete and resources are formally allocated to initiatives through formal strategic decisions, whereupon informal channels provide retrospective rationalization and can also maintain and restore political networks impacted by the decisions made, as well as plan subsequent participation

in the organization's formal decision-making channels (Ocasio and Joseph 2005).

In a production network, employees should have the opportunity to exchange ideas for improvement and then draw attention to them. A method that supports this procedure is regular strategy updates, which is employed in company E, for example. A direct line of communication to a manager also makes it easier to draw attention to potentials that have arisen informally.

4. ***Tight and loose coupling of the network of channels guides strategy formulation through the selective retention of strategic initiatives:*** the channels that decision-making processes flow through can either be closely linked or may only indirectly and occasionally impact each other (Ocasio and Joseph 2005). On an individual channel level, processes may be disconnected from each other and from corporate activities, focusing individual and group attention on particular initiatives. Ocasio and Joseph (2005) define closer and looser linking as the degree to which individual processes within one channel respond to issues and initiatives in others. Channels that are more closely linked usually hold a central position in the network, representing a focal point of attention in the organization and maintaining attention to the most commonly considered issues and initiatives. Loosely linked channels, on the other hand, may involve more peripheral issues as idiosyncratic focusses of attention that are not a priority for the management. Closely linked channels are more transparent and allow a greater sharing of knowledge (Argote et al. 2003). Decisions and actions can also be allocated more conveniently to members and units within the organization (Weick and Roberts 1993). A close link between managerial channels is important for agenda management and for focusing attention on corporate strategy initiatives at the middle and senior management levels. This allows strategic planning processes to filter throughout the organization more easily, linking them to other key areas including operations, compensation, budgeting and financial reporting. For globally distributed manufacturing networks, loosely coupled channels are critical for developing context-specific strategy initiatives. Such channels ensure that the actions and attitudes of international managers, while rooted in contextual factors within local

operational channels, are aligned with the field of attention created by corporate governance channels.

Under this consideration, the degree of centralization of strategic decision-making has an impact, not only on autonomy but also on the nature of decision-makers' attention. Based on the literature review, it was not possible to make a concrete statement about which strategic decisions should be centralized. The analysis of the survey and the evaluation of the expert interviews provided indications regarding which decisions should be made on which company level to ensure good alignment. It should be noted, however, that decision making should be structured differently depending on the context. For the further research in this project, it was essential for the discussion regarding which decisions should be made and where to be conducted consciously.

5. ***Selective retention of initiatives in channels is a source of competitive advantage:*** Companies must focus management attention effectively and efficiently in terms of both internal behavior and external contexts, such as market opportunities, in order to identify the “right” initiatives. Companies can direct internal competences and respond to external changes better if they can use these channels to optimize the focus of attention. If a company identifies and mobilizes initiatives that enhance competence, the management can adapt corporate activities to the changing environment, thereby mitigating the impact. The accuracy, facilitation and integration of the processed information about decisions and implementing the strategic concept is ensured by the ability of top managers to guide the attention of more junior managers to appropriate issues and activities (Ocasio 1997). It is vital to align issues and initiatives, as this influences if and how resources are allocated (Dutton and Duncan 1987). Competitive advantage is therefore ensured by the variation, selection and commitment processes and their respective channels that result in activities that reconfigure resources, rather than by resource combinations per se. Companies can only achieve a competitive advantage if they are successful in identifying capabilities that are difficult to imitate and most likely to result in valuable products and services (Teece et al. 1997). Early involvement of the voice of production can efficiently focus attention on potential or possible negative

consequences of strategic decisions of top management. This can be ensured by having a representative directly in top management (see company C) or by holding coordination meetings with production managers (see company G). This involvement also ensures that the potentials of the production network – the network capabilities – are considered as capabilities that are difficult to imitate and ensure a competitive advantage.

The discussion has indicated that various methods exist to ensure that the characteristics of global production receive sufficient attention in strategic discussions. There are governance as well as operational, formal as well as informal, and tied as well as loose structures, which as contextual factors influence the attention in strategic decisions. Based on the theoretical discussion, the current research findings were summarized into the following levers, which can be used to increase the attention given to global production in strategic discussions:

- Involvement of a global production representative in top management: If a representative from global production is present in the strategic discussions of top management, increased attention to network-relevant issues and initiatives is more likely. The extent to which the representative(s) succeeds in integrating the issues into the strategic agenda depends on their individual skills, authority, and ability to form alliances. This approach constitutes the highest level for ensuring that an alignment with the production network capabilities is achieved as early as the strategy formulation phase.
- Organizational structure: The role of production network managers within the company depends greatly on the organizational structure. According to the structure of the organization, the managers have the authority to direct or represent merely an advisory function. If focusing more attention on global production is necessary, it is crucial to adapt the formal structures so that production network managers are used as a direct link. This will ensure that top-down strategic initiatives are properly communicated and cascaded to the plants. On the other hand, the focus on production-relevant bottom-up initiatives and their implementation in top management will be improved.

- Meetings: Regular meetings provide a way for managers to formally ensure attention to production network issues and alignment with other strategic issues, both vertically and horizontally. Ocasio (2019) noted that “[g]reat strategies emerge from a focused, strategic agenda communicated and distributed throughout the organization.” Depending on the exact intention of the meeting, its duration, interval, and participants can vary.
- Corporate identity: The definition of culture is a set of shared beliefs and values among members of an organization (Linda Smircich and Gareth Morgan 1982), which vary in content and consensus between different organizations. A “strong culture” is forged by a high level of consensus, which underlies and explains the meaning and interpretation of actions within an organization (Waterman and Peters 1982). The perception of an organization by external customers and internal members is reflected in the corporate identity (Tripsas 2009). Identity importantly also provides a focal point for the members of an organization and determines how the organization directs its attention (Joseph and Ocasio 2012). In order to ensure a common understanding of opportunities, threats and solutions, coherence across all levels of an organization is important (Kaplan and Tripsas 2008). This avoids confusion about where to allocate effort and resources. Resources are more likely to be devoted to the same problems or opportunities by different divisions and BUs if they share a strategic agenda. Furthermore, there is a better alignment between the solutions and the wider interests and aims of the organization. A further strategy to draw greater attention to global production is therefore to fundamentally link it to the values and identity of the company.

5.2 Approach for Better Involvement

In the previous section, various approaches to how the voice of global production can be given more attention in strategic discussions were described. These methods were derived from the previous research results. However, what kind of involvement is necessary and under what circumstances remained unclear as the results from the benchmarking study and interviews did not enable a definitive statement to be made. Involvement can vary depending on the strategic decision. The distribution of the decision is also hardly significant. According to the benchmarking study, certain

strategic decisions relevant to the production network (choice of organizational structure and choice of data & IT infrastructure) are primarily anchored in top management, whereas other decisions are primarily anchored in network management (choice of manufacturing technology and make-or-buy decisions). However, several other strategic decisions have an impact on the GPN and the alignment between corporate, business, and production strategy, whose decision makers vary widely. In addition, the participants in strategic discussions vary. These discussions can occur either across functions and/or organizational levels or in isolation. In order to determine under which circumstances which, type of involvement is required, it is important to thoroughly understand the decision-making process of relevant strategic decisions. Among the particularly relevant decisions, that are analyzed in detail in the following case studies, are:

Corporate Decisions

- C1. Vision/mission
- C2. Corporate strategy
- C3. Business strategy
- C4. Network target (in the form of competitive priorities and network capabilities, etc.)

Configurational Decisions

- S1. Products manufactured at the plant
- S2. Manufacturing layout (project, job shop, flow shop, line, continuous)
- S3. Manufacturing technology
- S4. Capacity levels relative demand
- S5. Timing of capacity acquisition (e.g., leading or lagging)
- S6. Plant focus
- S7. Plant specialization
- S8. Make-or-buy decisions

Coordinative Decisions

- I1. Organizational structure
- I2. Selection of quality tools
- I3. Employee competence development
- I4. Improvement programs

15. Longer-term planning and control principles (e.g., sales and operations planning, budgeting)
16. Shorter-term planning and control principles (e.g., Kanban, production scheduling, load leveling)
17. Data & IT infrastructure systems
18. KPI/performance measurement system

The decision categories “Configurational Decisions” and “Coordinative Decisions” were identified in the previous chapters. The decision categories C1–3 were supplemented. They were not explicitly mentioned as relevant decisions for the management of GPNs in the literature, the survey, or the interviews. Nevertheless, of high interest to the research at hand and relevant for the results was to what extent involvement by global production occurs in these decisions, since the vision, corporate strategy, and business strategy predetermine the network strategy and thus strongly influence it.

The reason for a special focus being placed on strategic decision distribution is that previous studies have not made any distinctions regarding precisely on which level the decisions are made and who is involved. Olhager and Feldmann (2018) uses a seven-point Likert scale, which was then also applied by Lohmer et al. (2021), in which a distinction was made between centralized and decentralized. In Chapter 3, a four-level classification was used, but this still did not allow a precise statement to be made regarding who is actually responsible. Furthermore, how the decisions are derived is of interest as well as whether other areas are involved or consulted. Special attention is also paid to the organizational structure and how the decision makers are located in the company.

Researchers have demonstrated both positive and negative effects of the heterogeneity of teams in which strategic decisions are made on various outcomes, such as turnover, consensus, and performance (Zhang and Rajagopalan 2003; Peterson et al. 2003; Simsek et al. 2005). Research suggests that heterogeneous teams are able to evaluate alternatives along multiple dimensions, make high-quality decisions, and improve the group’s skills and overall problem definition and problem-solving abilities found that heterogeneity in team members’ functional backgrounds, for example, was positively associated with innovation (Bunderson 2003; Hambrick et al. 1996; Schweiger et al. 1989). In rapidly changing, dynamic

environments, information processing demands require the identification of greater adaptive capabilities, which favors heterogeneous teams (Harrison et al. 2002). On the other hand, some researchers agree that heterogeneity induces tension or a gap that narrows information sharing, thus negatively affecting organizational performance (Ancona and Caldwell David F. 1992). Different views, different ways of thinking, and unfamiliar vocabulary, paradigms, and objectives often make a heterogeneous team a burden to the organization (Hambrick et al. 1996).

The type of involvement of global production is determined in general or for decision clusters. These are the methods discussed in the previous section, namely a global production representative, organizational structure, meetings, and corporate identity.

5.3 Implications

Section 5.1 reviewed the practices that enable involvement to ensure that corporate strategy, business strategy, and global production strategy are aligned and answered sub-research question 3. Based on this, Section 5.2 suggested how the strategic discussion can be implemented in a company to ensure that global production receives sufficient attention. According to Fleury et al. (2015), a framework must consider four blocks of questions: the “what” block (variables, constructs, and concepts to be used); the “how” block (how do they relate to each other); the “why” block (what are the reasons that justify the relationships between constructs, variables, and concepts); and the “who,” “where,” and “when” blocks (which represent the specificity of the approach being developed to address the phenomenon and its limitations). These blocks of questions served as a guideline for the subsequent case study research.

Accordingly, guiding questions were developed and structured into four sections: (1) understanding the business environment and market requirements; (2) understanding the strategic focus of the manufacturing function, including network, business, and corporate strategy and their alignment; (3) understanding the distribution of decision making in the network; (4) involving the voice of production in strategic decisions; and (5) evaluating the potential of involvement mechanisms. These guiding questions should assist in validating the concept through a case study design, described in the following chapter.

6 Case Studies

The previous chapters have introduced practices that strengthen the voice of production in a corporation and enable better alignment of the production strategy with the corporate strategy and business strategy. To gain an enhanced understanding of how these practices can and should be applied, both the operationalization of the practices and the prevailing contextual factors needed to be investigated in more detail. This is the aim of the present chapter over the course of four case studies. Section 6.1 introduces the research design and methodology. Furthermore, it describes the data collection and analysis as well as the measures applied to ensure the reliability and validity of the case study approach. Sections 6.2–6.5 present within-case analyses of four firms. Lastly, a cross-case analysis is presented in Section 6.6.

6.1 Research Design

In order to handle high degrees of detail, dynamic complexity and hysteresis, which make it very difficult to research the management of global operations, Ferdows (2018) proposed using case-based research, an approach that has also been advocated by other researchers in the area of operations management (Eisenhardt 1989; Ferdows 2018; Stuart et al. 2002; Voss et al. 2002). The following four main advantages of case study research were highlighted by Yin (2009):

First of all, for the case study method, it is best to conduct empirical research that seeks answers to “how” and “why” questions about a recent uninvestigated topic (Eisenhardt and Graebner 2007; Yin 2018). Since the MRQ and the SRQs were aimed at identifying, describing, and explaining theoretical and practical issues, conducting case research seemed to be justified.

The second main advantage is the possibility of investigating phenomena in the real world without experimental controls or manipulations (Eisenhardt and Graebner 2007; Meredith 1998). It is advantageous for the researcher and participant to cooperate closely, whereby the researcher gains a better understanding of the participant’s actions through the latter’s description of their view of reality (Lather 1992).

Third, case study research is particularly useful when developing a holistic understanding of the research topic in its natural setting and capturing dynamic

aspects (Gassmann 1999; Yin 2009). Since context played a major role in Ulrich's (1973) research approach, a methodology that considers the context of the model application is required. Furthermore, it is not possible to obtain a true picture of decision making without considering the context in which it took place (cf. Baxter and Rideout, 2006).

The case study method also has the advantage of enabling studies in cases when there are unclear boundaries between the phenomenon and the context (Yin 2009). Cases studies are therefore a useful method for gaining a broader picture of the world around us (Rowley 2002).

It emerged from the literature review and the identified gaps in research that it has not provided an adequate understanding of how to successfully achieve an appropriate alignment of corporate, business and production strategy. In order to answer the research questions in this thesis, an inductive and exploratory case study approach was therefore deemed a suitable research methodology. This research was not limited, however, to putting forward proposals for further research, instead it sought to analyze the relationship between the involvement practices and their underlying mechanism and to identify management and organizational tools that benefit alignment. Explanatory aspects were therefore also included in this research project, which observed the case study methodology proposed and described by Yin (2018). A theory-driven case study approach was therefore taken. The conceptualizations set out previously in Chapter 5 provided guidance for the research. According to Yin (2018), the case study approach "benefits from the prior development of theoretical propositions that guide the design, data collection, and analysis" (Yin 2018). The previous chapter sets out a series of guiding questions that are based on both the empirical data from the expert interviews and on theory. The goal of the case-based approach is the identification of how involvement mechanisms can be practically applied and therefore provides "an excellent means of examining emergent practices" (Voss et al. 2002). Researchers can study differences within and across cases by means of a multiple-case study, with the aim of replicating the findings across cases (Yin 2009).

6.1.1 Case Selection

Eisenhardt (1989) proposed that case selection ought to be determined not by statistical criteria but by theoretical considerations. In order to establish the

applicability of various involvement practices, this study therefore took an information-oriented and theoretical sampling approach. Theoretical sampling, as defined by Eisenhardt and Graebner (2007) signifies the selection of cases due to being especially suitable for illuminating and widening relationships and the logic between constructs. It therefore does not seek the selection of samples that are representative of a specific population but instead to select cases that afford the necessary insights for the extension and replication of the emerging theory (Eisenhardt 1989). Selecting so-called “polar types” is an approach relevant to theoretical sampling, whereby identifying and explaining underlying patterns and relationships is enabled by significant case differences (Eisenhardt and Graebner 2007). According to Eisenhardt (1989), there should be a selection of 4 to 10 cases in order to ensure adequate empirical evidence and to develop a theory, because less than 4 cases might weaken the empirical base and more than 10 cases might make the volume and complexity of the collected data difficult to handle. In general, researchers select 4-15 cases when using case study methods (Babbie 2008; Charmaz 2006; Yin 2009). This study used four cases, conforming to Eisenhardt’s suggestion. This allowed a greater degree of generalization than in the majority of operations research studies, despite the limitations presented by the nature of a case study approach (Barrett et al. 2011).

The companies selected for the case studies are all based in Germany and Austria. This geographical proximity means that they tend to display more organizational, cultural and social similarities and fewer political and economic disparities, which raises comparability and generalizability (Ghemawat 2001; Knobens and Oerlemans 2006). Table 22 provides an overview of the selected case companies:

Table 22: Overview of case companies.

	Case A	Case B	Case C	Case D
Scope	Business sector	Company-wide	Company-wide	Business sector
Industry	Automotive	Automotive	Lifting solutions	Automotive
No. of sites	440	6	34	561
Employee	395,000	7,200	11,000	236,000
Revenue (billion €)	71.5	1.2	1.8	38
Global dispersion	60 countries			58 countries

Apart from the geographic proximity, the companies also differ in terms of various structures and dimensions. Cases A and D are very large corporations with several hundred sites. To narrow the focus, the case analysis considered only one business sector for each company. This was crucial for drawing boundaries. The comparison of the cases was interesting because similarities and differences could be analyzed in highly similar circumstances. Case B was selected under the “polar type” consideration to be a very small company. The company is also active in the automotive sector, but with “only” six sites, it is much smaller than cases A and D. Another factor that distinguishes case B is that it has experienced massive growth in recent years, making structural and organizational weaknesses easier to identify. To compare the findings from the automotive industry with another industry, a company of medium size was selected for case C, which operates in the lifting solutions industry.

6.1.2 Data Collection

Applying the strategy of using multiple data sources is one of the advantages of case study research, furthermore making the data more credible (Yin 2009). The principle of triangulation was applied to the data collection for this case study, in order to

increase the validity and evidence of the constructs (Eisenhardt 1989).

Semi-structured interviews with representatives with direct involvement in the company's global production strategy and with a network management function provided the main data source for the case studies. Additional internal and external information also enabled triangulation of the insights gained from the interviews. To kick off the process, between June 2021 and June 2022 the selected companies participated in a consortia research project on the subject of global production strategy, which comprises a series of workshops. This was followed between August 2021 and January 2022 by participation of all the case companies in a quantitative industry study. Compared to other qualitative approaches, case study research enables the collection and integration of quantitative survey data by researchers, making it easier to gain a holistic understanding of the study matter (Baxter and Jack 2008). This same study was described in Chapter 3.

To conclude, a review was conducted of company reports and of information that was publicly available on the Internet. The resulting internal and external information widened the insights gained through the personal interviews. In order to organize and store the large volume of data and facilitate subsequent data analysis, a case study database was set up (Yin 2009).

Yin (2009) recommended the development of detailed interview protocols for semistructured interviews to structure the data collection while maintaining a chain of evidence. The interview guide was structured according to the guiding research framework (see Figure 14). Attention was paid to include at least one question for each dimension of the research framework in the interview guide. Accordingly, the interview protocol was developed and structured into five sections: (1) understanding the business environment and market requirements; (2) understanding the strategic focus of the manufacturing function, including network, business, and corporate strategy and their alignment; (3) understanding the distribution of decision making in the network; (4) involving the voice of production in strategic decisions; and (5) evaluating the potential of involvement mechanisms. The interview guide and additional information regarding the purpose of the research project were sent to the interviewees in advance. A meeting transcript of each interview was prepared within 24 hours based on field notes and, if the interviewee agreed, on an audio recording. The seven interviews were held between March and April 2022, were conducted virtually, and lasted 30–90 minutes. Table 23 provides an overview of the interviews, participants, and other details.

Table 23: Semistructured interviews.

Case	Date	Min	Participants	Content
A.1	03.28.2022	60 min	VP of Corporate Technology and Planning, Coordination and Planning	General information, organizational structure, strategy
A.2	03.30.2022	50 min	VP of Corporate Technology and Planning, Coordination and Planning	Organizational structure, decision making, methods of involvement
A.3	04.27.2022	30 min	VP of Corporate Manufacturing Strategies	Methods of involvement
B.1	03.28.2022	60 min	Director of Global Manufacturing Operations	General information, organizational structure, strategy
B.2	04.04.2022	40 min	Director of Global Manufacturing Operations	Decision making, methods of involvement
C	03.21.2022	85 min	VP of Global Operations Excellence	General information, organizational structure, strategy, decision making, methods of involvement
D.1	04.04.2022	90 min	VP of Operations, Head of Manufacturing Footprint	General information, organizational structure, strategy
D.2	04.06.2022	60 min	VP of Operations, Head of Manufacturing Footprint	Decision making, methods of involvement

In the course of the consortia research project, in which all case companies participated, two workshops were held, and their results and findings were incorporated into the case analysis. The first workshop occurred on June 14, 2021. The focus of the workshop was on introducing the companies and current challenges on the topic of global production strategy. During the workshop, two experienced research associates from the Institute for Technology Management, University of St. Gallen, took meeting minutes and subsequently consolidated the results. The second workshop occurred on February 10, 2022. In the course of this workshop, the network management of the respective case companies was presented and discussed. Two experienced research associates as well as a research assistant from the Institute for Technology Management, University of St. Gallen, recorded the most important findings and finally compiled them.

The results of the quantitative survey were used to gain insights into the content of the global production strategy, the distribution of strategic decisions, and the role of the network manager. Internal and external information served to enrich the case studies with details and helped to enhance the understanding of internal and external contextual factors and structures.

6.1.3 Validity and Reliability

Case studies often face the criticism that they are not rigorous enough (Gibbert et al. 2008). In order to ensure that case study research is rigorous, four general criteria have been proposed:

(1) construct validity, (2) internal validity, (3) external validity, and (4) reliability (Gibbert et al. 2008; Yin 2009).

The first criterion of construct validity signifies to what extent a procedure leads to an accurate observation of reality (Gibbert et al. 2008). The use of multiple sources of evidence and building a chain of evidence was proposed by Yin (2009). Multiple data sources should therefore be used to provide evidence and the procedures for collecting and analyzing data should be made more transparent. As set out in Section 6.1.2., this requirement was met in the findings of this study. A guiding research framework supported the second criterion of internal validity, based on literature that identifies among the studied variables relationships that are theoretically valid (Gibbert et al. 2008). This study consequently adopts a case study approach that is driven by theory and is based on the guiding research framework (see Figure 14).

The third criterion of external validity refers to what extent the research findings can be generalized in the context of case study research (Yin 2009). Eisenhardt (1989) proposed carrying out multiple cases to ensure adequate empirical evidence that would allow a generalization of the research findings and the development of a theory. Researchers should also make case selection transparent and adequately illuminate the context of the companies in the case studies to allow the reader to gain an understanding (Gibbert et al. 2008). The reasons behind the case selection and relevant contextual information about the companies was therefore provided in Section 4.1.1. According to the fourth criterion, in order to increase reliability, detailed documentation of the case study and the underlying protocol should be provided (Yin 2009). To ensure reliability in terms of whether another researcher carrying out the data collection procedure would be able to obtain the same or similar results, this work makes use of comprehensive documentation, including a case study database (Yin 2018).

6.1.4 Data Analysis

Analysis of the data was a two-part process, comprising within-case analysis and cross-case analysis (Eisenhardt 1989). First of all, an analysis was carried out of the data within individual case studies. In order to facilitate within-case and the subsequent cross-case analysis, each data source was structured and coded on the basis of a cycle of reading and rereading (Strauss and Corbin 1991). The objective of the within-case analyses was the identification of strategic decision-making patterns and in what ways global production was involved. The aim of the ensuing cross-case analysis was to identify patterns common to all cases, which was important for generalizing the results (Voss et al. 2002).

6.2 Case A Analysis

Case company A is a leading international technology and services company with approximately 395,000 employees worldwide. The group includes nearly 440 fully consolidated subsidiaries and regional companies in more than 60 countries. The company generated sales of EUR 71.5 billion in fiscal year 2020. The activities are divided into four business sectors. Competition is intense in all four, especially on the cost side. Both traditional suppliers and increasingly market players from China

and several emerging countries are contributing to intense competition. In addition, with a view to increasing networking through the Internet (Internet of Things; IoT), competition is being intensified in all areas by new providers from the IT and Internet environment as well as the service sector, in some cases with different business models. The case company itself is increasingly offering networked solutions and services and developing business models to match. With its expertise in sensor technology, software and services, as well as its own IoT cloud, the company is able to offer its customers networked and cross-domain solutions from a single source. Despite these overlapping trends, the respective market and competitive environments of the company's divisions differ considerably in some cases.

The following case analysis in Section 6.2.1–6.2.4 focuses on one of the business sectors, namely the automotive sector.

6.2.1 General Information

The automotive sector is the group's largest segment, contributing 59% of total sales and employing almost 230,000 people. The case company is one of the leading suppliers to the automotive industry and offers a very broad range of activities, which are further broken down organizationally by six divisions and covered by two cross-domain divisions. The task of the two cross-domain divisions is to reduce and control the increasing complexity in vehicle development with overarching software and electronics solutions.

Figure 15 schematically illustrates an organizational chart for a division in the automotive sector. The management board consists of 10 managing directors and the supervisory board. The members of the management board define the strategy for the entire company and also control it. The responsibilities result from the main structure. A managing director can have overall responsibility for a business sector (or be responsible for certain divisions within one), central functions, companies, or regions. As already described, a business sector is divided into several divisions. Each division has a management board that consists of three to six members, depending on its size. Typically, the divisional management board consists of a chairman, an R&D manager, a production manager, a finance manager, and a sales manager. Each division constitutes a production network or a subnetwork.

Within a division, the plants can serve several BUs, but in organizational terms they

report directly to the divisional management board, which forms the technical bracket. The BUs are usually organized in such a way that they cover the topics of engineering, manufacturing, and finance. If a conflict of interest arises between two or more BUs due to the fact that they intend to access the same resources, divisional management is obliged to intervene to clarify the situation.

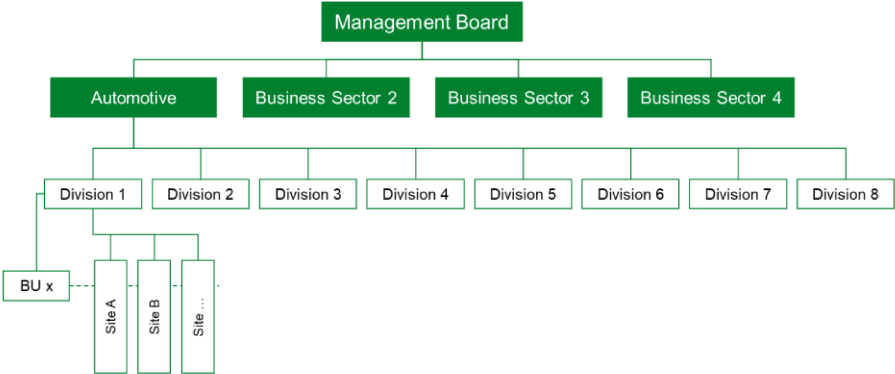


Figure 15: Schematic organizational structure of case company A (own illustration).

In the automotive sector, the group was for a long time mainly in competition with a few large automotive suppliers. Customers were predominantly globally operating automotive manufacturers and large regional producers. However, this market is changing due to the increasing electrification, automation, networking, and multimodality of mobility and, associated with this, the overarching electronics architectures with increasing software intensity in the vehicle. These trends are attracting additional suppliers, including those from industries such as consumer electronics, semiconductors, and the service and Internet sectors or mobility platforms. In addition, it is necessary for the divisions to cooperate more across the board or enter into external partnerships in view of the changing requirements and high upfront expenditures.

Thus, the automotive industry is undergoing a transformation. Global automotive production has already been declining since 2018 after reaching its previous peak in 2017. In addition, the COVID-19 pandemic led to a further significant decline in production figures in 2020. Mobility will also undergo a significant transformation. This is due to climate protection targets and the looming further tightening of CO₂ emission targets and emissions standards, new technological possibilities, and changing user preferences, particularly with regard to connectivity and convenient

mobility access. Networking also makes new mobility concepts and services possible as well as software updates, including new driving functions even after the vehicles have been delivered. In addition, the further increase in traffic poses additional challenges in terms of safety and optimal use of the transport infrastructure. All trends will have repercussions on technological development in terms of, for example, electric vehicles, vehicle networking, driver assistance systems, and automated driving. These four areas also form the four main elements of the business sector strategy, which was described in more detail in Section 6.1.3.

Due to the profound changes in the automotive sector, the company launched a performance program in 2019. This is based on the clear alignment of all divisions to target cost structures. Thus, the BUs are tasked with measuring themselves against benchmarks in key cost categories and defining and implementing measures to sustainably strengthen their competitiveness. Target budgets apply to the earnings contribution of the central and service areas. The resulting personnel measures depend on the respective requirements in the business and service units as well as in the regions.

6.2.2 Strategy

Management has created a vision statement, including mission, values, and strategic focus areas. The group's overarching strategic objective is to provide solutions and products for connected life that either have artificial intelligence (AI) or are developed or manufactured with its help. The company improves people's quality of life worldwide with innovative and inspiring products as well as services. The most critical economic objective is profitable growth. Due to the profound changes in the market and competitive environment in parts of the business and to limit increasing complexity, portfolio adjustments may be necessary in the future, as they were in the past. Further objectives are to grow faster than the market, to increase sales in Asia-Pacific and the Americas faster than in Europe, and to establish a stronger presence in Africa. In terms of the business sectors, the company aims to achieve a balanced ratio of sales between the automotive sector and other business sectors. Another crucial pillar for securing the company's economic independence is its broad positioning in various business sectors. The COVID-19 pandemic has once again demonstrated that this can strengthen the company's resilience. Growth is to be achieved primarily through innovations and the development of additional markets,

but also through corporate acquisitions and partnerships. A strategy department is responsible for formulating the overarching strategy and cascading it to the business sectors. The overarching strategy provides the business sectors with an effective framework, yet still gives them sufficient freedom to respond more precisely to their respective needs. The mission statement is valid for several years, because “as is common practice, you only change the mission statement when a new CEO comes in” (translation, Interview Case A on 28/03).

Together with the strategy department, the superordinate business sector strategy is formulated. This consists of the following guiding principle: “We are shaping a new age of mobility – sustainable, safe and inspiring.” It also consists of the four major topics of individualization, automation, connectivity, and electrification. The mission of the automotive business sector is to achieve a leading position as the automotive supplier with the highest sales, also in a changing market, and to help shape the transformation of the automotive industry. The focus of the overarching strategy is to determine in which business areas or BUs and in which markets the company wants to grow. Although the current production capabilities are considered by the strategy department here, the formulation of the production strategy does not occur until the next level. The strategies formulated thus far serve as a framework for the individual divisions. Following the division, management boards define a strategy, which can be divided into a commercial and a technological range. This strategy then defines how the production network is to be used to optimally achieve the assigned objectives. In the previous section, the contextual factors and challenges facing the company were described. In summary, the automotive sector faces the following challenges:

- Changes in technologies
- Changes in the market and competitive environment
- Legal and regulatory framework
- Disruption of the production and supply chain
- Digital transformation toward (A)IoT
- Changes in the competency portfolio
- Geopolitical shifts
- Changes of mobility

Each division is confronted with the abovementioned challenges to a different extent. The challenges that are relevant to the respective divisions are also addressed in the divisional strategy. The divisional strategies are aligned annually with the business sector manager. The strategy department is responsible for submitting an

annual strategy report to the board of management.

Furthermore, the network strategy is defined in each divisional strategy. A centrally valid framework exists for this, which is filled in individually. The overarching objectives are risk minimization, access to customers, and optimal use of resources. Critical parameters for these are the balance between sales and value-added in the region, the low-/high-cost site ratio, and available space. All plants are divided into a portfolio and a role is assigned to each plant. With the help of this portfolio, the existing network can be analyzed, and improvement potentials can be identified, and action instructions can be derived for each site. Thus, company A ensures that the production network achieves the predefined objectives in an optimal manner.

6.2.3 Decision Making

In the past, there was a production manager on the management board who discussed certain long-term strategic decisions with the board and made decisions with them. These decisions included greenfield or brownfield investments as well as M&As and multi-plant strategies. Since the production manager left the board, the decision-making distribution has become “fragmented” to some extent. Basically, the decision-making power now lies in the sectors to a greater extent. There is a central function for the automotive sector that develops the guidelines, frameworks, and methods that are applied in the individual business areas. However, this area has no disciplinary management. This structure was deliberately chosen because some of the divisions have very different requirements and it is extremely difficult to bundle this complexity in one unit.

The following three tables describe the decision distributions in case company A for production network-relevant decisions in more detail. First, Table 24 focuses on corporate decisions.

Table 24: Corporate decision making in case company A.

Corporate Decision	Decision Making
C1. Vision/mission	Business sector management consulted by central strategy department
C2. Corporate strategy	Business sector management consulted by central strategy department
C3. Business strategy	Division management
C4. Network target	Business sector standard detailed by division management

As already described in the previous chapter, the topics of vision/mission and corporate strategy exist both across the group and for the individual business sectors. The group's strategy provides the overarching framework to which the vision, mission, and corporate strategy of the automotive business sector are aligned. In some cases, individual divisions have derived a separate vision or mission. The business strategy is the responsibility of the individual divisions. However, there is a central New Ventures division that helps to determine the business strategy. The business sector provides guidelines for the network strategy for all divisions. The details are specified on a division-specific basis. The areas of responsibility for structural decisions are listed in Table 25.

Table 25: Configurational decision making in case company A.

Configurational Decision	Decision Making
S1. Products manufactured at the plant	Division management
S2. Manufacturing layout	Lead factory
S3. Manufacturing technology	Lead factory, consulted by business unit
S4. Capacity levels relative demand	Business unit, consulted by division management
S5. Timing of capacity acquisition	Business unit, consulted by division management
S6. Plant focus	No decision, developed historically
S7. Plant specialization	No decision, developed historically
S8. Make-or-buy decisions	Business unit, consulted by purchasing

The decision regarding which products are produced at which sites depends on the management of the respective division. A central function for the Business sector supports in cross-divisional issues. The BUs involved can also be invited to act as consultants. The lead plant is responsible for designing the production layout and selecting the production technology. There is one lead plant per division. Decisions on capacity design are made per BU, which must ensure that the available capacity is aligned with the request. The business area consolidates capacity. Plant focus and specialization are not specified. There are sites that represent specific capabilities, but these have historically evolved from an initial product allocation. These sites now represent centers of competences. The BU is responsible for make-or-buy decisions and is supported in its decision-making by the purchasing department.

Strategic decisions and the level at which they are made are presented in Table 26:

Table 26: Coordinative decision making in company A.

Coordinative Decisions	Decision Making
I1. Organizational structure	Corporate standards
I2. Selection of quality tools	Corporate standards
I3. Employee competence development	Site management
I4. Improvement programs	Site management
I5. Longer-term planning and control principles	Division management, consolidated by business unit
I6. Shorter-term planning and control principles	Site management
I7. Data & IT infrastructure systems	Site management
I8. KPI/performance measurement system	Site management

The organizational structure and quality tools are defined centrally for each business sector as a guideline, while the site manager is ultimately responsible for implementation. A selection of central training courses is available for employee development. Some training is mandatory, but each site is responsible for identifying and initiating training needs. The automotive business sector also has a central

framework for improvement programs. Which initiatives are implemented and how depends on the respective site manager. Divisional management, in coordination with the BU, is responsible for long-term planning. Short-term planning is within the remit of the respective site. For both data & IT infrastructure systems and KPI or performance measurement systems, options exist for group-wide standards from which the site manager can choose. The group has grown to such an extent that attempts are now being made to provide only a framework within which the site manager can move freely.

6.2.4 Involvement

The voice of production is not included at the level of the group's management board. The opinions of the interviewees regarding whether this is necessary varied widely. One argument for why representation of the voice of production at the level of the group's management board is not necessary is that the production characteristics in the various sectors differ so significantly that production-relevant discussions at the highest level do not seem appropriate or effective. The counterargument in favor of a global production presence involves two aspects. First, certain elements of manufacturing are always overarching and should be decided accordingly. These include the lean philosophy and digitization efforts. In this case, it was considered critical that a consistent understanding of certain production principles is specified by the management board and practiced throughout the group. For this decision, it is vital that a representative of global production is involved in top management and can participate in the discussion. The second aspect in favor of involvement in the group's board of management is the fact that decisions concerning the global distribution of the group are almost always made at the top level. These include market presence as well as production sites or other production-relevant real estate. These decisions are often binding in the long term and influence the capabilities of the GPN to a high degree. Thus, it is also critical to have a representative of global production involved at the board level to draw the board's attention to possible negative effects on, or also the potentials of, the production network. This is the optimal approach for aligning corporate, business, and global production strategy. In the four main business sectors, the voice of production is represented differently. In the automotive sector – the focus area of this case – production is given much more attention than in the other sectors.

The interviewees justified the differences in the perception of the importance of

production using different factors. The depth of value creation was mentioned as being critical. The deeper the value added, the more important it was in the eyes of the interviewees to strengthen the voice of production in strategic decisions. Other critical factors are the complexity of the processes and the investment volume, both of which are very high in the automotive sector of the case company. The other sectors are less pronounced in relation to these three factors. In a sector that mainly comprises commodity goods, functions such as marketing, product design, and sales have a much higher priority than production. The interviewees argued that it is necessary to give more weight to these departments the closer one is to the end customer. In the automotive sector, however, one speaks of a B2B business, which makes the focus on production justified and more appropriate in their eyes. Yet, global production in the other sectors not being considered should be avoided. Depending on the sector, there are different requirements for production in terms of flexibility or speed. A well-structured and -managed production network is necessary for meeting these requirements. According to the interviewees, attention to global production in strategic decision-making is also relevant in this context.

The involvement of production in top management is implemented very well in the automotive sector. At least one representative with production responsibility is present in each area or at each level. This was viewed as an important practice for drawing sufficient attention to production. According to the interviewee, the practice meetings and corporate identity are not particularly effective for involvement. However, meetings are excellent settings for sharing experiences and best practices between site managers, divisions, and BUs.

Another possibility that was considered critical for strengthening the voice of production is to anchor it in the business or decision-making processes in the form of a consultation obligation. This can ensure that in certain processes, at a certain point in time, the voice of production must be involved, which may occur formally or informally.

6.3 Case B Analysis

Case company B was founded in Germany in 1919. Initially an expert in the broadcast industry, the company evolved over decades into a global supplier in the automotive sector. Since 2011, a Japanese group has been the sole shareholder of the case company. However, the case company remains the unit of analysis.

6.3.1 General Information

In 2021, the company generated sales of EUR 1.3 billion. Approximately 7000 employees were employed at six production sites. Since its foundation, the company has distinguished itself through its technical innovation, outstanding production capabilities, and high flexibility. Today, its development and production competencies include, in particular, human–machine interface (HMI) systems for passenger cars and commercial vehicles as well as e-mobility control units. For example, the company develops and produces air conditioning control units, center stacks, center consoles, multifunctional switches, modules with active haptic feedback for touchscreens, and control units for battery management. Leading automotive manufacturers belong to the customer base.

The company consistently relies on a high vertical range of production in its own facilities. This ensures that the same standards are applied at all sites worldwide and that product manufacturing can be conducted flexibly within the international production network. This global positioning generates synergy effects and enables the company to always manufacture flexible and close to the market. The core competence is the development of innovative solutions for customer-specific and scalable assembly and automation systems based on cost-efficient standard modules. The business model of the case company is therefore strongly project driven. The feasibility analysis of a project is conducted by the interaction of development, site, and project management. The project-oriented focus can also be observed in the organizational structure, which is depicted in Figure 16.

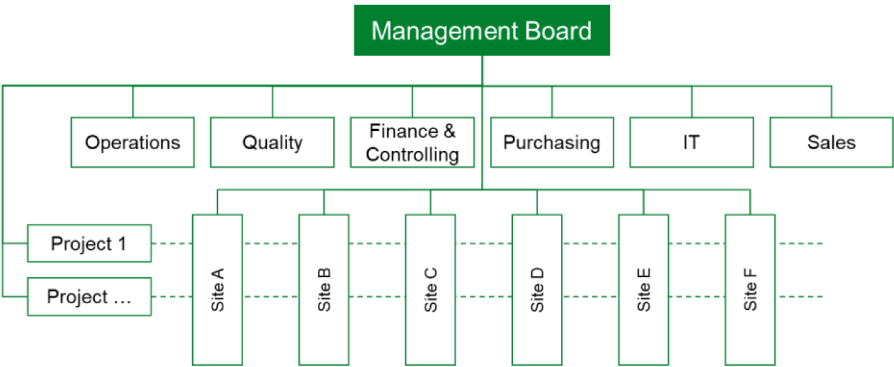


Figure 16: Schematic organizational structure of case company B (own illustration).

The eight sites are independent legal entities and the site managers report directly to the management board. Project managers have access to all sites. However, site and project managers are hierarchically on the same level and cannot overrule each other. The six central functions, namely Operations, Quality, Finance & Control, Purchasing, IT, and Sales, define global standards and consult with site and project managers. The operations manager represents the sites in certain committees. He is also responsible for optimizing the production network and continuously improving configuration and coordination. Furthermore, he has insight into all sites as well as knowledge of all manufacturing competencies and capacities.

Over the last few years, the case company has experienced rapid growth, making organizational, structural, and process changes necessary. The first step was to create a new organizational chart, as depicted in Figure 16, in an attempt to streamline structures, save costs, and create clear responsibilities. The bundling of overarching competencies in central functions has worked well. However, potential still exists for conflict between the project manager and the site manager as their responsibilities are not clearly defined. According to the interviewee, discussions are still being held on the exact allocation and distribution of areas of responsibilities.

6.3.2 Strategy

The company has a vision, mission, and values that are set by the management board and have been communicated thoroughly throughout the company. High innovative strength and the deep value chain are central components. The business areas are changing extensively and rapidly due to technological innovations and changes in consumer behavior. Innovative strength is ensured by consistently high in-house production depth – at all sites equally. Thus, cutting-edge know-how is available throughout the entire product development process, which can be exchanged with customers, experts, and between sites worldwide. In addition, the company is in a position to respond flexibly and rapidly to customer requirements in any region and in a cost-efficient manner. The company assumes that with the transformation there will also be a consolidation process among suppliers. To withstand this pressure, maximum competitiveness is required, which is to be ensured by a cost-efficient, lean organization and efficient processes. However, the implementation of the overarching strategy is still very poor. According to the interviewee, the strategy is still detached from reality. There is a lack of cascading into specific initiatives and

objectives.

Since the creation of the central Operations Department, a global network strategy has also been developed. The overarching objective is to bring the sites closer together and to promote exchange. Resources, capacities, and competencies ought not to be consolidated; instead, the focus is on globally distributed expertise and flexibility. The strategy implementation is structured in three stages, the first of which is to initiate change and lay the foundation for development. All of the capabilities and special characteristics of the individual sites were mapped with the help of a comprehensive assessment. Based on this, management tools, KPI systems, rules, and activities were defined, which apply to all sites. Furthermore, cross-site teams of experts were established to regularly exchange information on specific topics. Currently, the company is in the second implementation stage, namely stabilization. The defined standards are to be fully assimilated and digitized as well as possible or appropriate. The third and final stage is to continuously improve the standards and adapt them to changing contextual factors.

There is a 5-year plan for each site, from which the Head of Operations supports the sites in deriving annual actions and objectives. These are then approved by top management.

6.3.3 Decision Making

Table 27 presents an overview of the decision distribution in case company B regarding corporate decisions:

Table 27: Corporate decision making in case company B.

Corporate Decision	Decision-making
C1. Vision/mission	Management board
C2. Corporate strategy	Management board
C3. Business strategy	Management board, consulted by operations, sales, and project manager
C4. Network target	Operations

The vision, mission, and corporate strategy are developed and formulated by the

management board and communicated from the top down. Other areas are asked for their opinion if necessary, but they generally have little influence on the strategy. The business strategy is also generally decided by the management board, yet the analyses of operations, sales, and the project manager are critical in this context. For each business sector, the fields are discussed in terms of their opportunities, risks, and feasibility. The central function of Operations develops and defines the network strategy of case company B. The strategy is coordinated with the other central functions. Table 28 presents the configurative decisions:

Table 28: Configurational decision making in case company B.

Configurational Decision	Decision Making
S1. Products manufactured at the plant	Proposal made by sales, consulted by operations, and final decision made by management board
S2. Manufacturing layout	Site management based on project management proposal
S3. Manufacturing technology	Site management based on project management proposal
S4. Capacity levels relative demand	Operations, sales, and project management
S5. Timing of capacity acquisition	Operations, sales, and project management
S6. Plant focus	Management board
S7. Plant specialization	Management board
S8. Make-or-buy decisions	Project management and operations

Product allocation in the network is evaluated based on a customer request by the central sales department. The operations department reviews the feasibility before the decision is finally made by the management board. The manufacturing layout and technology are determined by the project manager depending on the project. The final decision is made by the site manager.

Moreover, capacities are strongly aligned with the customer project or sales plan and determined by sales and project management. Operations is consulted to compare the plan and the current development with the actual capacity available. If there are

any deviations, capacity expansions are discussed together. Currently, each site has all available capabilities and technologies, and therefore, there is no site focus or specialization. This situation has evolved historically. However, the operations manager would like to change this in the future. Make-or-buy decisions are made in cooperation between the operations manager and project manager.

Lastly, Table 29 summarizes the infrastructure decisions that are relevant for the coordination of a production network:

Table 29: Coordinative decision making in case company B.

Coordinative Decisions	Decision Making
I1. Organizational structure	Management board
I2. Selection of quality tools	Central quality function
I3. Employee competence development	Site management
I4. Improvement programs	Central operations function consulted by quality
I5. Longer-term planning and control principles	Central sales function
I6. Shorter-term planning and control principles	Site management
I7. Data & IT infrastructure systems	Management board and IT
I8. KPI/performance measurement system	Management board

The management board provides a general structure for the organization of the sites. However, slight plant-specific adjustments are possible by the site manager. The selection of the quality tools to be used is strictly defined centrally. The decision on the subject of employee competence development is structured differently, where responsibility lies with individual sites – there is no central standard. The strong growth in recent years and the large cultural differences have made the implementation of a standard difficult. However, the potential is known and one will be implemented as soon as possible. Improvement initiatives and programs are led by the central operations function. The quality function is consulted on the Six Sigma initiative. Decisions regarding long-term planning are the responsibility of the sales function. Short-term planning, on the other hand, is entirely the responsibility of the

sites. The last two decisions are made centrally by the management board. With regard to data and IT infrastructure, central IT is also involved.

Decision making is defined in case company B; however, decision makers often have no direct disciplinary control. This organizational gap gives sites leeway to override decisions. For example, the project manager has the responsibility to sell projects but cannot make any decisions that affect the equipment of individual sites.

6.3.4 Involvement

The voice of production is well involved apart from decisions made by the management board. The central operations area often represents the individual sites in discussions with sales and project managers. Although no direct disciplinary link exists between operations and sites, according to the interviewee, the decisions made centrally are implemented in the sites well. The Operations Manager has a good reputation, and his role is very well accepted. The company achieved this level of involvement by adapting the organizational structure and thus creating the central departments.

Nevertheless, it was considered critical that the voice of production is reinforced by a COO in the management board. With increasing growth and complexity, it will become increasingly crucial to involve production more in the top strategic issues as well as to have direct disciplinary responsibility of a production manager at the sites. The second point is especially critical when it comes to flexibility and speed.

Although the current CEO has much production experience and is accordingly able to empathize well with production-related issues, it is essential from the interviewee's point of view that a role exists in the form of a COO "who raises awareness of global production issues in board management" (translated from the interview with case company B).

Furthermore, top management at company B is characterized by high fluctuation. The CEO has changed frequently in the past and further changes are pending. According to the interviewee, this is difficult because the changes often overload the attention of the management board; nevertheless, the changes offer an opportunity to better anchor the voice of production in the board in the near future.

Meetings are also used as practice for production involvement. Every 2 weeks, a meeting is held with the project managers, sales, management board, and operations. Operations represents the sites in this meeting, in which all new projects are

discussed and the management board are given the opportunity to obtain the opinions of the different departments before making a decision (decision category S1).

The fourth possibility for strengthening the voice of production in a company, which was elaborated in Chapter 5, does not apply today according to the interviewee. In the past, when the company was smaller, there was a very strong production focus in the corporate identity, but this was lost with increasing internationalization and growth. This factor was also not considered particularly relevant. The interviewee considered the practices of “involvement in top management” and “organizational structure” to be the most effective.

6.4 Case C Analysis

Founded in 1932, case company C is a listed technology and engineering company focused on hydraulic crane and lifting solutions. Based in Austria, the company is considered a world leader in its field with the most innovative, reliable, and economical lifting solutions. The case study considered the entire company.

6.4.1 General Information

As a multinational company headquartered in Austria, the company has 34 manufacturing and assembly sites in Europe, in CIS, in North and South America, as well as in Asia. The worldwide presence enables optimal pre- and after-sales service, tailored to the needs of each market. More than 95% of the products are exported to more than 130 countries worldwide. With its 11,000 employees, the company could achieve sales of just over EUR 1.8 billion in 2021. The company recognized early on that sustainable growth is only possible through diversification, on the one hand by entering new markets and on the other hand by expanding its market offering and serving different market segments. To achieve these benefits quickly, extensive M&A activities were part of the company’s strategy. With more than 20 acquisitions and joint ventures, it expanded into markets such as CIS, but also entered new areas with new products. The company was organized into independent BUs in all world regions. The BUs were responsible for the entire business model, from defining the market offering, engineering, and production to sales, service, and after-sales. The headquarters acted as the financial holding company but also assumed central functions with directive authority for the regions and BUs. This strategy proved successful. With the structure in place, it became clear

that further growth required a change in the way the company was managed and controlled. The largest organizational transformation to date was initiated at the end of 2018. The change from stand-alone BUs to a global functional organization was one of the key elements, in addition to the refinement of management principles throughout the company. Since January 1, 2019, the company has been managed by global functions (e.g., Sales & Service, Operations, and Procurement) across all regions and countries. The entire product portfolio has been divided into global product lines responsible for market offerings and engineering in all world markets. Figure 17 presents a schematic representation of the organization’s structure, which has been in place since 2019.

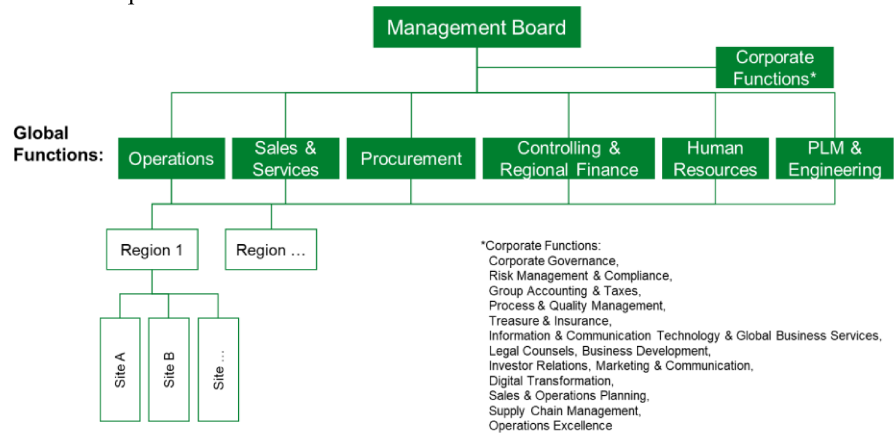


Figure 17: Schematic organizational structure of case company C (own illustration).

This organizational chart enables centralized functional management within the group. Management is conducted through global and corporate functions, which are headed by the executive board. The global functions comprise Sales & Service, Operations, Procurement, Control & Regional Finance, Human Resources, and Product Line Management & Engineering. They lead directly with disciplinary responsibility down to the regions and local units. The corporate functions comprise Corporate Governance, Risk Management & Compliance, Group Accounting & Taxes, Process & Quality Management, Treasure & Insurance, Information & Communication Technology & Global Business Services, Legal Counsels, Business Development, Investor Relations, Marketing & Communication, Digital Transformation, Sales & Operations Planning (S&OP), and Supply Chain

Management. These functions operate as centers of excellence and thus provide group-wide governance and functional leadership down to the local units. The global and corporate functions create and develop strategies, processes, tools, and group policies. These measures ensure consistent global standards. Moreover, the global value creation structure is used across products and regions.

6.4.2 Strategy

Global megatrends are constantly creating new challenges. Sustainability, social change, and digitalization are especially relevant in this context. The current vision and strategy provide a well-founded response to the aforementioned challenges as well as to those of the future. Since the beginning of its existence, the company has proactively and successfully used changing market conditions to expand its position as an innovative technology leader. Based on a vision, two strategic pillars or focal points have been derived. The company is aligned with sustainable profitable growth and its position as a leading global manufacturer and innovative solution provider is to be strengthened. This will also lead to cross-product sales and earnings growth in all customer segments and regions. The issue of sustainability is also anchored in the strategy, with the aim of giving significant consideration to environmental, social, and governance issues in addition to economic aspects in all business processes. Sustainability is not seen as a challenge or a risk, but rather as an opportunity and a value driver through responsible, sustainable management, enabling new business areas, growth, and additional differentiation. In addition to financial targets, which are limited to the earnings before interest and tax (EBIT) margin and return on capital employed ROCE, the strategy also includes nonfinancial targets that are separated according to environmental, social, and governance criteria. These targets include energy consumption, emissions, staff turnover, diversity, employee development, and anticorruption. Innovation and the further internationalization of products, processes, and services, along with greater flexibility, are the lived strategic pillars of the corporate strategy. To enable prioritization of the challenges and opportunities of digital transformation, a third pillar has been added to this proven strategy, which stands for new core competencies, new approaches, and new products, services, and business models in the digital age.

In the overarching strategy, capacity expansions and new investment in production activities are defined. Investments are also made to leverage global production synergies (i.e., plant utilization and flexibility). The network strategy has clear

objectives for configuration and coordination.

A main driver of the network configuration is access to cost-efficient production factors, but the importance of automation is increasing to create independence from labor constraints. Volume mobility between sites is critical for avoiding capacity constraints and investment decisions due to site bottlenecks. Product mobility occurs on a limited basis and the bundling of identical products at one site in the global network is not envisioned. Rather, the approach is to bundle similar products at one site that can be manufactured on the same machinery.

Furthermore, the characteristics of network coordination are derived from the general functional organization. The production network is managed top-down from a global level (i.e., the global functions) through the regional level down to the plant level. This is consistent across global product lines as well as across regions. Global competence centers for the key value-adding steps – component manufacturing, component painting, product assembly, and product installation – together with leadership functions in specific sites drive the performance of the manufacturing and industrial engineering processes and actively contribute to the introduction of new products.

6.4.3 Decision Making

Table 30–Table 32 illustrate the organizational level at which each production network-relevant decision is made. Decisions concerning the overarching strategy and network goals are presented in Table 30.

Table 30: Corporate decision making in case company C.

Corporate Decision	Decision Making
C1. Vision/mission	Management board, global function, corporate function
C2. Corporate strategy	Management board, global function, corporate function
C3. Business strategy	Management board consulted by the product line manager
C4. Network target	Operations, Procurement, and Supply Chain Management consulted by regional managers

The vision, mission, and corporate strategy are formulated and developed by the management board together with the global and corporate functions. The business strategy is defined for each product line, for which the individual product line managers are responsible, and the strategy must be approved by the management board. The business strategy is heavily dependent on the first two decisions. The global functions of Operations and Procurement and the corporate function of Supply Chain Management define the network targets collectively. They are supported by regional operations managers who provide bottom-up insight, such as regional market or site knowledge. The network strategy depends on all other corporate decisions. A production representative is involved in all corporate decisions – on the management board by the COO, by the global function of Operations, or by the corporate function of Operations Excellence.

Table 31 summarizes the structural decisions made in the network. Product allocations are decided by Operations and Supply Chain Management. The regional representatives support the decision as they can provide comprehensive information about current capacity utilization and possible relocations. However, determining which products are produced where also depends on the business and network strategy. The same framework also determines make-or-buy decisions.

The final manufacturing layout is decided by the site manager. However, there are templates and proposals from the corporate function of Operations Excellence. A similar decision-making process also applies to manufacturing technology. In this case, the final approval comes from Global Operations. Capacity decisions within the next 2 years are triggered by S&OP, while strategic capacity expansions are triggered by initiatives. The input comes from regional managers, Business Development, and S&OP. The final decision is made by the management board as well as global and corporate functions. Site focus and specializations are defined by global Operations and regional managers. These are aligned with the overarching network goals and business strategy.

Table 31: Configurational decision making in case company C.

Configurational Decision	Decision Making
S1. Products manufactured at the plant	Global Operations and Supply Chain Management consulted by regional management
S2. Manufacturing layout	Site management consulted by Operations Excellence
S3. Manufacturing technology	Site management consulted by Operations Excellence with final approval by global Operations
S4. Capacity levels relative demand	Inputs from regional managers, Business Development, Sales & Operations Planning (S&OP), with final approval by the management board and global and corporate functions
S5. Timing of capacity acquisition	Inputs from regional managers, Business Development, S&OP, with final approval by the management board and global and corporate functions
S6. Plant focus	Global and regional Operations
S7. Plant specialization	Global and regional Operations
S8. Make-or-buy decisions	Global Operations and Supply Chain Management consulted by regional management

The decision on the organizational structure (the first coordinative decision from Table 32) is determined by the specifications of the management board and global and corporate functions. However, the implementation of these specifications is not consistent throughout the network.

Table 32: Coordinative decision making in case company C.

Coordinative Decisions	Decision Making
I1. Organizational structure	Management board, global function, corporate function
I2. Selection of quality tools	Process & Quality Management
I3. Employee competence development	Site management, specific training by global and corporate functions
I4. Improvement programs	Operations Excellence
I5. Longer-term planning and control principles	S&OP
I6. Shorter-term planning and control principles	Site Management
I7. Data & IT infrastructure systems	Process & Quality Management, Information & Communication Technology & Global Business Services
I8. KPI/performance measurement system	Management board, global function, corporate function

Moreover, process and quality management are mapped by the corporate function. Quality assurance, on the other hand, is ensured by Operations. The site managers are mainly responsible for how they train their employees. There are certain trainings for each corporate and global function, the aim of which is to be applied company-wide. Business process improvements are assigned to Operations Excellence. These also provide global objectives that must be implemented on the store floor by the individual sites. There is S&OP, for which the corporate function of the same name is responsible, which looks 2 financial years into the future. The plan is cascaded down to the regional and plant levels. Each site is responsible for its own short-term planning. The corporate functions of Process & Quality Management and Information & Communication Technology & Global Business Services decide on the company-wide data and IT infrastructure systems.

Targets are cascaded down from the very top. The standard has been defined globally and there is an identical KPI set for each site. These have been defined by the management board and global and corporate functions.

6.4.4 Involvement

Strategic decisions in the company are all based on overarching objectives. Generally, the network strategy paired with the business strategy serves as orientation, which in turn are dependent on the corporate strategy or the vision and mission. From Table 30–Table 32, it appears that every decision relevant to the production network is made by a representative of production. This procedure ensures not only that the overarching strategy is optimally cascaded over each level but also that the network interests are sufficiently represented in the decision-making process.

Misalignments or disagreements often occur at the interface between operations and product line managers. Product Line Management offers the customer solutions that often push the limits of production capabilities or, in the worst case, exceed them. On the other hand, it was precisely this pressure that was considered critical by the interviewee, because the greatest danger when production receives too much power is “that the product portfolio narrows down too much. You only produce what you can. The external input from product managers is very important in order to constantly progress and to be able to offer innovative solutions!” (translated from the interview with case company C).

If the conflict between the areas becomes too great, it can be escalated to the COO, to whom the functions of Operations, Procurement, Product Line Management, and Supply Chain Management are attached. The interface between Supply Chain Management, Procurement, and Operations is also considered crucial, as their interaction is critical for stable production and the identification of relocation potential.

Moreover, regular meetings are held at both the regional and global levels. These are mainly used to exchange information, point out capacity bottlenecks, and identify market potential.

The interviewee believed that most employees view the company as a production company. The role of production is thus anchored in the corporate identity. On the other hand, however, the company attempts to present itself to customers not as a production company but as a provider of technology and solutions.

In summary, all four methods of involvement are applied in case company C. However, the interviewee admitted that the levers of “involvement in top management” and “organizational structure” are the most critical and can achieve

the greatest effects.

In his opinion, it depends solely on the composition of the executive board, which determines how the role of production can be anchored organizationally. In the case of company C, the board is very well balanced and production is given sufficient attention. This is also reflected in the organizational structure.

6.5 Case D Analysis

Founded in 1871, the company provides safe, efficient, intelligent, and affordable solutions for vehicles, machinery, traffic, and transportation. The company generated sales of EUR 33.8 billion in 2021 and currently employs approximately 190,000 people at 530 sites in almost 60 countries and markets. The group comprises three business sectors. Research and development is conducted at more than 80 sites, which are mainly located close to customers so that they can respond flexibly to different requirements and regional market conditions. The production and sales of two sectors are organized on a regional basis. Economies of scale in production are crucial for the third business sector. Low production costs combined with high volumes and proximity to customers or high regional growth are key success factors. The automotive industry accounts for almost two-thirds of group sales and is therefore one of the most crucial customer groups for the company. A third of sales in 2021 were generated with the five largest OEM customers.

This case study focused on the automotive business sector. This sector comprises five powerful, flexible BUs that will be systematically aligned to automotive strategic areas of activity and market developments in the future.

6.5.1 General Information

The business areas of the automotive business sector include technologies for passive safety, braking, chassis, and motion and movement control systems. Innovative solutions for assisted and automated driving, display and control technologies, and audio or camera solutions for the passenger compartment are also part of the portfolio, as are intelligent information and communications technology for mobility services for fleet operators and commercial vehicle manufacturers. Comprehensive activities related to networking technologies and vehicle electronics through to high-performance computers round off the portfolio of the five business areas. These areas are responsible for the successful implementation of the strategy

and have the necessary decision-making authority and flexibility to respond quickly to market changes. They are supported by a decentralized strategy department. Overall, the business sector contributes 45% of the group’s sales.

The automotive sector’s environment is characterized by rising raw material costs, supply shortages, and delivery problems. However, the value share of electronics in automotive components is also growing due to electrification, assisted driving, and increasing connectivity. Overall, the order situation is burdened by a high level of uncertainty due to the ongoing global COVID-19 pandemic and supply issues for semiconductors. This year, the entire organizational structure and all management processes were realigned to enable strategic goals to be achieved. Product requirements, market trends, customer groups, and distribution channels form the basis for allocation to a business sector or business area with overall business responsibility, including profit responsibility. Overall management responsibility is assigned to the management board of the company. The business sectors are represented in the board of management. The Chairman of the executive board is also responsible for the automotive sector. The organizational chart of the automotive sector is schematically illustrated in Figure 18:

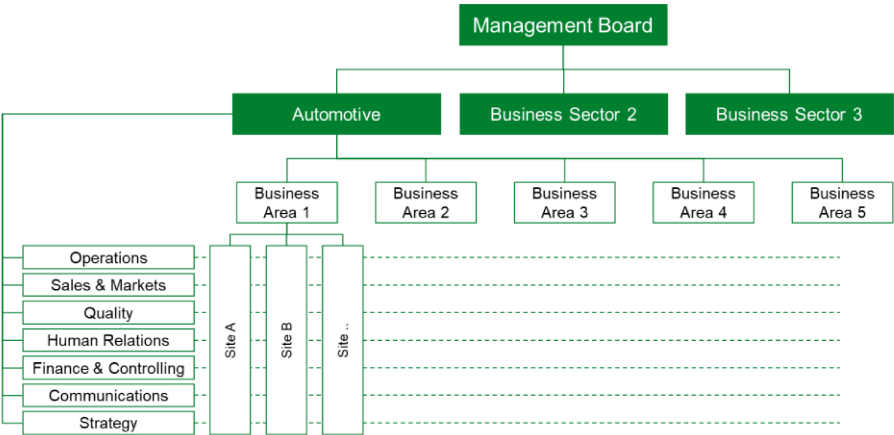


Figure 18: Schematic organizational structure of case company D (own illustration).

Each business area has a head of operations who is responsible for managing the sites. Thus, in the automotive area, there are five heads of operations who are

responsible for production networks with 3–27 sites. They report to the respective head of business area.

In the automotive business sector, there are seven central functions, which have service and governance tasks. They provide cross-business area consultation and define standards. Some central functions are represented by the chairman of the executive board, the Chief Financial Officer, and the Chief Human Resources Officer, who perform cross-business area functions for the management of the group, including Finance, Control, Compliance, Law, IT, Human Relations, Sustainability, Quality, and Environment.

The person responsible for the central operations function has the position of head of automotive operations. He has indirect authority to give instructions to the five heads of operations as well as the plant managers.

6.5.2 Strategy

Changes in the automotive industry are opening numerous opportunities. To seizing these opportunities, the company adopted a realigned strategy in 2020, which is based on three pillars. The aim is to emerge as a winner in this period of fundamental transformation. One pillar involves strengthening operational performance through more transparent and efficient processes, adapted product designs, and sustainable changes in the purchasing structure. The second pillar is the differentiation of the portfolio. The decisive factors for the design of the product portfolio are growth and earnings. Additional competencies are built up in-house or through targeted partnerships. The third and final pillar of the overall strategy is the effective and efficient exploitation of market opportunities. The restructuring of business areas has created greater transparency, autonomy, and flexibility, thus enabling the company to respond quickly in an increasingly complex market environment. The overarching strategy also includes a vision, mission, and values, which serve as guiding principles for the business sectors and their business areas. The automotive business sector has an overarching corporate strategy, based on which each business area and central function defines a vision and mission statement with a detailed strategy. The central strategy department is used to support the formulation such that the substrategies ultimately fit together. For example, the theme of “global collaboration,” which is also defined as a group value, was found in the statements

from each area.

However, the exchange of the respective strategies is partly limited to the statements of the areas, depending on the seniority of the person. Although there have not yet been any alignment conflicts, from the point of view of one interviewee, the exchange and communication should be improved at this point. All managers in the group should have insight into all strategies.

The process that guides the central operations strategy consists of five steps. First, relevant internal and external factors are identified and considered. These include the requirements of the individual business areas as well as those of other functions. Second, with the help of a SWOT analysis, a vision is created. Third, this vision is then detailed and its implementation defined in the form of projects, standards, and tools. Fourth, a cross-business area process is performed for how the strategic initiatives are to be implemented. Fifth and finally, the operations departments of all business areas in the automotive sector pursue the same objectives.

6.5.3 Decision Categories

Table 33 provides an overview of the corporate decisions made in case company D:

Table 33: Corporate decision making in case company D.

Corporate Decision	Decision Making
C1. Vision/mission	Automotive board
C2. Corporate strategy	Automotive board, consulted by central functions and business area management
C3. Business strategy	Business area management consulted by central functions and aligned with the automotive board
C4. Network target	Central function of Operations

The business sector has a corporate strategy and vision and/or mission, which is developed and defined by the business sector management board. Some central units have also formulated their own mission statement, such as central production. This is coordinated with the management board. A separate business strategy is defined for each business area, which is managed by purchasing, sales, and the strategy department. Each business strategy is aligned with the business sector management

board. The central Operations function is responsible for the overarching network strategy, ensuring the holistic optimum of the network. For the individual business areas, however, there are specific subnetwork footprint strategies and more decision-making power for configurational decisions, as indicated in Table 34.

Table 34: Configurational decision making in case company D.

Configurational Decision	Decision Making
S1. Products manufactured at the plant	Business area operations consulted by the central function
S2. Manufacturing layout	Site management
S3. Manufacturing technology	Business area operations
S4. Capacity levels relative demand	Business area management
S5. Timing of capacity acquisition	Business area management
S6. Plant focus	Business area management
S7. Plant specialization	Business area management
S8. Make-or-buy decisions	Business area management

Product allocation decisions are primarily made by the business area operations manager. In critical cases, the central Footprint Planning Department is consulted. The responsibility for the production layout remains with the site management, although it is obliged to adhere to certain specifications and to obtain best practice suggestions. The manufacturing technology used is determined to a large extent by the respective plant strategy. The final decision is made by the business area operations manager, who coordinates with the central operations area and R&D. The capacity decisions are mainly made by the business area operations manager; however, depending on the scope and investment requirements, other areas may have to be involved. Large capacity expansions, such as greenfield investments or M&As, are discussed by the business sector management board and the central Operations function, especially the Footprint Planning Department. The plants' focus and specialization are decided in the business area, and hence, in the subnetwork. The central Operations function and the sites have an advisory role in the decision-making process. The specialization of the sites is in turn strongly determined by the projects that are allocated there. Make-or-buy decisions are also made by the

business area management in consultation with the central purchasing, quality, logistics, and operations functions.

Table 35 presents a list of coordinative decisions and the corresponding responsible role in Company D:

Table 35: Coordinative decision making in case company D.

Coordinative Decisions	Decision Making
I1. Organizational structure	Business area management
I2. Selection of quality tools	Central function of Quality and Site Management
I3. Employee competence development	Central function of Human Resources
I4. Improvement programs	Business area operations
I5. Longer-term planning and control principles	Business area sales consulted by the central function of Sales & Markets
I6. Shorter-term planning and control principles	Site management
I7. Data & IT infrastructure systems	Central function
I8. KPI/performance measurement system	Central function

Moreover, central guidelines exist for the organizational structure in case company D. The execution of these guidelines is the responsibility of the sites. However, the business area management is ultimately responsible for ensuring that certain standards are adhered to. The quality tools that are used can be decided by each engineer at the plant level. Several standard tools are provided by the central function of Quality, from which the engineers can select. However, certain tools are the same for all sites, since in the automotive area some general standards and certifications must be ensured. The development of employees is primarily controlled by HR. There are, however, different development paths, which in turn include different training and development stages, although these were described as highly transparent. Improvement programs are overseen by the operations manager of the respective business area, who demands a roadmap of improvement measures per

site. However, it is up to the plant manager to decide exactly which improvement measures are defined in this roadmap.

Once a year, the central function of Sales & Markets meets with the sales managers of the individual business areas to jointly prepare a long-term plan. Short-term planning, on the other hand, is the responsibility of the individual sites.

For the last two coordinative decisions, a central function sets a standard that must be implemented. In some cases, IT & data solutions are developed independently in the business areas. However, this was considered to be critical by the interviewees. The KPIs applied are derived from the overall targets.

6.5.4 Involvement

No person with production responsibility holds a seat on the executive board. According to the interviewees, it is not necessary to represent the voice of production here either, as no decisions relevant to the production network are made. On the contrary, it is even considered a great advantage. The highly different production methods require a certain degree of flexibility. The risk of dyssynergy due to overlapping issues of the individual subnetworks is negligible. From the next hierarchical level onwards, that is, from the business sector automotive management board downwards, a person responsible for production is always involved in the decision-making process. The production manager also has authority over various operations managers, from the automotive management board to the business area management boards and into the sites. Case company D also strives to involve production at an early stage in organizational and product development projects. The interviewees viewed the involvement of top management and the organizational structure as key levers for increasing attention to global production issues in strategic decisions. The management board defines the circle of discussion partners and decision-makers. It is essential to have a production representative on the management board, whose responsibility must be part of the job description. Considering the organizational structure, it is critical to ensure that production is always a separate function with the corresponding authority to issue directives.

In terms of the corporate identity of the company, production is part of the business model. The voice of production could be further emphasized at this level by shedding more light on production capabilities.

According to the interviewee, an additional lever for involving production deeper in

strategic decision-making is the production experience. Through minimum production experience or through job rotation, top managers’ understanding of global production issues could be improved and thus considered more in strategic discussions.

6.6 Cross-Case Analysis

In the cross-case analysis, the aim was to analyze patterns comprehensively. In the following sections, there is a focus on the code groups of Decision Making and Involvement. In particular, the similarities and differences that exist between the cases are analyzed along with which contextual factors are important.

6.6.1 Decision Making

Before the companies were asked about the distribution of global, production-relevant, strategic decision-making, the organizational structure of the respective companies was examined in more detail. A schematic overview of the organizational charts was presented in Figure 15, Figure 16, Figure 17, and Figure 18. The companies were found to exhibit similar structures in some cases. In most cases, a cascading structure based on business units or regions was found. Overarching central functions ensure consistent scope and synergies. Following the reporting line, the organizational charts from site management to the executive board could be divided into four or five hierarchical levels. A comparison is presented in Table 36:

Table 36: Comparison of the hierarchical levels in the case companies.

Level	Case A	Case B	Case C	Case D
1	Site	Site	Site	Site
2	Business units	Project	Region	Business area
3	Business area	Central function	Central function	Central function
4	Business sector	Executive board	Executive board	Business sector
5	Executive board			Executive board

In most of the companies, the hierarchical levels are linked by a direct disciplinary authority. Only in company B do the central functions or project managers have only informal, indirect authority to issue directives.

In the discussion of the decision distribution of companies A and D (see Sections 6.2.3 and 6.5.3), it was found that the executive boards do not make any strategic decisions relevant to the production networks. For these two companies, the fourth organizational level is that of the business sectors, which are comparable to the executive boards of the other two case companies (B and C). Thus, the fifth level of companies A and D is not included in the following comparison. Figure 19 presents a summary of the distribution of the global production-relevant strategic decisions in all four case companies:

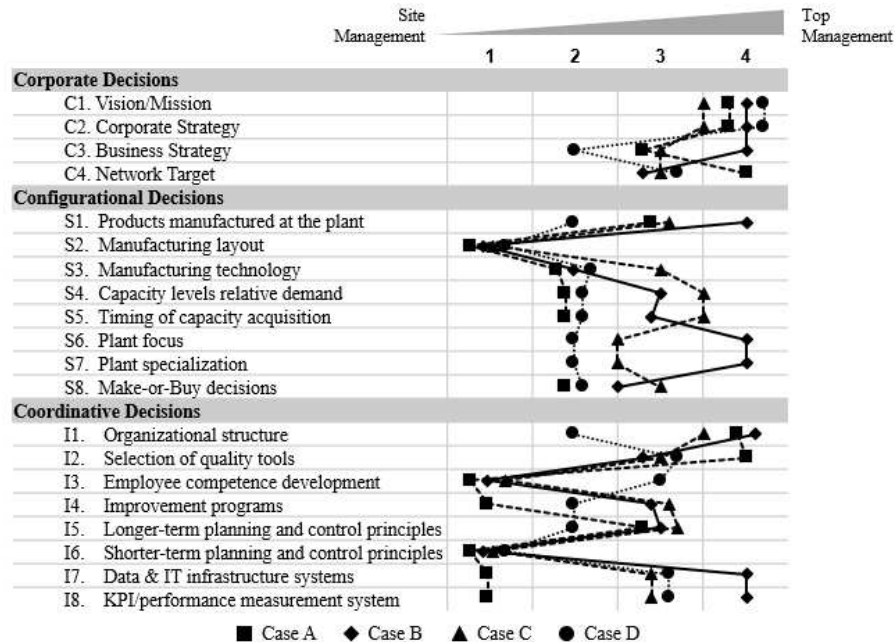


Figure 19: Distribution of production-relevant strategic decisions of the four case companies (A–D).

The corporate decision categories were found to be very similar across the four companies. The largest difference was in the business strategy, which is decided by the BU in company D and by the executive board in company B. The reason for this

difference is probably the product portfolio and the market segments served.

In the next category, configurative decisions, the differences in decision distribution were found to be more significant. For product allocation, the picture was similar to that for business strategy, with decentralized deviation by company D and centralized deviation by company B. For manufacturing layout, all companies were positioned the same. For decision categories S3–S8, a similar pattern was recognizable. Companies A and D delegate decision making for these categories to the business areas and BUs, respectively, whereas company C primarily assigns responsibility to central functional areas in coordination with the executive board or regions. The reasoning for the distribution is the same in the three cases: Network-relevant decisions are made across networks, but subnetwork-relevant decisions are made within subnetworks. The more different BUs or business areas there are, the more decentralized a decision must be. However, it is ensured that a holistic optimum exists and that no dyssynergies arise between the networks.

Company B has also attached decision making to the central operations function, apart from plant specialization and focus, which has been determined by the executive board. Here, the operations manager desires a greater voice.

The largest differences were found in the coordinative decision categories. For the categories of organizational structure, selection of quality tools, employee competence development, improvement programs, data & IT infrastructure systems, and KPI/performance measurement systems, companies A and D have central standards, with different decision-making power at the site or BU/area level within these standards. Company C uses the central functions responsible for these decisions. In company B, the data & IT and KPI systems are also specified by the executive board. A cross-company decision-making pattern was also observed in planning (categories I5 and I6). Long-term planning is usually decided centrally in coordination with sales. Individual short-term planning, however, is the responsibility of the individual sites in all companies.

The greatest challenge in the decision distribution of the coordinative categories is setting standards aimed at standardizing processes and making them comparable while allowing sufficient flexibility for adjustment to be able to meet the respective special requirements of the individual BUs. At company B in particular, due to the extreme growth in the last few years, there was still no possibility of discussing and defining how the decision distribution should be designed to optimally align

production-relevant strategic decisions with the business and corporate strategy. Companies A, C, and D were able to argue for the distribution of decisions per category almost consistently in terms of detail. This was seen as a critical factor in strengthening the voice of production in a company; that is, which decision should be made by which department at which hierarchical level and the reason why must be transparent and clearly justified in the company.

6.6.2 Involvement in Top Management

The first practice from among the opportunities to strengthen the voice of production in strategic decision-making elaborated in Chapter 5, subsequently subjected to cross-case analysis, was “involvement in top management.” The explanations of the different organizational structures demonstrated that management boards or leadership roles of functional areas are located at different hierarchical levels. The aim of the case study analysis was to determine at which levels the voice of production is considered or represented by the presence of a production manager. Table 37 summarizes the hierarchical levels at which the voice of production is represented.

In general, the voice of production is very strongly represented in the various management committees in all companies.

Table 37: Comparison of the participation of production managers in the management levels of the case companies.

Level	Case A	Case B	Case C	Case D
1	Involved	Involved	Involved	Involved
2	Involved	Involved	Involved	Involved
3	Involved	Involved	Involved	Involved
4	Involved	Not involved	Involved	Involved
5	Not involved		Not involved	

In companies A and D, the voice of production is present through a representative in charge of production or from the production area at every level, with the exception of the executive board. Both companies agreed that in their case it is not necessary

to additionally involve a production representative on the board because no global decisions relevant to production are made at the highest management level. According to the interviewees, it would also not be possible, since the production characteristics and underlying circumstances differ so greatly from the next hierarchical level downwards that no overarching decisions can be made. Nevertheless, according to one interviewee, the involvement of a production representative on the board of management is important to be able to sufficiently discuss long-term, strategic, group-wide production-related issues such as digitalization initiatives, lean principles, or relocations or closures of sites.

By contrast, in companies B and C, the smaller companies, the executive board is highly involved in global production-related decisions. In the case of company C, someone in the role of COO represents the voice of production on the board effectively. In addition, many strategically relevant decisions in the company are made jointly with the executive board and the global or corporate functions. Production is also very strongly represented in this group of participants. Company B was the only one that stood out with its lack of involvement at the fourth hierarchical level, which in this company's case is the executive board. This is exacerbated by the fact that most corporate and many configurational or coordinative decisions that have an impact on global production are made at this level. The interviewee considered this to be the cause of current misalignments as well as the failure to exploit the full potential of the network. While it is beneficial that the current CEO has production experience and can thus better empathize with production-relevant issues, a need still exists for a COO who can represent production-relevant issues and actively solicit attention for specific peculiarities.

For all case companies, the involvement of production in top management is a crucial lever for strengthening the voice of production in the company and ensuring the alignment of strategies across all vertical levels. The management board often determines the group of participants in which the assigned decisions are discussed and determined. Therefore, placing a production representative on each board where a strategic discussion takes place that could have an impact on global production is crucial. A balanced group of participants from all stakeholders involved should be present on the board. A company is seen as a sensitive ecosystem in which all those who influence each other should be able to discuss with each other. One interviewee offered the following reason for this:

“The way the top management presents itself is the way it is perceived in the company.” (translated from interview A3).

Thus, the main areas of the company should be represented equally on the executive board as far as possible.

6.6.3 Organizational Structure

In addition, the organizational structure was also considered consistently by all case companies to be the second key lever for strengthening the voice of production. The person responsible for production must be able to implement strategic decisions relevant to production within the company. This must be clearly defined in the organizational chart, which it is in case companies A, C, and D. A unanimous opinion existed that the voice of production is strongly anchored in the organizational structure. An interview from company C highlighted that in its case the structure is strongly determined by the board. If the importance of production is already recognized by the board, then attention will be paid to ensuring that this condition is also secured at further levels. Company D has attempted to design the organization chart in such a manner that consolidation occurs wherever it makes sense: a business area production manager is responsible for a subnetwork, which then converges in a central operations function and is represented by the overarching head of operations on the management board of the business sector. Once there are threats of dyssynergy, the decision is escalated to the next level.

Notably different from the abovementioned three case companies is the organizational structure at company B, where the six production plants report directly to the executive board. There has already been an attempt to optimize the organizational structure by combining certain functions centrally. However, these functions have no direct disciplinary power. Frequent conflicts occur because different roles want to access resources to achieve their individual objectives, but they cannot overrule each other and thus often have to escalate to the executive board. In the case of the network manager, the interviewee from case company B, it is a challenging situation, but he has managed to build a good reputation within the company. A critical success factor in such a structure is personality. According to the interviewee, it is essential for a network manager to be able to interact well with people and different roles. If the informal channels are used and maintained well, the

importance of the formal channels will recede into the background. The informal channels are also extremely well suited to distributing existing knowledge in the network and identifying potentials.

6.6.4 Meetings

The participants in the meetings in which strategic decisions are made are predefined by the organizational structure and management boards in the case companies. The extent to which the voice of production is represented in these meetings therefore depends on the abovementioned practices of “involvement in top management” and “organizational structure.” The surveyed companies are unanimous on this point – it is not a suitable method for strengthening the voice of production. Meetings are much more a way to exchange and align interests (companies B and C). However, this occurs mainly between organizational functions on their own levels, such as between site managers and between subnetwork managers (company A). Case company D also recognizes meetings as an opportunity to highlight potential dyssynergies.

Consequently, meetings are critical for ensuring alignment, sharing knowledge, and identifying potentials. However, meetings do not seem to be a suitable method for strengthening the voice of production in strategic decisions for the analyzed companies.

6.6.5 Corporate Identity

The corporate identity depends strongly on the business model as well as on how the company wants to be perceived on the market (company D). Case company C still has a kind of production identity, although it attempts to be perceived as a technology and solution provider. Case company B mentioned that the identity of a production company used to be highly pronounced when it was smaller but this has diminished with rapid growth. The case companies consistently agreed that in their case, corporate identity plays a lesser role in strengthening the voice of manufacturing in strategic decision-making. They also highlighted the difficulty of fully anchoring, among other things, visions, missions, and values among employees.

6.6.6 Further Practices

Case company A highlighted another possibility for involvement. For strategic decisions, the process can be designed in such a manner that the voice of production must be obtained in the form of a consultation requirement.

For case company D, production experience plays a crucial role. If management personnel gain a certain amount of experience in production, such as through job rotations, these individuals will better understand production-related issues and interrelationships and thus consider them more when making strategic decisions. In case company B, this is indeed conducive to improving the understanding of production, but there needs to be a production representative on the management board who actively represents the interests of global production.

6.7 Implications

The goal of the case studies was to determine what practices can be applied to improve the voice of production in strategic decision-making. A special focus was also placed on investigating the context and operationalization of the practices.

To strengthen the voice of production, it is critical to be present at the discussions on the one hand. It transpired that participants in the discussions are often defined by the composition of the management boards. It is important to note that those management boards that discuss production-related decisions also include representatives of production. However, it is not only important to be present at the decisions but also to be able to implement them in the company. Therefore, the organizational structure is essential for ensuring that strategic decisions are deployed and that production-relevant interests are represented all the way to the site.

However, the case studies also clearly demonstrated that it is not necessary to represent the voice of production equally in every area. Factors such as the business model, value-added depth, product complexity, company size, and growth phase influence the importance of different areas.

Over the course of the case studies, the evaluation of the benchmarking study was confirmed, according to which the greatest influences come from top management or sales. In the case of company C, however, the influence of the sales department was seen as critical for continuously developing in line with the challenging customer requirements and being seen as an innovative technology and solution provider. The influence of top management can be put into perspective if a

representative of production is represented who is also able to bring production-relevant topics onto the strategic agenda.

In summary, the case study analysis offered an explanation for the conditions under which it is vital to strengthen the voice of production as well as which practices are particularly suitable for this purpose.

In the following chapter, the findings from the present chapter are combined with the findings from the previous chapters and compared to derive general recommendations.

7 Discussion and Conclusion

This final chapter concludes the thesis. Thus, the most important research results and contributions are summarized. Section 7.1 provides a critical reflection on the findings in relation to the initial underlying research questions (presented in Section 1.3). Then, Section 7.2 presents a discussion of the major contributions to science and practice. Finally, Section 7.3 highlights the limitations of this thesis and offers suggestions and ideas for future research.

7.1 Findings

The increasing complexity of globalized production networks makes them vulnerable to disruptions, such as the recent COVID-19 pandemic, which stresses the need for network coordination and configuration that is consistent with the network strategy as well as the overarching business strategy and corporate strategy. The corporate strategy and/or the business strategy determines the network strategy, which in turn achieves network performance through configurational and coordinative decisions. Some top management decisions, however, directly affect the network configuration or coordination. These decisions can also counteract the actual network strategy and cause a misalignment and consequently poor network performance. It is crucial to understand how global production can and must be integrated into strategic decisions to prevent any strategic misalignment. The research at hand aims to ensure that global production finds a sufficient voice in corporate strategy and business strategy as well as in strategic decision-making. Thus, the MRQ of this thesis was formulated as follows:

MRQ: How can global operations be given a voice in strategic decisions?

In the introduction chapter, having explained the practical and theoretical relevance of the topic, it became evident that the involvement of global production in strategic decision making could be essential for the success of a company. Although this is considered a critical factor, no concrete suggestions exist regarding how involvement can be implemented in practice. Therefore, four subordinate research questions were designed to fill this research gap, which were partly based on each other. The first question focused on strategic decisions in the GPN and was as

follows:

SRQ 1: What are strategic decisions in the context of GPN management?

The present research belongs to the literature on IMNs and production strategy. A systematic literature review of the intersection of these two literature streams formed the basis of this research question and provided guidance for the further research questions. In the course of the review, 34 scientific papers were identified that addressed the following problem: “A large share of companies fails to consider GPNs as an integral part of strategic decision making.” The analysis of the papers revealed that five issues must be considered to integrate production networks into strategic decision making, namely network goals, decision categories, strategy formulation, specifically strategic decision distribution, involvement, and contextual factors. Each of these topics has been further elaborated in the course of the research. To answer the first sub-research question, different decision categories were identified. These consisted of the overarching network goals, which can be achieved through configurational and coordinative or structural and infrastructural decisions. How these decisions are made was the objective of the second sub-research question, which was as follows:

SRQ 2: How are strategic decisions made in the production network?

The distribution of strategic decisions in a GPN accounted for a significant share of this research work. Already in the course of the literature search, scientific articles were identified that have dealt with this issue. Although this topic is controversial, a consensus of opinion seemed to exist in certain areas; that is, overarching objectives and long-term strategic decisions are usually made by top management when a uniform standard is required, whereas decentralized decisions are considered more suitable for creative and innovative solutions. For the research work at hand, specifically regarding the development of methods for strengthening the voice of global production in strategic decision-making, it was important to determine exactly who makes which strategic decisions. Therefore, a survey was conducted to investigate which decisions are made at the top management, network

management, and site levels. One of the main findings from the analysis of 69 companies was that decisions in the categories of “Choice of products manufactured at the plant,” “Choice of plant focus,” “Choice of plant specialization,” “Make-or-buy decisions,” “Choice of organizational structure,” “Choice of longer-term planning and control principles,” “Choice of data & IT infrastructure systems,” and “Choice of KPI/performance measurement system” are predominantly made by top management. These decisions are significantly responsible for the configurational and coordinative design of the production network and thus strongly influence the performance of network capabilities. Unfortunately, the data did not indicate exactly how the decisions are made and whether the voice of production has been considered. This question was addressed by another research method used in this thesis.

Specifically, expert interviews were used to gather information on how strategic decision making is accomplished in 10 different global manufacturing companies. Through the analysis of the interviews, three generic approaches were identified. The first approach was a strict top-down approach in which top management almost completely determines all strategically relevant decisions. In the companies studied where this approach applies, the voice of production was found to not be considered in this process. The second approach was similar to the first, except that only strategic guidelines are provided by top management, leaving network management free to make its own decisions. The last approach is an integrated approach in which global production is represented in top management and can directly participate in strategic decisions relevant to the production network. After shedding light on decision distribution and decision making, this research addressed the methods and practices that can increase attention to global production in line with the third sub-research question, which was as follows:

SRQ 3: What practices and methods increase attention to global production-relevant issues?

The expert interviews mentioned earlier not only gathered information on decision distribution but also provided insights into applied methods and practices for strengthening the voice of production. This information was enriched with the findings of the literature review and consolidated under the theoretical lens of the

ABV and strategic agenda building. The result was four practices intended to increase attention to global manufacturing in strategic decision-making to achieve more effective alignment between corporate, business, and global manufacturing strategy. The first practice is to involve a person responsible for global production in top management, which is similar to the strategic decision-making approach described earlier. The presence of a global production representative can ensure that the specifics of the GPN are considered in strategic discussions that are made in top management. The global production manager can highlight potential strategic misalignments as well as development opportunities. Yet, how well the representative succeeds in positioning global production-relevant issues in the strategic agenda depends on a variety of factors. One key factor here are individual skills. The second practice for strengthening the voice of production is to anchor it more strongly in the organizational structure. The role that global production plays within a company depends heavily on how it is structured in terms of organization. To strengthen attention, it makes sense to give global production a great deal of authority. While this does not guarantee that production is sufficiently considered in strategic decisions, it does ensure that strategic initiatives are communicated properly and cascaded to the sites. On the other hand, the focus on production-relevant bottom-up initiatives and their implementation in top management is improved. The third practice is the use of meetings. Formal meetings can be used to raise awareness of global production-relevant issues horizontally with a higher or lower level or vertically with other functional areas. The fourth practice identified is to root global production in the corporate identity. The corporate identity reflects how customers and employees perceive an organization. Embedding global production deeply in the company's values and identity creates a high degree of attention coherence. Strategic initiatives can thus be more easily aligned with the overarching interests and objectives of the company. Over the course of the case studies, two other potential practices were discovered. One is the possibility, when making strategic decisions, of designing the process in such a manner that the voice of production must be sought in the form of a consultation requirement. The other suggestion considers the production experience of decision makers. Thus, as executives gain a certain amount of experience in production, they can better understand production-related issues and contexts through job rotations, for example, and accordingly consider them more when making strategic decisions.

Which practices can be applied when as well as how were addressed in the fourth and final sub-research question, which was as follows:

SRQ 4: How can top management involve global production in strategic decisions?

The case study investigation of four companies provided valuable results for the present research, including two main insights, the first of which was the results on the decision categories. The second insight was that the distribution of decisions from the previous research questions could be validated and the applicability of the identified practices elaborated in detail. The case study method enabled a deeper analysis of decision making and exactly how which decisions are made. The categories of business decisions were found to be distributed very similarly in the four companies. The explanation for this distribution was highly homogeneous: Network-relevant decisions are made across networks, whereas subnetwork-relevant decisions are made within subnetworks. The more different the business units or areas, the more decentralized the decision that must be made. However, it is ensured that a holistic optimum exists and that no dyssynergies arise between the networks.

The greatest variation within the cases examined was found in coordinative decisions. The major challenge in the decision distribution of the coordinative categories is to set standards intended to standardize processes and make them comparable while also allowing sufficient flexibility for adjustments to be able to meet the respective special requirements of the individual business areas. Subsequently, the case study investigated which practices are particularly suitable for strengthening the voice of production in strategic decisions. The most crucial practice was considered to be the involvement of global production in top management. The composition of the board often determines the group of participants in which overarching strategic decisions are discussed and determined. It is critical for all main areas of the company to be equally represented in this circle. The composition of top management is very important in terms of how the company is perceived, both externally and internally. If certain areas are overrepresented, then this relationship will permeate the entire company. A representative of global production can ensure that strategic decisions pay

sufficient attention to the potential or negative impact on the GPN. However, it is not only important to be present when decisions are made but also to be able to implement them within the company. Therefore, the organizational structure was seen as the second key lever for ensuring that strategic decisions are implemented and that production-related interests are represented right down to the shop floor. This requires direct disciplinary power from the production manager to the individual sites. Informal or indirect authority to issue directives is usually not sufficient.

Other possible methods for focusing more attention on global production when making strategic decisions include meetings, corporate identity, job rotations, or through processes. The extent to which these practices should be used as well as how strongly the voice of production should be represented in a company depend on various factors. In particular, companies that are characterized by notably high process complexity, vertical integration, investment volume, or individualism – in other words, any company that considers its global production capabilities to be a key competitive factor – should take care to anchor the voice of production as strongly as possible.

In sum, companies must be able to consistently explain the distribution of decisions in detail. It must be transparent and clearly justified within the company which decision should be made by which department at which hierarchical level and why. This is considered an essential factor in creating the best possible alignment between corporate, business, and global production strategy – and in fact any functional strategy.

Figure 20 consolidates the results of this research into a process template for practitioners.



Figure 20: Involvement practice selection process (own illustration).

The process involves three main elements: "Context factors", "Involvement practices" and "Decision distribution". Initially, the company needs to evaluate the

context factors "Process and product complexity", "Vertical integration", "Invest volume", "Quality requirements", "Individualism" and "Market dynamics". The higher the factors are, the higher the involvement of global production is necessary. The four practices "Top Management involvement", "Organizational structure", "Meetings" and "Corporate identity" enable better involvement. The applied practices should be aligned with the decision distribution of global production-relevant strategic decisions. A transparent overview of the decision distribution is necessary for this alignment. For those categories that tend to be centrally located, the practice "Top management involvement" is appropriate. The representative of global production thus has the opportunity to draw attention directly to global production-relevant issues or potentials when making strategic decisions. If certain decision categories are focused around the global production manager, it is important to provide this manager with the necessary organizational authority. The practice "Organizational structure" is most effective in this case and is very important for the strategy deployment. In cases where decision-making responsibilities are mainly decentralized or scattered throughout the organization, the practice "Meetings" is effective. Formal and informal meetings can enable both horizontal and vertical alignment. Yet, it is important to consider that this practice does not ensure the active involvement of global production. The practice "Corporate Identity" is recommended, if the production should be very prominent in the external as well as internal appearance. According to the applied involvement practices, the decision distribution is to be allocated so that the greatest possible "fit" is achieved.

7.2 Implications for Theory and Practice

The results of this thesis have implications for practice as well as for the existing knowledge base in the field of global production. Table 38 summarizes the main results and assesses their level of contribution to both theory and practice.

Table 38: Contributions to theory and practice.

SRQ	Research Result	Theoretical Contribution	Practical Contribution
1	Decision categories	Medium	Low
2	Decision distribution	High	Medium
3	Involvement practices	High	High
4	Application of involvement practices	Low	High

The first contribution is the findings from the systematic literature review, which illuminated the intersection of the literature streams of IMNs and production strategy as well as identified issues that are critical for the alignment of corporate, business, and global production strategy. The most significant contribution was the identification of decision categories. Since these have already been described in detail in the literature, the value of this contribution is rated as medium, while the implications for practice are rated as low. Although it helps managers to be aware of the different decision categories, there is no recommendation for practice at this point. The second result, decision distribution, provides a somewhat greater contribution to practice. It was demonstrated exactly how companies centralize or decentralize certain decisions as well as the reasons that exist for this, which is also a major contribution to theory. Through the survey, expert interviews, and case studies, the findings – which are already controversially discussed in the literature – could be validated and supplemented. Furthermore, a third major contribution to science was the identified practices for strengthening the voice of production in strategic decision making. Considering the ABV and the strategic agenda building theory, concrete practices were identified, which can also be implemented in practice and have very high relevance for managers seeking methods for focusing more attention on global production. The fourth contribution, detailing and application, is also of high value for managers because it provides concrete suggestions for when to implement which practice and how. For theory, this finding is rather negligible, and scientific work on it is difficult since the results were raised only through an investigation with four enterprises. This leads into the next section on the limitations of this thesis.

7.3 Limitations and Future Research

The content and methodology of this thesis was subject to certain limitations, but which also led to further research recommendations.

Firstly, interactions along the supply chain and with other stakeholders were mostly not taken into account, due to the research being limited to IMNs or intra-firm networks. It is necessary to abstract reality in order to address a field as complex as production networks, influenced by a wide range of variables (Ferdows 2018). On the other hand, the intended results would not be so explanatory in the event of simplification. In addition, the framework applied by the research was the ABV and the theories of strategic agenda-building. Alternative perspectives could be gained by considering contingency theory, for example, and the internal view of production and network management could be holistically extended by an external perspective. One suggestion for future research would be the application of organizational theories, for example agency theory, to a study on the voice of production. The insights gained from this could be used to define management policies or structures that take the different motivations of managers into account. Further opportunities for research could also be presented by a more in-depth consideration of the whole value chain that includes third parties such as suppliers, customers and other stakeholders. It would be particularly interesting to get to know the point of view of the executive board and other departments.

The use of the case studies also gave rise to a methodological limitation. There are certain disadvantages alongside the many advantages afforded by case study research. While cross-case research can be very useful for building theoretical models and gaining a wealth of information and in-depth insights, the findings may only be representative and generalizable to a limited extent due to the small selection. The author is aware of this and has sought to improve the reliability and validity of the case studies. The results now need to be validated by carrying out further studies. Certain limitations also affected the expert interviews. Despite the fact that the selected companies had demonstrated global strategy excellence in a survey to improve the comparison, they represented a limited sample that did not allow general conclusions (Barrett et al. 2011). The expert interviews were also dependent on static observations gained from semi-structured interviews. Consequently, the study could only provide limited insights into causal relationships and the decision-making processes behind dynamic strategies.

Finally, one should point out the limitations of the quantitative study, primarily due to the medium-sized selection which may not have taken existing relationships into account. It would be advantageous to carry out a similar study with a wide data sample that includes a larger number of variables.

Furthermore, the study only comprised companies based in Switzerland, Austria or Germany, across all research methods, and does not take account in detail of cultural differences and foreign characteristics despite their having sites around the world. The research results could be verified by including cases of companies in other countries, as an interesting tangent. Investigating the potential influence of cultural or personal characteristics on involvement practices could also be of use.

To conclude, in general the author is advocating more empirical and quantitative research on the subject of international production networks.

References

- Abele, Eberhard; Meyer, Tobias; Näher, Ulrich; Strube, Gernot; Sykes, Richard (2008): Global Production. Berlin, Heidelberg: Springer Berlin Heidelberg.
- Adamides, Emmanuel D. (2015): Linking operations strategy to the corporate strategy process: a practice perspective. In: *Business Process Management Journal* 21 (2), S. 267–287. DOI: 10.1108/BPMJ-07-2013-0107.
- Adamides, Emmanuel D.; Pomonis, Nikolaos (2009): The co-evolution of product, production and supply chain decisions, and the emergence of manufacturing strategy. In: *International Journal of Production Economics* 121 (2), S. 301–312. DOI: 10.1016/j.ijpe.2006.11.025.
- Ahmed, Nazim U.; Montagno, Ray V.; Firenze, Robert J. (1996): Operations strategy and organizational performance: an empirical study. In: *International Journal of Operations & Production Management* 16 (5), S. 41–53. DOI: 10.1108/01443579610113933.
- Akoglu, Haldun (2018): User's guide to correlation coefficients. In: *Turkish journal of emergency medicine* 18 (3), S. 91–93. DOI: 10.1016/j.tjem.2018.08.001.
- Alberto De Toni (1992): Manufacturing Strategy in Global Markets: An Operations Management Model. In: *International Journal of Operations & Production Management* 12 (4), S. 7–18.
- Ancona, Deborah Gladstein; Caldwell David F. (1992): Demography and Design: Predictors of New Product Team Performance. In: *Organization Science* 3 (3), S. 321–341.
- Anderson, John C.; Schroeder, Roger G.; Cleveland, Gary (1991): The Process of Manufacturing Strategy: Some Empirical Observations and Conclusions. In: *International Journal of Operations & Production Management* 11 (3), S. 86–110. DOI: 10.1108/01443579110143016.
- Archibald, Mandy M. (2016): Investigator Triangulation. In: *Journal of Mixed Methods Research* 10 (3), S. 228–250. DOI: 10.1177/1558689815570092.
- Argote, Linda; McEvily, Bill; Reagans, Ray (2003): Managing Knowledge in Organizations: An Integrative Framework and Review of Emerging Themes. In: *Management Science* 49 (4), S. 571–582. DOI: 10.1287/mnsc.49.4.571.14424.
- Arogyaswamy, Bernard; Byles, Charles M. (1987): Organizational Culture: Internal and External Fits. In: *Journal of Management* 13 (4), S. 647–659.
- Atteslander, Peter (2010): Methoden der empirischen Sozialforschung. 13., neu bearbeitete und erweiterte Auflage. Berlin: Erich Schmidt Verlag (ESV basics).

Babbie, Earl R. (2008): The basics of social research. 4th ed. Belmont CA: Thomson/Wadsworth.

Barnes, David (2002): The complexities of the manufacturing strategy formation process in practice. In: *International Journal of Operations & Production Management* 22 (10), S. 1090–1111. DOI: 10.1108/01443570210446324.

Barrett, Lisa Feldman; Mesquita, Batja; Gendron, Maria (2011): Context in Emotion Perception. In: *Current Directions in Psychological Science* 20 (5), S. 286–290. DOI: 10.1177/0963721411422522.

Bartlett, Christopher A.; Goshal, Sumantra (2000): Going Global: Lessons from Late Movers. In: *Harvard Business Review*.

Bartol, Kathryn; Srivastava, Abhishek (2002): Encouraging Knowledge Sharing The Role of Organizational Reward Systems. In: *Journal of Leadership and Organization Studies* 9 (1), S. 64–76.

Baumbach, Michael (1998): After-Sales-Management im Maschinen- und Anlagenbau. St. Gallen, Univ., Diss., 1998. Regensburg: Transfer Verl.

Baxter, Pamela; Jack, Susan (2008): Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. In: *The Qualitative Report* 13 (4), S. 544–559.

Baxter, Pamela; Rideout, Elizabeth (2006): Second-year baccalaureate nursing Students' decision making in the clinical setting. In: *The Journal of nursing education* 45 (4), S. 121–127. DOI: 10.3928/01484834-20060401-05.

Benbasat, Izak; Zmud, Robert W. (1999): Empirical Research in Information Systems: The Practice of Relevance. In: *MIS Quarterly* 23 (1), S. 3–16.

Bernard, H. Russell (2013): Social research methods. Qualitative and quantitative approaches. 2. ed. Los Angeles: Sage.

Bleicher, K. (2011): Das Konzept Integriertes management: Vision - Mission - Programme: Campus-Verlag.

Bortz, Jürgen; Döring, Nicola (1995): Hypothesengewinnung und Theoriebildung. In: Jürgen Bortz und Nicola Döring (Hg.): Forschungsmethoden und Evaluation. Zweite, vollständig überarbeitete und aktualisierte Auflage. Berlin, Heidelberg: Springer (Springer eBook Collection), S. 327–367.

Bortz, Jürgen; Schuster, Christof (2010): Statistik für Human- und Sozialwissenschaftler. 7., vollständig überarbeitete und erweiterte Auflage. Berlin, Heidelberg: Springer (Springer-Lehrbuch).

Bower, Joseph L. (1970): Planning within the Firm. In: *The American Economic*

Review 60 (2), S. 186–194.

Bower, Joseph L. (1972): Managing the resource allocation process: A study of corporate planning and investment: Irwin Homewood.

Boyer (2002): Competitive priorities: investigating the need for trade-offs in operations strategy. In: *Production and Operations Management* 11 ((1)), S. 9.

Boyer, Kenneth K. (1998): Longitudinal linkages between intended and realized operations strategies. In: *International Journal of Operations & Production Management* 18 (4), S. 356–373. DOI: 10.1108/01443579810199739.

Brennan, Louis; Vecchi, Alessandra (2017): International Manufacturing Strategy in a Time of Great Flux. Cham: Springer International Publishing.

Brown, Steve; Blackmon, Kate (2005): Aligning Manufacturing Strategy and Business-Level Competitive Strategy in New Competitive Environments: The Case for Strategic Resonance. In: *Journal of Management Studies* 42 (4), S. 793–815. DOI: 10.1111/j.1467-6486.2005.00519.x.

Brown, Steve; Squire, Brian; Blackmon, Kate (2007): The contribution of manufacturing strategy involvement and alignment to world-class manufacturing performance. In: *International Journal of Operations & Production Management* 27 (3), S. 282–302. DOI: 10.1108/01443570710725554.

Brown, Steve; Squire, Brian; Lewis, Mike (2010): The impact of inclusive and fragmented operations strategy processes on operational performance. In: *International Journal of Production Research* 48 (14), S. 4179–4198. DOI: 10.1080/00207540902942883.

Brumme, Hendrik; Simonovich, Daniel; Skinner, Wickham; van Wassenhove, Luk N. (2015): The Strategy-Focused Factory in Turbulent Times. In: *Production and Operations Management* 24 (10), S. 1513–1523. DOI: 10.1111/poms.12384.

Bunderson, J. Stuart (2003): Team Member Functional Background and Involvement in Management Teams: Direct Effects and the Moderating Role of Power Centralization. In: *The Academy of Management Journal* 46 (4), S. 458–474.

Burgelman, Robert A. (1983): A Model of the Interaction of Strategic Behavior, Corporate Context, and the Concept of Strategy. In: *The Academy of Management Review* 8 (1), S. 61–70.

Burgelman, Robert A. (1991): Intraorganizational Ecology of Strategy Making and Organizational Adaptation: Theory and Field Research. In: *Organization Science* 2 (3), S. 239–262.

Burgelman, Robert A. (2002): Strategy as Vector and the Inertia of Coevolutionary Lock-in. In: *Administrative Science Quarterly* 47, S. 325–357.

Cachia, Moira; Millward, Lynne (2011): The telephone medium and semi-structured interviews: a complementary fit. In: *Qualitative Research in Organizations and Management: An International Journal* 6 (3), S. 265–277. DOI: 10.1108/17465641111188420.

Campbell, John L.; Quincy, Charles; Osserman, Jordan; Pedersen, Ove K. (2013): Coding In-depth Semistructured Interviews. In: *Sociological Methods & Research* 42 (3), S. 294–320. DOI: 10.1177/0049124113500475.

Carter, Eugen (1971): The Behavioral Theory of the Firm and Top-Level Corporate Decisions. In: *Administrative Science Quarterly* 16 (4), S. 413–429.

Chandler, Alfred Dupont (2001): Strategy and structure. Chapters in the history of the industrial enterprise. 22. print. Cambridge, Mass.: MIT Press.

Charmaz, Kathy (2006): Constructing grounded theory. A practical guide through qualitative analysis. 1. publ. London: SAGE Publ (Introducing qualitative methods).

Chatha, K. A.; Butt, I. (2015): Themes of study in manufacturing strategy literature. In: *International Journal of Operations & Production Management* 35 (4), S. 604–698. DOI: 10.1108/IJOPM-07-2013-0328.

Chatha, K. A.; Butt, I.; Tariq, Adeel (2015): Research methodologies and publication trends in manufacturing strategy. In: *International Journal of Operations & Production Management* 35 (4), S. 487–546. DOI: 10.1108/IJOPM-07-2012-0285.

Cheng, Yang; Farooq, Sami; Jajja, Muhammad Shakeel Sadiq (2021): Does plant role moderate relationship between internal manufacturing network integration, external supply chain integration, operational performance in manufacturing network? In: *Journal of Manufacturing Technology Management* 32 (6), S. 1267–1289. DOI: 10.1108/JMTM-06-2019-0237.

Cheng, Yang; Farooq, Sami; Johansen, John (2011): Manufacturing network evolution: a manufacturing plant perspective. In: *International Journal of Operations & Production Management* 31 (12), S. 1311–1331. DOI: 10.1108/01443571111187466.

Cheng, Yang; Farooq, Sami; Johansen, John (2015): International manufacturing network: past, present, and future. In: *International Journal of Operations & Production Management* 35 (3), S. 392–429. DOI: 10.1108/IJOPM-03-2013-0146.

Cheng, Yang; Farooq, Sami; Johansen, John; O'Brien, Chris (2019): The

management of international manufacturing networks: a missing link towards total management of global networks. In: *Production Planning & Control* 30 (2-3), S. 91–95. DOI: 10.1080/09537287.2018.1534273.

Child, John (1972): Organization Structure and Strategies of Control: A Replication of the Aston Study. In: *Administrative Science Quarterly* 17 (2), S. 163–177.

Christodoulou, P. A.; Srai, J. S.; Gregory, M. J. (2019): Synergy from configuration of global production networks: drivers, mechanisms, and outcomes. In: *Production Planning & Control* 30 (2-3), S. 179–196. DOI: 10.1080/09537287.2018.1534291.

Christodoulou, Paul; Fleet, Don; Hanson, Phil; Phaal, Robert; Probert, David; Shi, Yongjiang (2007): Making the right thing in the right places. In: *University of Cambridge, IfM Publication*.

Cohen, Jacob (1992): A power primer. In: *Psychological bulletin* 112 (1), S. 155.

Cohen, Morris A.; Lee, Hau L. (1988): Strategic Analysis of Integrated Production-Distribution Systems: Models and Methods. In: *Operations Research* 36 (2), S. 216–228.

Colotla, Ian; Shi, Yongjiang; Gregory, Michael J. (2003): Operation and performance of international manufacturing networks. In: *International Journal of Operations & Production Management* 23 (10), S. 1184–1206. DOI: 10.1108/01443570310496625.

Cooper, Harris M. (1988): Organizing knowledge syntheses: A taxonomy of literature reviews. In: *Knowledge in Society* 1 (1), S. 104–126. DOI: 10.1007/BF03177550.

Costa Ferreira Junior, Silas; Fleury, Afonso Carlos Corrêa (2018): Performance assessment process model for international manufacturing networks. In: *International Journal of Operations & Production Management* 38 (10), S. 1915–1936. DOI: 10.1108/IJOPM-03-2017-0183.

Cycyota, Cynthia S.; Harrison, David A. (2006): What (Not) to Expect When Surveying Executives. In: *Organizational Research Methods* 9 (2), S. 133–160. DOI: 10.1177/1094428105280770.

Cyert, Richard M.; March, James G. (1963): A behavioral theory of the firm: Englewood Cliffs, NJ (4).

da Silveira, Giovani J.C.; Sousa, Rui S. (2010): Paradigms of choice in manufacturing strategy. In: *International Journal of Operations & Production Management* 30 (12), S. 1219–1245. DOI: 10.1108/01443571011094244.

Dangayach, G. S.; Deshmukh, S. G. (2001): Manufacturing strategy. In: *Int Jrnl of Op & Prod Mngemnt* 211 (7), S. 884–932. DOI: 10.1108/01443570110393414.

Demeester, Lieven; Meyer, Arnoud de; Grahovac, Jovan (2014): The role of operations executives in strategy making. In: *Journal of Operations Management* 32 (7-8), S. 403–413. DOI: 10.1016/j.jom.2014.09.006.

Díaz Garrido, E.; Martín-Peña, M. L.; García-Muiña, F. (2007): Structural and infrastructural practices as elements of content operations strategy. The effect on a firm's competitiveness. In: *International Journal of Production Research* 45 (9), S. 2119–2140. DOI: 10.1080/00207540600735480.

Dohale, Vishwas; Akarte, Milind M.; Verma, Priyanka (2021): Systematic review of manufacturing strategy studies focusing on congruence aspect. In: *Benchmarking: An International Journal* ahead-of-print (ahead-of-print). DOI: 10.1108/BIJ-02-2021-0103.

Downs, George W.; Mohr, Lawrence B. (1976): Conceptual Issues in the Study of Innovation. In: *Administrative Science Quarterly* 21 (4), S. 700–714.

Doz, Y. L.; Prahalad, C. K. (1991): Managing DMNCs: A Search for a New Paradigm. In: *Strategic Management Journal* 12 (12), S. 145–164.

Dutton, Jane E. (1986): Understanding strategic agenda building and its implications for managing change. In: *Scandinavian Journal of Management Studies* 3 (1), S. 3–24. DOI: 10.1016/0281-7527(86)90008-3.

Dutton, Jane E.; Dukerich, Janet M. (1991): Keeping an Eye on the Mirror: Image and Identity in Organizational Adaptation. In: *The Academy of Management Journal* 34 (3), S. 517–554.

Dutton, Jane E.; Duncan, Robert B. (1987): The Influence of the Strategic Planning Process on Strategic Change. In: *Strategic Management Journal* 8 (2), S. 103–116.

Eisenhardt, Kathleen (1989): Building Theories from Case Study Research. In: *The Academy of Management Review* 14 (4), S. 532–550.

Eisenhardt, Kathleen; Graebner, Melissa (2007): Theory Building from Cases: Opportunities and Challenges. In: *Academy of Management* 50 (1), S. 25–32.

Fai Pun, Kit (2004): A conceptual synergy model of strategy formulation for manufacturing. In: *International Journal of Operations & Production Management* 24 (9), S. 903–928. DOI: 10.1108/01443570410552117.

Feldmann, A.; Olhager, J.; Persson, F. (2009): Designing and managing manufacturing networks—a survey of Swedish plants. In: *Production Planning & Control* 20 (2), S. 101–112. DOI: 10.1080/09537280802705252.

Feldmann, Andreas (2011): A Strategic Perspective on Plants in Manufacturing Networks.

Feldmann, Andreas; Olhager, Jan (2013): Plant roles. In: *International Journal of Operations & Production Management* 33 (6), S. 722–744. DOI: 10.1108/IJOPM-03-2011-0077.

Feldmann, Andreas; Olhager, Jan; Fleet, Don; Shi, Yongjiang (2013): Linking networks and plant roles: the impact of changing a plant role. In: *International Journal of Production Research* 51 (19), S. 5696–5710. DOI: 10.1080/00207543.2013.778429.

Ferdows, Kasra (1997): Making the Most of Foreign Factories. In: *Harvard Business Review*, S. 73–88.

Ferdows, Kasra (2014): Relating the Firm's Global Production Network to Its Strategy. In: John Johansen, Sami Farooq und Yang Cheng (Hg.): *International Operations Networks*. London: Springer London, S. 1–11.

Ferdows, Kasra (2018): Keeping up with growing complexity of managing global operations. In: *International Journal of Operations & Production Management* 38 (2), S. 390–402. DOI: 10.1108/IJOPM-01-2017-0019.

Ferdows, Kasra; Vereecke, Ann; Meyer, Arnoud de (2016): Delayering the global production network into congruent subnetworks. In: *Journal of Operations Management* 41 (1), S. 63–74. DOI: 10.1016/j.jom.2015.11.006.

Fine, Charles; Hax, Arnaldo (1985): Manufacturing Strategy: A Methodology and an Illustration. In: *Interfaces* 15 (6), S. 28–46. DOI: 10.2307/25060761.

Fleury, A.; Shi, Y.; Junior, S. F.; Cordeiro, J.H.D.; Fleury, M.T.L. (2015): Developing an analytical framework for study of emerging country multinationals' operations management. In: *International Journal of Production Research* 53 (18), S. 5418–5436. DOI: 10.1080/00207543.2015.1005252.

Flick, Uwe (Hg.) (2018): *The Sage handbook of qualitative data collection*. Los Angeles: Sage Reference.

Fornasiero, Rosanna; Sardesai, Saskia; Barros, Ana Cristina; Matopoulos, Aristides (2021): *Next Generation Supply Chains*. Cham: Springer International Publishing.

Fredriksson, Anna; Wänström, Carl (2014): Manufacturing and supply chain flexibility – towards a tool to analyse production network coordination at operational level. In: *Strategic Outsourcing: An International Journal* 7 (2), S. 173–194. DOI: 10.1108/SO-04-2014-0003.

Friedli, Thomas; Lanza, Gisela; Remling, Dominik; Kaiser, Jens; Verhaelen,

Bastian & Benfer, Martin (2020): Benchmarking: Managing Global Production Networks. St. Gallen: General Report.

Friedli, Thomas; Mundt, Andreas; Thomas, Stefan (2014): Strategic Management of Global Manufacturing Networks. Berlin, Heidelberg: Springer Berlin Heidelberg.

Fukuzawa, Mitsuhiro (2019): Factory strategy. In: *Annals of Business Administrative Science* 18 (5), S. 149–170. DOI: 10.7880/abas.0190731a.

Garetti, Marco; Taisch, Marco (2012): Sustainable manufacturing: trends and research challenges. In: *Production Planning & Control* 23 (2-3), S. 83–104. DOI: 10.1080/09537287.2011.591619.

Garvin, David A. (1993): Manufacturing Strategic Planning. In: *California Management Review* 35 (4), S. 85–106.

Gassmann, Oliver (1999): Praxisnähe mit Fallstudienforschung. In: *Wissenschaftsmanagement* 11 (3).

Ghemawat, Pankaj (2001): Distance still matters. In: *Harvard Business Review*.

Gibbert, Michael; Ruigrok, Winfried; Wicki, Barbara (2008): What passes as a rigorous case study? In: *Strategic Management Journal* 29 (13), S. 1465–1474. DOI: 10.1002/smj.722.

Gilgeous, Vic (2001): The strategic role of manufacturing. In: *International Journal of Production Research* 39 (6), S. 1257–1287. DOI: 10.1080/00207540010022971.

Gioia, Dennis A.; Corley, Kevin G.; Hamilton, Aimee L. (2013): Seeking Qualitative Rigor in Inductive Research. In: *Organizational Research Methods* 16 (1), S. 15–31. DOI: 10.1177/1094428112452151.

Glaser, Barney G.; Strauss, Anselm L. (2017): The discovery of grounded theory. Strategies for qualitative research. London, New York: Routledge. Online verfügbar unter <https://www.taylorfrancis.com/books/9780203793206>.

Gläser, Jochen; Laudel, Grit (2010): Experteninterviews und qualitative Inhaltsanalyse als Instrumente rekonstruierender Untersuchungen. 4. Auflage. Wiesbaden: VS Verlag (Lehrbuch). Online verfügbar unter <http://dnb.info/1002141753/04>.

Golini, Ruggero; Deflorin, Patricia; Scherrer, Maike (2016): Exploiting the potential of manufacturing network embeddedness. In: *International Journal of Operations & Production Management* 36 (12), S. 1741–1768. DOI: 10.1108/IJOPM-11-2014-0559.

Greene, Jennifer C.; Caracelli, Valerie J.; Graham, Wendy F. (1989): Toward a Conceptual Framework for Mixed-Method Evaluation Designs. In: *Educational Evaluation and Policy Analysis* 11 (3), S. 255–274.

Hallgren, Mattias; Olhager, Jan (2006): Quantification in manufacturing strategy: A methodology and illustration. In: *International Journal of Production Economics* 104 (1), S. 113–124. DOI: 10.1016/j.ijpe.2005.09.004.

Hallgren, Mattias; Olhager, Jan (2009): Lean and agile manufacturing: external and internal drivers and performance outcomes. In: *International Journal of Operations & Production Management* 29 (10), S. 976–999. DOI: 10.1108/01443570910993456.

Hambrick, Donald C. (1981): Environment, Strategy, and Power Within Top Management Teams. In: *Administrative Science Quarterly* 26 (2), S. 253–275.

Hambrick, Donald C.; Seung, Cho Theresa; Chen, Ming-Jer (1996): The Influence of Top Management Team Heterogeneity on Firms' Competitive Moves. In: *Administrative Science Quarterly* 41 (4).

Harrison, David A.; Price, Kenneth H.; Gavin, Joanne H.; Florey, Anna T. (2002): Time, Teams, and Task Performance: Changing Effects of Surface- and Deep-Level Diversity on Group Functioning. In: *Academy of Management Journal* 45 (5), S. 1029–1045. DOI: 10.5465/3069328.

Hart, Chris (2009): Doing a literature review. Releasing the social science research imagination. Reprinted. London: Sage.

Hayes, Robert H.; Pisano, Gary P.; Upton, David; Wheelwright, Steven C. (2005): Operations, strategy, and technology. Pursuing the competitive edge. Hoboken, NJ: Wiley.

Hayes, Robert H.; Upton, David M. (1998): Operations-Based Strategy. In: *California Management Review* 40 (4), S. 8–25.

Hayes, Robert H.; Wheelwright, Steven C. (1984): Restoring Our Competitive Edge: Competing through Manufacturing. New York: Wiley.

Hill, Alex; Brown, Steve (2007): Strategic profiling. In: *International Journal of Operations & Production Management* 27 (12), S. 1333–1361. DOI: 10.1108/01443570710835642.

Hill, Terry (1993): Manufacturing Strategy. The strategic management of the manufacturing function. 2nd Edt. London: The Macmillan Press Ltd.

Hill, Terry (1997): Manufacturing strategy - keeping it relevant by addressing the needs of the market. In: *Integrated Manufacturing Systems* 8 (5), S. 257–264. DOI:

10.1108/09576069710815780.

Hoffman, Andrew J.; Ocasio, William (2001): Not All Events Are Attended Equally: Toward a Middle-Range Theory of Industry Attention to External Events. In: *Organization Science* 12 (4), S. 414–434. DOI: 10.1287/orsc.12.4.414.10639.

Hofmann, Erik (2004): Betriebswirtschaftslehre als anwendungsorientierte Wissenschaftsdisziplin - Zur Diskrepanz von Wissenschaft und Praxis bei der Erarbeitung von Gestaltungsempfehlungen. In: *Netzkompetenz in Supply Chains - Grundlagen und Umsetzung*, S. 285–297.

Honer, Anne (1994): Das explorative Interview: zur Rekonstruktion der Relevanzen von Expertinnen und anderen Leuten. In: *Schweizerische Zeitschrift für Soziologie* 20 (3), S. 623–640.

Howell (2016): *Fundamental Statistics for the Behavioral Sciences*: Cengage Learning.

Huff, Anne S. (1982): Industry Influences on Strategy Reformulation. In: *Strategic Management Journal* 3 (2), S. 119–131.

Huff, Anne S.; Pondy, Louis R. (1983): *Issue Management by School Superintendents: Final Report. Part II.*

Johansen, John; Farooq, Sami; Cheng, Yang (2014): *International Operations Networks*. London: Springer London.

Jonsson, Henric; Rudberg, Martin (2014): Classification of production systems for industrialized building: a production strategy perspective. In: *Construction Management and Economics* 32 (1-2), S. 53–69. DOI: 10.1080/01446193.2013.812226.

Joseph, John; Ocasio, William (2012): Architecture, attention, and adaptation in the multibusiness firm: General electric from 1951 to 2001. In: *Strategic Management Journal* 33 (6), S. 633–660. DOI: 10.1002/smj.1971.

Joshi, Maheshkumar P.; Kathuria, Ravi; Porth, Stephen J. (2003): Alignment of strategic priorities and performance: an integration of operations and strategic management perspectives. In: *Journal of Operations Management* 21 (3), S. 353–369. DOI: 10.1016/S0272-6963(03)00003-2.

Kaplan, Sarah; Tripsas, Mary (2008): Thinking about technology: Applying a cognitive lens to technical change. In: *Research Policy* 37 (5), S. 790–805. DOI: 10.1016/j.respol.2008.02.002.

Kendall, M. G. (1938): A New Measure of Rank Correlation. In: *Oxford Journals* 30 (1/2), S. 81–93.

Khurana, Anil (1999): Managing Complex Production Processes. In: *Sloan management review* 40 (2), S. 85–97.

Kiesler, Sara; Sproull, Lee (1982): Managerial Response to Changing Environments: Perspectives on Problem Sensing from Social Cognition. In: *Administrative Science Quarterly* 27 (4), S. 548–570.

Kim, Yoon Hee; Sting, Fabian J.; Loch, Christoph H. (2014): Top-down, bottom-up, or both? Toward an integrative perspective on operations strategy formation. In: *Journal of Operations Management* 32 (7-8), S. 462–474. DOI: 10.1016/j.jom.2014.09.005.

Kingdon, John W.; Stano, Eric (1984): Agendas, alternatives, and public policies: Little, Brown Boston.

Klassen, Robert D.; Whybark, D. Clay (1999): The Impact of Environmental Technologies on Manufacturing Performance. In: *The Academy of Management Journal* 42 (6), S. 599–615.

Knoben, J.; Oerlemans, L.A.G. (2006): Proximity and inter-organizational collaboration: A literature review. In: *International Journal of Management Reviews* 8 (2), S. 71–89. DOI: 10.1111/j.1468-2370.2006.00121.x.

Kubicek, H. (1977): Heuristische Bezugsrahmen und heuristisch angelegte Forschungsdesigns als Elemente einer Konstruktionsstrategie empirischer Forschung. In: *Empirische und handlungstheoretische Forschungskonzeptionen in der Betriebswirtschaftslehre*, S. 3–36.

Kuhn, Joachim (2006): Evolution of a worldwide production network. In: *Jnl of Manu Tech Mngmnt* 17 (8), S. 1099–1116. DOI: 10.1108/17410380610707401.

Kulkarni, Sourabh; Verma, Priyanka; Mukundan, R. (2019): Assessing manufacturing strategy definitions utilising text-mining. In: *International Journal of Production Research* 57 (14), S. 4519–4546. DOI: 10.1080/00207543.2018.1512764.

Kulkarni, Sourabh; Verma, Priyanka; R, Mukundan (2016): Extending Canvas of Manufacturing Strategy: 8Ps Model. In: *International Journal of Global Business and Competitiveness* 11 (1), S. 7–21.

Langley, Ann; Mintzberg, Henry; Pitcher, Patricia; Posada, Elizabeth; Saint-Macary, Jan (1995): Opening up Decision Making: The View from the Black Stool. In: *Organization Science* 6 (3), S. 260–279.

Lanza, Gisela; Ferdows, Kasra; Kara, Sami; Mourtzis, Dimitris; Schuh, Günther; Váncza, József et al. (2019): Global production networks: Design and operation. In: *CIRP Annals* 68 (2), S. 823–841. DOI: 10.1016/j.cirp.2019.05.008.

Lather, Patti (1992): Critical Frames in Educational Research: Feminist and Post-Structural Perspectives. In: *Theory Into Practice* 31 (2), S. 87–99.

Lee Park, Camila; Paiva, Ely Laureano (2018): How do national cultures impact the operations strategy process? In: *International Journal of Operations & Production Management* 38 (10), S. 1937–1963. DOI: 10.1108/IJOPM-03-2017-0145.

Leonard-Barton, Dorothy (1990): A Dual Methodology for Case Studies: Synergistic Use of a Longitudinal Single Site with Replicated Multiple Sites. In: *Organization Science* 1 (3), S. 248–266.

Leong, G. Keong; Snyder, D. L.; Ward, Peter T. (1990): Research in the Process and Content of Manufacturing Strategy. In: *International Journal of Management Science* 18 (2), S. 109–122.

Lester, Frank K. (2005): On the theoretical, conceptual, and philosophical foundations for research in mathematics education. In: *Zdm* 37 (6), S. 457–467.

Linda Smircich and Gareth Morgan (1982): Leadership: The Management of Meaning. In: *Journal of Applied Behavioral Science* 18 (3), S. 257–273.

Löfving, Malin; Säfsten, Kristina; Winroth, Mats (2016): Manufacturing strategy formulation, leadership style and organisational culture in small and medium-sized enterprises. In: *International Journal of Manufacturing Technology and Management* 30 (5), S. 306. DOI: 10.1504/IJMTM.2016.078918.

Lohmer, Jacob; Kossmann, Franz; Lasch, Rainer (2021): Manufacturing strategy in multi-plant networks – a multi-case study on decision-making authority, network capabilities and competitive advantages. In: *International Journal of Production Research*, S. 1–22. DOI: 10.1080/00207543.2021.1950936.

Lovas, Bjorn; Ghoshal, Sumantra (2000): Strategy as guided evolution. In: *Strategic Management Journal* 21, S. 875–896.

Lyles, Marjorie A.; Mitroff, Ian I. (1980): Organizational Problem Formulation: An Empirical Study. In: *Administrative Science Quarterly* 25 (1), S. 102–119.

Malhotra, Manoj K.; Sharma, Subhash (2002): Spanning the continuum between marketing and operations. In: *Journal of Operations Management* 20 (3), S. 209–219. DOI: 10.1016/S0272-6963(02)00019-0.

March, James G. (1978): Bounded Rationality, Ambiguity, and the Engineering of Choice. In: *The Bell Journal of Economics* 9 (2), S. 587–608.

March, James G.; Olsen, Johannes P. (1976): Ambiguity and Choice in Organizations. In: *Ambiguity and Choice in Organizations*.

- March, James G.; Simon, Herbert A. (1958): Organizations John Wiley & Sons. In: *New York*.
- Maritan, Catherine A.; Brush, Thomas H.; Karnani, Aneel G. (2004): Plant roles and decision autonomy in multinational plant networks. In: *Journal of Operations Management* 22 (5), S. 489–503. DOI: 10.1016/j.jom.2004.05.007.
- Maruchek, Ann; Pannesi, Ronald; Anderson, Carl (1990): An exploratory study of the manufacturing strategy process in practice. In: *Journal of Operations Management* 9 (1), S. 101–123. DOI: 10.1016/0272-6963(90)90148-7.
- Mayring, Philipp (1991): Qualitative Inhaltsanalyse. In: Uwe Flick (Hg.): *Handbuch qualitative Sozialforschung. Grundlagen, Konzepte, Methoden und Anwendungen*. München: Psychologie-Verl.-Union, S. 209–213.
- Mazzolini, Renato (1981): How Strategic Decisions are Made. In: *Long Range Planning* 14 (3), S. 85–96.
- Meijboom, Bert; Vos, Bart (1997): International manufacturing and location decisions: balancing configuration and co-ordination aspects. In: *International Journal of Operations & Production Management* 17 (8), S. 790–805.
- Menda, Rafael; Dilts, David (1997): The manufacturing strategy formulation process: Linking multifunctional viewpoints. In: *Journal of Operations Management* 15 (4), S. 223–241. DOI: 10.1016/S0272-6963(97)00007-7.
- Meredith, Jack (1998): Building operations management theory through case and field research. In: *Journal of Operations Management* 16 (4), S. 441–454. DOI: 10.1016/S0272-6963(98)00023-0.
- Meuser, Michael; Nagel, Ulrike (2009): The Expert Interview and Changes in Knowledge Production. In: Alexander Bogner, Beate Littig und Wolfgang Menz (Hg.): *Interviewing experts*. Basingstoke England, New York: Palgrave Macmillan (Research methods series), S. 17–42.
- Miedler, Philipp (2021): Analyzing and optimizing international manufacturing networks—learnings from the field. In: *Die Unternehmung* 75 (4), S. 521–536.
- Miedler, Philipp; Friedli, Thomas (2021): Deriving a Network Strategy. In: Thomas Friedli, Gisela. Lanza und Dominik Remling (Hg.): *Global Manufacturing Management: From excellent plants toward network optimization.*: Springer, S. 87–100.
- Miles, Matthew B.; Huberman, A. Michael; Saldaña, Johnny (2014): *Qualitative data analysis. A methods sourcebook*. Edition 3. Los Angeles, London, New Delhi, Singapore, Washington DC: Sage.

Mills, John; Platts, Ken; Gregory, Mike (1995): A framework for the design of manufacturing strategy processes. In: *International Journal of Operations & Production Management* 15 (4), S. 17–49.

Miltenburg, John (2005): How to formulate and implement a business strategy successfully. 2nd. New York: Productivity Press.

Miltenburg, John (2009): Setting manufacturing strategy for a company's international manufacturing network. In: *International Journal of Production Research* 47 (22), S. 6179–6203. DOI: 10.1080/00207540802126629.

Miltenburg, John (2015a): Changes in manufacturing facility-, network-, and strategy-types at the Michelin North America Company from 1950 to 2014. In: *International Journal of Production Research* 53 (10), S. 3175–3191. DOI: 10.1080/00207543.2014.975865.

Miltenburg, John (2015b): Changing a multidomestic production network to a global function network: North America Heinz ketchup from 1960 to 2015. In: *International Journal of Production Economics* 168, S. 267–278. DOI: 10.1016/j.ijpe.2015.07.003.

Mintzberg, Henry (1979): Patterns in Strategy Formation. In: *International Studies of Management & Organization* 9 (3), S. 67–86. DOI: 10.1080/00208825.1979.11656272.

Mintzberg, Henry (1994): The Rise and Fall of Strategic Planning. New York: The Free Press.

Mintzberg, Henry; Raisinghani, Duru; Theoret, Andre (1976): The Structure of "Unstructured" Decision Processes. In: *Administrative Science Quarterly* 21 (2), S. 246–275.

Müller-Setwens, Günter; Lechner, Christoph (1999): Die Gestaltung unternehmerischer Einheiten: Der General Management Navigator als ein Konzept zur integrierten Strategie- und Wandelarbeit. In: *Die Organisationsentwicklung* 18 (2), S. 24–43.

Mundt, Andreas (2013): The Architecture of Manufacturing Networks - Integrating the Coordination Perspective. In: (*Doctoral dissertation*).

Ocasio, William (1997): Towards an Attention-Based View of the Firm. In: *Strategic Management Journal* 18 (S1), S. 187–206.

Ocasio, William; Joseph, John (2005): An Attention-Based Theory of Strategy Formulation: Linking Micro- and Macroperspectives in Strategy Processes. In: *Strategy Process*, Bd. 22. Bingley: Emerald (MCB UP) (Advances in Strategic Management), S. 39–61.

Ocasio, William; Joseph, John (2008): Rise and Fall - or Transformation? In: *Long Range Planning* 41 (3), S. 248–272. DOI: 10.1016/j.lrp.2008.02.010.

Ocasio, William; Joseph, John (2018): The Attention-Based View of Great Strategies. In: *Strategy Science* 3 (1), S. 289–294. DOI: 10.1287/stsc.2017.0042.

Olhager, Jan; Feldmann, Andreas (2018): Distribution of manufacturing strategy decision-making in multi-plant networks. In: *International Journal of Production Research* 56 (1-2), S. 692–708. DOI: 10.1080/00207543.2017.1401749.

Olhager, Jan; Feldmann, Andreas (2021): Linking plant roles and operations strategy decision-making autonomy in international manufacturing networks. In: *International Journal of Production Research*, S. 1–14. DOI: 10.1080/00207543.2021.1991026.

Onwuegbuzie, A. J.; & Frels, R. (2016): 7 steps to a comprehensive literature review: A multimodal & cultural approach.: Sage.

Onwuegbuzie, A. J., Leech, N. L., & Collins, K. M. (2012): Qualitative analysis techniques for the review of the literature. In: *The Qualitative Report* 17 (56), S. 1–28.

O'Regan, Nicholas; Lehmann, Uwe (2008): The impact of strategy, leadership and culture on organisational performance: a case study of an SME. In: *International Journal of Process Management and Benchmarking* 2 (4), S. 303–322. DOI: 10.1504/IJPMB.2008.021790.

Papke Shields, Karen; Malhotra, Manoj K. (2008): Manufacturing managers' perceptions of functional power in manufacturing organizations. In: *International Journal of Operations & Production Management* 28 (9), S. 858–874. DOI: 10.1108/01443570810895285.

Papke-Shields, Karen E.; Malhotra, Manoj K. (2001): Assessing the impact of the manufacturing executive's role on business performance through strategic alignment. In: *Journal of Operations Management* 19 (1), S. 5–22. DOI: 10.1016/S0272-6963(00)00050-4.

Papke-Shields, Karen E.; Malhotra, Manoj K.; Grover, Varun (2006): Evolution in the strategic manufacturing planning process of organizations. In: *Journal of Operations Management* 24 (5), S. 421–439. DOI: 10.1016/j.jom.2005.11.012.

Peng, David Xiaosong; Lai, Fujun (2012): Using partial least squares in operations management research: A practical guideline and summary of past research. In: *Journal of Operations Management* 30 (6), S. 467–480. DOI: 10.1016/j.jom.2012.06.002.

Peterson, Randall S.; Smith, D. Brent; Martorana, Paul V.; Owens, Pamela D.

(2003): The impact of chief executive officer personality on top management team dynamics: one mechanism by which leadership affects organizational performance. In: *The Journal of applied psychology* 88 (5), S. 795–808. DOI: 10.1037/0021-9010.88.5.795.

Platts, K. W. (1994): Characteristics of methodologies for manufacturing strategy formulation. In: *Computer Integrated Manufacturing Systems* 7 (2), S. 93–99. DOI: 10.1016/0951-5240(94)90003-5.

Platts, K. W.; Gregory, M. J. (1990): Manufacturing Audit in the Process of Strategy Formulation. In: *International Journal of Operations & Production Management* 10 (9), S. 5–26. DOI: 10.1108/EUM0000000001264.

Platts, K. W.; Mills, J. F.; Bourne, M. C.; Neely, A. D.; Richards, A. H.; Gregory, M. J. (1998): Testing manufacturing strategy formulation processes. In: *International Journal of Production Economics* 56-57, S. 517–523. DOI: 10.1016/S0925-5273(97)00134-5.

Pontrandolfo, P.; Okogbaa O. (1999): Global manufacturing: a review and a framework for planning in a global corporation. In: *International Journal of Production Research* 37 (1), S. 1–19.

Porter, Michael E. (1986): Changing patterns of international competition. In: *California Management Review* 28 (2), S. 9–40. DOI: 10.1016/0737-6782(86)90056-1.

Porter, Michael E.; Heppelmann, James E. (2014): How Smart, Connected Products Are Transforming Competition. In: *Harvard Business Review* 92 (11), S. 64–88.

Prahalad, C. K.; Doz, Y. L. (1987): The multinational mission: Balancing local demands and global vision. New York: Simon and Schuster.

Prasad, Sameer; Babbar, Sunil (2000): International operations management research. In: *Journal of Operations Management* 18 (2), S. 209–247.

Qiu, Robin G. (2009): The challenges of manufacturing in the globally integrated economy. In: *International Journal of Computer Integrated Manufacturing* 22 (4), S. 281–282. DOI: 10.1080/09511920902857798.

Quezada, Luis E.; Córdova, Felisa M.; Widmer, Serge; O'Brien, Christopher (1999): A methodology for formulating a business strategy in manufacturing firms. In: *International Journal of Production Economics* 60-61, S. 87–94. DOI: 10.1016/S0925-5273(98)00194-7.

Quinn, James Brian (1980): Strategies for change: Logical incrementalism: Richard D Irwin.

Rivkin, Jan W. (2000): Imitation of Complex Strategies. In: *Management Science* 46 (6), S. 824–844.

Rosenthal, Robert; Rosnow, Ralph L. (2008): Essentials of behavioral research. Methods and data analysis. 3. ed. Boston: McGraw-Hill (McGraw-Hill higher education). Online verfügbar unter <http://www.loc.gov/catdir/enhancements/fy0702/2006017236-d.html>.

Rowley, Jennifer (2002): Using Case Studies in Research. In: *Management Research News* 25 (1).

Rudberg, Martin (2004): Linking competitive priorities and manufacturing networks: a manufacturing strategy perspective. In: *International Journal Manufacturing Technology and Management* Vol. 6 (1/2), S. 55–80.

Rudberg, Martin; Martin West, B. (2008): Global operations strategy: Coordinating manufacturing networks. In: *Omega* 36 (1), S. 91–106. DOI: 10.1016/j.omega.2005.10.008.

Rudberg, Martin; Olhager, Jan (2003): Manufacturing networks and supplychains: an operations strategyperspective. In: *Omega* (31), S. 29–39.

Rüegg-Stürm, Johannes (2005): The New St.Gallen Management Model. Basic Categories of an Approach to Integrated Management: PALGRAVE.

Saldaña, Johnny (2015): Thinking qualitatively. Methods of mind. Los Angeles, Calif.: Sage.

Saldaña, Johnny (2021): The coding manual for qualitative researchers. 4e. Los Angeles, London, New Delhi, Singapore, Washington DC, Melbourne: Sage.

Sarmiento, Roberto; Shukla, Vinaya; Izar-Landeta, Juan Manuel (2013): Performance improvements seen through the lens of strategic trade-offs. In: *International Journal of Production Research* 51 (15), S. 4682–4694. DOI: 10.1080/00207543.2013.784417.

Saunders, Mark; Lewis, Philip; Thornhill, Adrian (2019): Research methods for business students. Eighth edition. Harlow, England: Pearson.

Sayem, Ahmed; Feldmann, Andreas; Ortega-Mier, Miguel (2018): Coordination in International Manufacturing: The Role of Competitive Priorities and the Focus of Globally Dispersed Facilities. In: *Sustainability* 10 (5), S. 1314. DOI: 10.3390/su10051314.

Scherrer, Maike; Deflorin, Patricia (2017): Linking QFD and the manufacturing network strategy. In: *International Journal of Operations & Production Management* 37 (2), S. 226–255. DOI: 10.1108/IJOPM-07-2014-0350.

- Schmenner, Roger W. (1982): Multiplant Manufacturing Strategies among the Fortune 500. In: *Journal of Operations Management* 2 (2), S. 77–86. DOI: 10.1016/0272-6963(82)90024-9.
- Schweiger, David M.; Sanberg, William R.; Rechner, Paula I. (1989): Experiential Effects of Dialectical Inquiry, Devil's Advocacy, and Consensus Approaches to Strategic Decision Making. In: *The Academy of Management Journal* 32 (4), S. 745–772.
- Shi, Yongjiang; Gregory, Mike (1998): International manufacturing networks—to develop global competitive capabilities. In: *Journal of Operations Management* 16, S. 195–214.
- Simon, Herbert A. (1971): Designing organizations for an information-rich world. In: *Computers, communications, and the public interest* 72, S. 37.
- Simsek, Zeki; Veiga, John F.; Lubatkin, Michael H.; Dino, Richard N. (2005): Modeling the Multilevel Determinants of Top Management Team Behavioral Integration. In: *The Academy of Management Journal* 48 (1), S. 69–84.
- Skinner, C. Wickham (1969): Manufacturing - Missing Link in Corporate Strategy, S. 136–145.
- Skinner, Wickham (1974): The Focused Factory. In: *Harvard Business Review* 52, S. 113–121. DOI: 10.1225/74308.
- Slack, Nigel (2015): Operations Strategy. In: 1098-6596. DOI: 10.1002/9781118785317.weom100160.
- Snyder, Hannah (2019): Literature review as a research methodology: An overview and guidelines. In: *Journal of Business Research* 104, S. 333–339. DOI: 10.1016/j.jbusres.2019.07.039.
- Strang, Kenneth D. (2015): The Palgrave Handbook of Research Design in Business and Management. New York: Palgrave Macmillan US.
- Strauss, Anselm L.; Corbin, Juliet M. (1991): Basics of qualitative research. Grounded theory procedures and techniques. 3. printing. Newbury Park, Calif.: Sage.
- Stuart, I.; McCutcheon, D.; Handfield, R.; McLachlin, R.; Samson, D. (2002): Effective case research in operations management: a process perspective. In: *Journal of Operations Management* 20, S. 419–433.
- Sun, Hongyi; Hong, Cui (2002): The alignment between manufacturing and business strategies: its influence on business performance. In: *Technovation* 22 (11), S. 699–705. DOI: 10.1016/S0166-4972(01)00066-9.

Swamidass, Paul M.; Darlow, Neil; Baines, Tim (2001): Evolving forms of manufacturing strategy development. In: *International Journal of Operations & Production Management* 21 (10), S. 1289–1304. DOI: 10.1108/EUM0000000005971.

Swamidass, Paul M.; Newell, William T. (1987): Manufacturing Strategy, Environmental Uncertainty and Performance: A Path Analytic Model. In: *Management Science* 33 (4), S. 509–524. DOI: 10.1287/mnsc.33.4.509.

Swink, Morgan; Narasimhan, Ram; Wang, Cynthia (2007): Managing beyond the factory walls: Effects of four types of strategic integration on manufacturing plant performance (25). Online verfügbar unter <https://reader.elsevier.com/reader/sd/pii/S027269630600009X?token=6FD60350236B4180A571B7CF5FA61E06073577F3C00BD42D9C6D173742256037FC4A2CCF372FDAD97E01D71E32A6C93A>.

Szwejczeniowski, Marek; Sweeney, Michael T.; Cousens, Alan (2016): The strategic management of manufacturing networks. In: *Journal of Manufacturing Technology Management* 27 (1), S. 124–149. DOI: 10.1108/JMTM-10-2014-0116.

Teddle, Charles; Yu, Fen (2007): Mixed Methods Sampling. In: *Journal of Mixed Methods Research* 1 (1), S. 77–100. DOI: 10.1177/1558689806292430.

Teece, David J.; Pisano, Gary P.; Shuen, Amy (1997): Dynamic capabilities and strategic management. In: *Strategic Management Journal* 18 (7), S. 509–533.

Thomas, Simone (2013): Produktionsnetzwerksysteme - Ein Weg zu effizienten Produktionsnetzwerken. In: *Diss. Univ. St. Gallen. St. Gallen*.

Thomas, Simone; Scherrer-Rathje, Maike; Fischl, Maria; Friedli, Thomas (2015): Linking network targets and site capabilities. In: *International Journal of Operations & Production Management* 35 (12), S. 1710–1734. DOI: 10.1108/IJOPM-10-2014-0464.

Thompson, James D. (2008): Organizations in action. Social science bases of administrative theory. 6. print. New Brunswick, NJ: Transaction Publ (Classics in organization and management).

Thun, Jörn-Henrik (2008): Empirical analysis of manufacturing strategy implementation. In: *International Journal of Production Economics* 113 (1), S. 370–382. DOI: 10.1016/j.ijpe.2007.09.005.

Tomczak, Torsten (1992): Forschungsmethoden in der Marketingwissenschaft. Ein Plädoyer für den qualitativen Forschungsansatz. In: *Marketing: Zeitschrift für Forschung und Praxis* (2), S. 77–87.

Tripsas, Mary (2009): Technology, Identity, and Inertia Through the Lens of “The

Digital Photography Company”. In: *Organization Science* 20 (2), S. 441–460. DOI: 10.1287/orsc.1080.0419.

Ulrich, H. (1983): Die Betriebswirtschaftslehre als anwendungsorientierte Sozialwissenschaft. In: *Management, Schriftreihe Unternehmung und Unternehmungsführung*, S. 168–199.

Ulrich, P.; Hill, W. (1973): Wissenschaftstheoretische Grundlagen der Betriebswirtschaftslehre (Teil1). In: *Wirtschaftswissenschaftliches Studium* 5 (7), S. 304–309.

Vereecke, Ann; van Dierdonck, Roland (2002): The strategic role of the plant: testing Ferdows’s model. In: *International Journal of Operations & Production Management* 22 (5), S. 492–514. DOI: 10.1108/01443570210425147.

Vereecke, Ann; van Dierdonck, Roland; Meyer, Arnoud de (2006): A Typology of Plants in Global Manufacturing Networks. In: *Management Science* 52 (11), S. 1737–1750. DOI: 10.1287/mnsc.1060.0582.

Verhaelen, Bastian; Haefner, Benjamin; Lanza, Gisela (2021): Methodology for the strategy-oriented distribution of decision autonomy in global production networks. In: *Procedia CIRP* 96, S. 15–20. DOI: 10.1016/j.procir.2021.01.045.

Vickery, Shawnee K.; Droge, Cornelia; Markland, Robert E. (1993): Production Competence and Business Strategy: Do They Affect Business Performance? In: *Decision Sciences* 24 (2), S. 435–456. DOI: 10.1111/j.1540-5915.1993.tb00482.x.

Vokurka, Robert J.; Davis, Robert A. (2004): Manufacturing strategic facility types. In: *Industrial Management & Data Systems* 104 (6), S. 490–504. DOI: 10.1108/02635570410543799.

Voss, C. A. (1995): Alternative paradigms for manufacturing strategy. In: *International Journal of Operations & Production Management* 15 (4), S. 5–16. DOI: 10.1108/01443570510633611.

Voss, C. A. (2005): Paradigms of manufacturing strategy re-visited. In: *International Journal of Operations & Production Management* 25 (12), S. 1223–1227. DOI: 10.1108/01443570510633620.

Voss, Chris; Tsikriktsis, Nikos; Frohlich, Mark (2002): Case research in operations management. In: *International Journal of Operations & Production Management* 22 (2), S. 195–219. DOI: 10.1108/01443570210414329.

Wang, Xueyuan; Zhang, Yufeng (2019): Engineering network operations for international manufacturing: strategic orientations, influencing factors and improvement paths. In: *Production Planning & Control* 30 (2-3), S. 239–258. DOI: 10.1080/09537287.2018.1534290.

Ward, Peter T.; Duray, Rebecca (2000): Manufacturing strategy in context: Environment, competitive strategy and manufacturing strategy. In: *Journal of Operations Management* 18 (2), S. 123–138. DOI: 10.1016/S0272-6963(99)00021-2.

Waterman, Robert H.; Peters, Thomas J. (1982): In search of excellence: Lessons from America's best-run companies: New York: Harper & Row.

Webster, Jane; Watson, Richard T. (2002): Analyzing the Past to Prepare for the Future: Writing a Literature Review. In: *MIS Quarterly* 26 (2), S. 13–23.

Weick, Karl E.; Roberts, Karlene H. (1993): Collective Mind in Organizations: Heedful Interrelating on Flight Decks. In: *Administrative Science Quarterly* 38 (3), S. 357–381.

Wheelwright, Steven C. (1984): Manufacturing Strategy : Defining the Missing Link : Summary. In: *Strategic Management Journal* 5 (1), S. 77–91.

Wheelwright, Steven C.; Hayes, Robert H. (1985): Competing Through Manufacturing. In: *Havard Business Review* 63 (1), S. 99–109. Online verfügbar unter <http://proquest.umi.com/pqdlink?did=8963475&Fmt=7&clientId=36563&RQT=309&VName=PQD>.

Williamson, Oliver E. (1985): The economic institutions of capitalism. New York: Free Press: Douglas.

Wit, Bob de; Meyer, Ron (2010): Strategy: Process, content, context. Hampshire: Cengage Learning.

Wooldridge, Bill; Floyed, Steven W. (1989): Strategic Process Effects on Consensus. In: *Strategic Management Journal* 10 (3), S. 295–302.

Wooldridge, Bill; Floyed, Steven W. (1990): The Strategy Process, Middle Management Involvement, and Organizational Performance. In: *Strategic Management Journal* 11 (3), S. 231–241.

Yin, R. K. (2009): Case study research: Design and methods. 4th Ed. Thousand Oaks, CA: Sage.

Yin, Robert K. (2018): Case study research and applications. Design and methods. Sixth edition. Los Angeles, London, New Dehli, Singapore, Washington DC, Melbourne: Sage.

Zhang, Yan; Rajagopalan, Nandini (2003): Explaining New CEO Origin: Firm versus Industry Antecedents. In: *The Academy of Management Journal* 46 (3), S. 327–338.

Appendix A: Benchmarking Survey Questionnaire

Questionnaire

1 LandingPage

Benchmarking Study

Rethinking Global Production Strategy

A project by the ITEM-HSG, University of St. Gallen

Today's business environment challenges globally operating companies to a great extent. Not only increasing customer requirements and product complexity, but also unpredictable risks and environmental concerns increasingly threaten global value chains and reveal their limitations. A sustainable competitive advantage can be achieved by those companies that are able to holistically reflect these multidimensional influences in their global production strategy by strengthening the resilience.

We therefore would like to address the following topics in our benchmarking 2021:

- Empowering the **voice of production** in the strategic corporate priorities
- **Agile strategy processes** to flexibly respond to external uncertainties and strengthen the resilience
- **Harmonization of silo dominated strategies** between different functions
- **Vertical cascading of goal setting** from top floor to shop floor

The study addresses companies from all industries and regions. The objective is to identify "Successful Practice" companies, who master the challenges of strategy formulation and implementation in global production networks in a remarkable manner.

This questionnaire is addressed to persons who are responsible for the **management of multiple production sites**.

We look forward to your participation!

With kind regards



Prof. Dr. Thomas Friedli

Director
Institute of Technology
Management (ITEM-HSG)

Your benefits:

- **Personalized evaluation** of the study and report for your company
- Comparison of your company performance with **industry benchmark** to derive implications
- Among all participants, we will raffle **five copies of our latest book** "Global Manufacturing Management - From Excellent Plants Toward Network Optimization" (worth 80 CHF each)
- Depending on your performance you might be chosen as "Successful Practice" company:
 - In this case you have the opportunity to visit other "Successful Practice" companies
 - On this occasion you have the possibility to discuss challenges and opportunities for your business
 - You will receive a "Successful Practice" award from the University of St.Gallen

The confidentiality of the data:

All data will be treated confidentially by the University of St.Gallen and will not be given to associations or third parties. In addition, we comply with the „International Benchmarking Code of Conduct“, which is based on the widely used APQC/SPI Code of Conduct.

Questionnaire Structure:

The questionnaire's structure and specific questions were developed together with an industrial consortium of four globally producing companies and consists of four main chapters:

General <i>Industry / Market & Competitors / Performance</i>
Strategy Context <i>Trends / Stakeholder / Voice of Operations</i>
Strategy Content <i>Goals / Definiteness / Components</i>
Strategy Process <i>Decisions / Formulation / Support / Collaboration</i>

The questionnaire requires **30 - 45 minutes** to complete.

Contact:

We offer email and telephone assistance for this questionnaire. Please do not hesitate to contact us.



Philipp Miedler

Research Associate

✉ philipp.miedler@unisg.ch

☎ +41 (0)71 224 73 09

Contact Details

In order to provide you with a **personalized evaluation of the study results**, we ask you to submit your contact information:

First Name

#v_1553#

Last Name

#v_1554#

Company

#v_1555#

Position

#v_1556#

E-Mail (a@bc.de)

#v_1557#

Telephone (+4171123456)

#v_1558#

We keep your data strictly confidential.

If you have any kinds of questions, please do not hesitate to contact

- Philipp Miedler (E-Mail: philipp.miedler@unisg.ch, Phone: +41 (0) 71 224 73 09) or
- Jens Kaiser (E-Mail: jens.kaiser@unisg.ch, Phone: +41 (0) 71 224 72 62).

2 ScopeDefinition

The quality and usability of the survey results depend on the exact definition of the **analyzed unit**. Since the focus of this questionnaire is the evaluation of your production network, it is necessary to define the **organizational scope of your production network**. The answer should relate to the company name (#c 0001#) you stated on the last page.

- Please consider this short **definition** of a production network:

Organizational Scope

☐ Company-wide network

☐ Division-wide network

☐ Business-unit-wide network

☐ Other type of network, please specify:

If your organizational scope (as answered above) is **not** a "Company-wide network", then please indicate the name of your division, business unit, or other sub-network to be analyzed. Otherwise, your organizational unit is already set as the company name (#c_0001#) you indicated on the previous page and must not be entered here again.

Please indicate the country in which the headquarter of your organizational unit resides. In case you fill the questionnaire for a "Company-wide network", please indicate the country of the company headquarters.

- Afghanistan
- Albania
- Algeria
- Andorra
- Angola
- Antigua and Barbuda
- Argentina
- Armenia
- Australia
- Austria
- Azerbaijan
- Bahamas
- Bahrain
- Bangladesh
- Barbados
- Belarus
- Belgium
- Belize
- Benin
- Bhutan
- Bolivia (Plurinational State of)
- Bosnia and Herzegovina
- Botswana
- Brazil
- Brunei Darussalam
- Bulgaria
- Burkina Faso
- Burundi
- Cabo Verde
- Cambodia
- Cameroon
- Canada
- Central African Republic
- Chad

China
 Colombia
 Comoros
 Congo
 Congo, Democratic Republic of the
 Costa Rica
 Côte d'Ivoire
 Croatia
 Cuba
 Cyprus
 Czechia
 Denmark
 Djibouti
 Dominica
 Dominican Republic
 Ecuador
 Egypt
 El Salvador
 Equatorial Guinea
 Eritrea
 Estonia
 Eswatini
 Ethiopia
 Fiji
 Finland
 France
 Gabon
 Gambia
 Georgia
 Germany
 Ghana
 Greece
 Grenada
 Guatemala
 Guinea
 Guinea-Bissau
 Guyana
 Haiti
 Honduras
 Hungary
 Iceland
 India
 Indonesia
 Iran (Islamic Republic of)
 Iraq
 Ireland
 Israel
 Italy
 Jamaica
 Japan
 Jordan
 Kazakhstan
 Kenya
 Kiribati
 Korea (Democratic People's Republic of)
 Korea, Republic of
 Kuwait
 Kyrgyzstan
 Lao People's Democratic Republic
 Latvia
 Lebanon
 Lesotho
 Liberia
 Libya
 Liechtenstein
 Lithuania
 Luxembourg
 Madagascar
 Malawi
 Malaysia
 Maldives
 Mali
 Malta
 Marshall Islands
 Mauritania
 Mauritius
 Mexico
 Micronesia (Federated States of)
 Moldova, Republic of
 Monaco

Mongolia
 Montenegro
 Morocco
 Mozambique
 Myanmar
 Namibia
 Nauru
 Nepal
 Netherlands
 New Zealand
 Nicaragua
 Niger
 Nigeria
 North Macedonia
 Norway
 Oman
 Pakistan
 Palau
 Panama
 Papua New Guinea
 Paraguay
 Peru
 Philippines
 Poland
 Portugal
 Qatar
 Romania
 Russian Federation
 Rwanda
 Saint Kitts and Nevis
 Saint Lucia
 Saint Vincent and the Grenadines
 Samoa
 San Marino
 Sao Tome and Principe
 Saudi Arabia
 Senegal
 Serbia
 Seychelles
 Sierra Leone
 Singapore
 Slovakia
 Slovenia
 Solomon Islands
 Somalia
 South Africa
 South Sudan
 Spain
 Sri Lanka
 Sudan
 Suriname
 Sweden
 Switzerland
 Syrian Arab Republic
 Tajikistan
 Tanzania, United Republic of
 Thailand
 Timor-Leste
 Togo
 Tonga
 Trinidad and Tobago
 Tunisia
 Turkey
 Turkmenistan
 Tuvalu
 Uganda
 Ukraine
 United Arab Emirates
 United Kingdom of Great Britain and Northern Ireland
 United States of America
 Uruguay
 Uzbekistan
 Vanuatu
 Venezuela (Bolivarian Republic of)
 Viet Nam
 Yemen
 Zambia
 Zimbabwe

Please keep in mind that the following questions always address the organizational scope selected above, i.e., the whole company or a division/business unit/... sub-network. In the following, we call this unit *your production network*.

3 General Information

General Information

Please enter some general information about the organizational unit (#c_0003#) of your production network.

Industry

Please indicate the **primary** industrial sector in which your organizational unit (#c_0003#) operated.

- ☐ Oil & Gas
- ☐ Chemicals
- ☐ Basic Materials
- ☐ Industrials
- ☐ Automobiles & Parts
- ☐ Food & Beverage
- ☐ Personal & Household Goods
- ☐ Health Care
- ☐ Other manufacturing:

Number of Employees

Please indicate the total number of employees in your organizational unit (#c_0003#) at the end of the year 2020.

- ☐ < 250 employees
- ☐ 250 - 500 employees
- ☐ 501 - 750 employees
- ☐ 751 - 1,000 employees
- ☐ 1,001 - 5,000 employees
- ☐ 5,001 - 10,000 employees
- ☐ 10,001 - 50,000 employees
- ☐ > 50,000 employees

Number of Sites

Please indicate the geographic dispersion of your organizational unit's (#c_0003#) production network by entering the number of sites in each region listed below.

(We describe regions marked with * after pointing the mouse cursor on them.)

Western Europe*	
Eastern Europe*	
USA & Canada	
Central & South America	
Middle East*	
Russia & (former) CIS*	
Africa	
India	

China	
Japan, Singapore & South Korea	
Rest of Asia*	
Australia & New Zealand	
Oceania*	

Number of Product Groups

Please indicate the number of product groups produced from your organizational unit (#c_0003#) sold from a marketing perspective in the year 2020.

- ☐ 1 product group
- ☐ 2 - 5 product groups
- ☐ 6 - 10 product groups
- ☐ 11 - 20 product groups
- ☐ 21 - 30 product groups
- ☐ 31 - 40 product groups
- ☐ > 40 product groups
- ☐ n/a

Customer Decoupling point

Where is the customer order decoupling point for your main product?

- ☐ Engineer-to-Order (ETO): Design, purchasing and production to customer order
- ☐ Make-to-Order (MTO): Purchasing of raw materials on forecast and production to customer order
- ☐ Assemble-to-Order (ATO): Assemble to customer order, while modules and subsystems are based on forecast
- ☐ Make-to-Stock (MTS): Production to finished goods inventory at the factory
- ☐ Make and Distribute-to-Stock: Production and distribution to stock to a stock point in the distribution system

4 MarketCustomer&CompetitorInformation

Market, Customer & Competitor Information

Please enter some general information about the market, customers and competitors in the production network of your organizational unit (#c_0003#).

If no explicit answer is possible, focus on the main product/market/competitor/customer.

Market Share

Please indicate the market share in relevant market segments and the aspired market share in five years for your organizational unit's (#c_0003#) production network.

	< 5%	5 - 10%	11 - 20%	21 - 30%	31 - 40%	41 - 50%	> 50%	n/a
Today's market share in relevant market segments	☐	☐	☐	☐	☐	☐	☐	☐
Aspired market share in 5 years	☐	☐	☐	☐	☐	☐	☐	☐

Market Dynamics

Please indicate market dynamics as demand shifts for your organizational unit (#c_0003#) within the last five years.

- ☐ Stable
- ☐ Mostly stable
- ☐ Somewhat stable
- ☐

Neutral

- ☐ Somewhat volatile
- ☐ Mostly volatile
- ☐ Volatile
- ☐ n/a

Customer Structure

Please indicate the customer structure for your organizational unit's (#c_0003#) production network in the **year 2020**.

	< 20%	20 - 30%	31 - 40%	41 - 50%	51 - 60%	61 - 70%	> 70%	n/a
Percentage of Top 5 customer sales on total sales	☐	☐	☐	☐	☐	☐	☐	☐
Percentage of sales to global distributed customers on total sales	☐	☐	☐	☐	☐	☐	☐	☐

Change in Customer Base

Please indicate the changes in the customer base for your organizational unit (#c_0003#) within the **last five years**.

- ☐ Strongly decreasing
- ☐ Decreasing
- ☐ Slightly decreasing
- ☐ Stable
- ☐ Slightly increasing
- ☐ Increasing
- ☐ Strongly increasing
- ☐ n/a

Competitor Structure

Please indicate the competitor structure for your organizational unit's (#c_0003#) production network in the **year 2020**.

	< 20%	20 - 30%	31 - 40%	41 - 50%	51 - 60%	61 - 70%	> 70%	n/a
Market share of Top 5 competitors	☐	☐	☐	☐	☐	☐	☐	☐
Percentage of global distributed competitors (as share of total number of competitors)	☐	☐	☐	☐	☐	☐	☐	☐

Changes of Competitor Base

Please indicate the changes of the competitor base for your organizational unit (#c_0003#) for the **last five years**.

- ☐ Strongly decreasing
- ☐ Decreasing
- ☐ Slightly decreasing
- ☐ Stable
- ☐ Slightly increasing
- ☐ Increasing
- ☐ Strongly increasing
- ☐

n/a

Competitive Priorities

Please indicate which dimensions listed below, are important to support the demands of the markets in which your organizational unit competes?

	Not at all important	Low importance	Slightly important	Moderately important	Important	Very important	Most important	n/a
Meeting and / or beating price levels	☐	☐	☐	☐	☐	☐	☐	☐
Providing products which fully meet or exceed customer requirements	☐	☐	☐	☐	☐	☐	☐	☐
Producing goods to their defined specification reliably and consistently	☐	☐	☐	☐	☐	☐	☐	☐
Meeting and exceeding the expected delivery speed	☐	☐	☐	☐	☐	☐	☐	☐
Keeping delivery promises on time and in full	☐	☐	☐	☐	☐	☐	☐	☐
Providing a wide product range and / or developing new designs quickly	☐	☐	☐	☐	☐	☐	☐	☐
Changing order sizes and / or delivery times quickly	☐	☐	☐	☐	☐	☐	☐	☐
Providing innovative products or processes	☐	☐	☐	☐	☐	☐	☐	☐
Enhancing products with additional customer service	☐	☐	☐	☐	☐	☐	☐	☐

5 Performance

Performance

Please enter some information about the performance of the production network of your organizational unit (#c_0003#).
If no explicit answer is possible, focus on the main product.

Performance - External Comparison

Please indicate for each dimension listed below, how you perform relative to the main competitors? Qualitative assessment only!

	Much lower			Equal			Much better	n/a
Profitability	☐	☐	☐	☐	☐	☐	☐	☐
Cost efficiency	☐	☐	☐	☐	☐	☐	☐	☐
Quality	☐	☐	☐	☐	☐	☐	☐	☐
On-time delivery	☐	☐	☐	☐	☐	☐	☐	☐
Delivery speed	☐	☐	☐	☐	☐	☐	☐	☐
Volume flexibility (e.g.: order size flexibility)	☐	☐	☐	☐	☐	☐	☐	☐
Design flexibility (e.g.: product range or meeting customers' individual product expectations)	☐	☐	☐	☐	☐	☐	☐	☐
After market service	☐	☐	☐	☐	☐	☐	☐	☐
Rate of new product introductions (e.g.: innovation)	☐	☐	☐	☐	☐	☐	☐	☐

Performance - Internal Development

Please indicate for each dimension listed below, how your performance has changed over the last five years?

	Strongly decreased	Decreased	Slightly decreased	Equal	Slightly increased	Increased	Strongly increased	n/a
Profitability	☐	☐	☐	☐	☐	☐	☐	☐
Cost efficiency	☐	☐	☐	☐	☐	☐	☐	☐
Quality	☐	☐	☐	☐	☐	☐	☐	☐
On-time delivery	☐	☐	☐	☐	☐	☐	☐	☐
Delivery speed	☐	☐	☐	☐	☐	☐	☐	☐
Volume flexibility (e.g.: order size flexibility)	☐	☐	☐	☐	☐	☐	☐	☐
Design flexibility (e.g.: product range or meeting customers' individual product expectations)	☐	☐	☐	☐	☐	☐	☐	☐
After market service	☐	☐	☐	☐	☐	☐	☐	☐
Rate of new product introductions (e.g.: innovation)	☐	☐	☐	☐	☐	☐	☐	☐

6 Context Factors

Strategy Context

Please enter some information about the context factors, that are influencing the global production strategy of your organizational unit (#c_0003#).

Mega-Trends

Please indicate which megatrends influence the global production strategy of your organizational unit (#c_0003#).

	Not at all	Low	Slightly	Neutral	Moderately	Very	Extremely	n/a
Protectionism (e.g.: import tariffs, quotas, subsidies, different tax structures)	☐	☐	☐	☐	☐	☐	☐	☐
Political stability (e.g.: terrorism, conflict, social unrest)	☐	☐	☐	☐	☐	☐	☐	☐
Social changes (e.g.: population growth, demographic change, urbanization)	☐	☐	☐	☐	☐	☐	☐	☐
Change in consumption pattern (e.g.: more environmental awareness, individualism, mass customization, middle-class explosion, healthy diets & lifestyles, consumerism)	☐	☐	☐	☐	☐	☐	☐	☐
Global trade shift (e.g.: economic growth in emerging economies, export growth, investment, globalization, emergence of born-global firms)	☐	☐	☐	☐	☐	☐	☐	☐
Digital transformation (e.g.: big data analytics, AI, cloud based computer systems, blockchain, IoT)	☐	☐	☐	☐	☐	☐	☐	☐
Technology development and automatization (e.g.: electrification, robots, cyber-physical system, augmented & virtual reality, 3D printing / additive manufacturing,	☐	☐	☐	☐	☐	☐	☐	☐

drones, autonomous systems, automated guided vehicles, renewable energy sources, wearable devices)

Legal (e.g.: social and environmental regulations, consumer protection laws, intellectual property law, trade agreements)

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Environmental (e.g.: climate change, resource scarcity, catastrophic events/hazards, pollution, CO2 emissions)

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Supply chain disruptions

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Others:

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Influencing Stakeholder

Please indicate which stakeholders influence the global production strategy of your organizational unit (#c_0003#).

	Not at all	Low	Slightly	Neutral	Moderately	Very	Extremely	n/a
Suppliers	☐	☐	☐	☐	☐	☐	☐	☐
Customers	☐	☐	☐	☐	☐	☐	☐	☐
Competitors	☐	☐	☐	☐	☐	☐	☐	☐
Investors / Shareholders	☐	☐	☐	☐	☐	☐	☐	☐
Others:	☐	☐	☐	☐	☐	☐	☐	☐

Influencing Functional Areas

Please indicate which functional areas influence the global production strategy of your organizational unit (#c_0003#).

	Not at all	Low	Slightly	Neutral	Moderately	Very	Extremely	n/a
Quality Management	☐	☐	☐	☐	☐	☐	☐	☐
Marketing and Sales	☐	☐	☐	☐	☐	☐	☐	☐
General / Top Management	☐	☐	☐	☐	☐	☐	☐	☐
Accounting and Finance	☐	☐	☐	☐	☐	☐	☐	☐
Legal	☐	☐	☐	☐	☐	☐	☐	☐
Research and Development (including Engineering)	☐	☐	☐	☐	☐	☐	☐	☐
Human Resources	☐	☐	☐	☐	☐	☐	☐	☐
Others:	☐	☐	☐	☐	☐	☐	☐	☐

7 Voice Of Operation

Voice of Operations

Please enter some information about the involvement of production and operations know-how in strategic decisions for the global production network of your organizational unit (#c_0003#).

Involvement

Please indicate to what extent the statements below apply to the production network of your organizational unit (#c_0003#).
(We explain terms marked with * pointing the mouse cursor on them.)

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	n/a
The network manager is totally involved in specifying the strategy of the firm.	☐	☐	☐	☐	☐	☐	☐	☐
The network manager participated in capital budget decisions (the selection and	☐	☐	☐	☐	☐	☐	☐	☐

financing of long-term investments).

The network manager participates in decision making regarding changes in the business units operating philosophy and strategies for growth.

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The network manager takes an active, proactive role in strategic business planning.

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

The top management^b gives sufficient attention to issues relevant to the production network in their strategic decisions.

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Presence of Operations in the Top Management Team

Please indicate how many people in the top management have at least three years of production experience. For this question please separate between board of directors, C-level management and Vice Presidents.

Number of board of directors with at least three years experience:

Total number of board of directors:

Number of C-level manager with at least three years experience:

Total number of C-level managers:

Number of Vice Presidents with at least three years experience:

Total number of Vice Presidents:

Other Involvements

Are there any other ways in which the voice of operations is present in the formulation of the overall strategy? Please describe briefly (e.g.: results from plant manager meetings, production days, conferences with process specialists, workshops,...):

8 Global Production Strategy Content

Strategy Content

Please enter some information about the content of the global production strategy of your organizational unit (#c_0003#).

Strategy Formulation

Please rate yourself with the following statement: "We have a clearly and detailed formulated strategy for the global production network."

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neutral
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree
- ☐ n/s

Integrated Strategy

Please assess to what extent the network strategy is embedded in the overall company strategy.

- ☐ Very poor
☐
☐ Neutral
☐
☐ Very good
☐ n/a

Strategy Deployment

Please assess how the formulated strategy for the global production strategy of your organizational unit (#c_0003#) has been deployed within the company considering its communication, implementation and tracking/monitoring.

	Very poor			Neutral			Very good	n/a
Strategy communication	☐	☐	☐	☐	☐	☐	☐	☐
Strategy implementation (e.g.: strategy execution, ...)	☐	☐	☐	☐	☐	☐	☐	☐
Strategy tracking/monitoring (e.g.: performance measurement, auditing,...)	☐	☐	☐	☐	☐	☐	☐	☐

9 NetworkFocus

Strategic Network Focus

From today's perspective (As-Is), please rate the fulfillment of the following strategic capabilities of your organizational unit's (#c_0003#) production network.
*(We explain terms marked with * pointing the mouse cursor on them.)*

Strategic Access

From today's perspective (As-Is), our organizational unit's (#c_0003#) production network is able to provide with favorable access to...

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	n/a
... markets & customers*.	☐	☐	☐	☐	☐	☐	☐	☐
... competitors*.	☐	☐	☐	☐	☐	☐	☐	☐
... socio-political factors*.	☐	☐	☐	☐	☐	☐	☐	☐
... image*.	☐	☐	☐	☐	☐	☐	☐	☐
... suppliers and raw material*.	☐	☐	☐	☐	☐	☐	☐	☐
... best-cost labor*.	☐	☐	☐	☐	☐	☐	☐	☐
... skilled labor*.	☐	☐	☐	☐	☐	☐	☐	☐
... external know-how*.	☐	☐	☐	☐	☐	☐	☐	☐

Strategic Efficiency

From today's perspective (As-Is), our organizational unit's (#c_0003#) production network is able to provide us with cost advantages and contribute to efficiency improvements by realizing...

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	n/a
... economies of scale*.	☐	☐	☐	☐	☐	☐	☐	☐
... economies of scope*.	☐	☐	☐	☐	☐	☐	☐	☐
... reduction of duplications*.	☐	☐	☐	☐	☐	☐	☐	☐

Strategic Mobility

From today's perspective (As-Is), our organizational unit's (#c_0003#) production network enables us to respond quickly to changes in the market by economically transferring...

Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	n/a
-------------------	----------	-------------------	---------	----------------	-------	----------------	-----

... products, processes, or personnel*.	☐	☐	☐	☐	☐	☐	☐	☐
... production volumes*.	☐	☐	☐	☐	☐	☐	☐	☐

Strategic Learning

From today's perspective (As-Is), our organizational unit's (#c_0003#) production network is able to provide us with excellent learning ability through unlocking and transferring knowledge about...

	Strongly disagree	Disagree	Somewhat disagree	Neutral	Somewhat agree	Agree	Strongly agree	n/a
... external factors*.	☐	☐	☐	☐	☐	☐	☐	☐
... internal factors*.	☐	☐	☐	☐	☐	☐	☐	☐

10 Strategy Components

Strategy Components

Please assess to what extend the following topics are addressed in the global production strategy of your network.

	Not at all			Somewhat			Clearly and precisely	n/a
Manufacturing competitive priorities (e.g.: costs, quality, flexibility, delivery, innovation,...)	☐	☐	☐	☐	☐	☐	☐	☐
Manufacturing network capabilities (e.g.: accessibility, thriftiness, mobility, learning)	☐	☐	☐	☐	☐	☐	☐	☐
Geographical dispersion of sites (e.g.: network footprint, offshoring, reshoring,...)	☐	☐	☐	☐	☐	☐	☐	☐
Capacity distribution	☐	☐	☐	☐	☐	☐	☐	☐
Specialization of the network (e.g.: product oriented, market-oriented, process oriented,...)	☐	☐	☐	☐	☐	☐	☐	☐
Specialization of sites (e.g.: site roles, strategic site reasons)	☐	☐	☐	☐	☐	☐	☐	☐
Investment in technology	☐	☐	☐	☐	☐	☐	☐	☐
Digitalization	☐	☐	☐	☐	☐	☐	☐	☐
Internal supply chain (e.g.: local-for-local, world factory, global hub&spoke, global value chain,...)	☐	☐	☐	☐	☐	☐	☐	☐
Make-or-Buy	☐	☐	☐	☐	☐	☐	☐	☐
Management structure	☐	☐	☐	☐	☐	☐	☐	☐
Distribution of responsibilities between sites and network	☐	☐	☐	☐	☐	☐	☐	☐
Degree of standardization (e.g.: IT-systems, production systems, sourcing, cost calculation,...)	☐	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐	☐

Exchange of know-how and information

Exchange of goods and resources

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Others:

☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

11 Strategic Decisions

Strategic Decisions

Please choose at which level the strategic decisions below are made.

	Each Site Individually	Selected Sites*	Network management*	Top management*	n/a
Choice of products manufactured at the plant	☐	☐	☐	☐	☐
Choice of manufacturing layout (project, job shop, flow shop, line, continuous)	☐	☐	☐	☐	☐
Choice of manufacturing technology	☐	☐	☐	☐	☐
Capacity levels relative demand	☐	☐	☐	☐	☐
Timing of capacity acquisition (e.g.: leading, lagging,...)	☐	☐	☐	☐	☐
Choice of plant focus (e.g.: product focus, process focus, market focus,...)	☐	☐	☐	☐	☐
Choice of plant specialization (e.g.: dedicated, multipurpose,...)	☐	☐	☐	☐	☐
Make-or-Buy decisions	☐	☐	☐	☐	☐
Value added inside plant	☐	☐	☐	☐	☐
Supplier selection	☐	☐	☐	☐	☐
Delivery programs with customers (e.g.: vendor inventory management)	☐	☐	☐	☐	☐
Choice of organizational structure (e.g.: central, decentral,...)	☐	☐	☐	☐	☐
Employee competence development	☐	☐	☐	☐	☐
Selection of quality tools (e.g.: 5S, QFD, PDCA,...)	☐	☐	☐	☐	☐
Selection of improvement programs (e.g.: TQM, JIT, Lean,...)	☐	☐	☐	☐	☐
Choice of longer-term planning and control principles (e.g.: sales and operations planning, budgeting,...)	☐	☐	☐	☐	☐
Choice of shorter-term planning and control principles (e.g.: Kanban, production scheduling, load levelling,...)	☐	☐	☐	☐	☐
Choice of data & IT infrastructure systems	☐	☐	☐	☐	☐
Choice of KPI/performance measurement system	☐	☐	☐	☐	☐

12 Strategic Formulation

Strategy Formulation

Please enter some information about the strategy formulation process of the global production strategy in your organizational unit (#c_0003#).

Standardization

Please indicate, to what degree do you follow a standard process to define the global production strategy.

- ☐ We never follow a standard process
- ☐ We very rarely follow a standard process
- ☐ We rarely follow a standard process
- ☐ We sometimes follow a standard process
- ☐ We regularly follow a standard process
- ☐ We very often follow a standard process
- ☐ We always follow a standard process
- ☐ n/a

Planning Interval

Please indicate, how often the global production strategy is revised in your organizational unit (#c_0003#).

- ☐ Quarterly
- ☐ Twice a year
- ☐ Yearly
- ☐ Every 2 years
- ☐ Every 3 years
- ☐ Every 5 years
- ☐ > 5 years
- ☐ n/a

Institutionalization

Please indicate, to what degree the definition of the global production strategy has been institutionalized within your organizational unit (#c_0003#).

- ☐ Dedicated global strategy team. If so, please specify the number of team members:
- ☐ Temporary project-teams depending on the task.
- ☐ Dedicated staff positions.
- ☐ Others, please specify:

13 Strategy Support

Strategy Tools & Methods

Please enter some information about the tools and methods you use for the formulation, implementation and tracking/monitoring of the global production strategy in your organizational unit (#c_0003#).

Data

Which of the following information do you take into account for the formulation, the implementation and the tracking/monitoring of a global production strategy?

	Formulation	Implementation	Tracking/Monitoring*	n/a
Financial site data	☐	☐	☐	☐
Operational site data	☐	☐	☐	☐

Financial network data	☐	☐	☐	☐
Operational network data	☐	☐	☐	☐
Sales & operations planning data	☐	☐	☐	☐
Market / customer data	☐	☐	☐	☐
Competitor data	☐	☐	☐	☐
Supplier data	☐	☐	☐	☐
HR data	☐	☐	☐	☐
Geopolitical data	☐	☐	☐	☐
Environmental data (e.g.: data about natural hazards, ...)	☐	☐	☐	☐
Others	☐	☐	☐	☐

If others, please specify:

IT-Tools

Which of the following IT-Tools do you take into account for the formulation, the implementation and the tracking/monitoring of a global production strategy?

	Formulation	Implementation	Tracking/Monitoring.	n/a
Visualization tools	☐	☐	☐	☐
Simulation tools	☐	☐	☐	☐
Optimization tools	☐	☐	☐	☐
Process mining tools	☐	☐	☐	☐
Artificial intelligence applications	☐	☐	☐	☐
Others	☐	☐	☐	☐

If others, please specify:

Methods

Which of the following methods do you take into account for the formulation, the implementation and the tracking/monitoring of a global production strategy?

	Formulation	Implementation	Tracking/Monitoring*	n/a
Hoshin Kanri	☐	☐	☐	☐
Balanced Scorecard	☐	☐	☐	☐
SMART-Pyramid	☐	☐	☐	☐
EFQM-Model	☐	☐	☐	☐
DuPont	☐	☐	☐	☐
PESTEL Analysis	☐	☐	☐	☐
SWOT Analysis	☐	☐	☐	☐
VRIO Framework	☐	☐	☐	☐
Porter's Five Forces	☐	☐	☐	☐
Benchmarking	☐	☐	☐	☐
McKinsey 7S	☐	☐	☐	☐
	☐	☐	☐	☐

BCG Matrix

PARTS Analysis

☐☐☐☐

Others

☐☐☐☐

If others, please specify:

14 Collaboration

Network Collaboration

In global production networks, plants can either cooperate or compete with each other. Please enter some information about the collaboration degree, barriers and incentives in the production network of your organizational unit (#c_0003#).

Introduction Cooperation

Please indicate to which degree production plants in your organizational unit (#c_0003#) are cooperating or competing with regards to the following aspects.

(We explain terms marked with * after pointing the mouse cursor on them.)

	High Competition		Neutral		High Cooperation		n/a
Technological*	☐	☐	☐	☐	☐	☐	☐
Operational*	☐	☐	☐	☐	☐	☐	☐
Organizational*	☐	☐	☐	☐	☐	☐	☐
Financial*	☐	☐	☐	☐	☐	☐	☐
Parent resource & support*	☐	☐	☐	☐	☐	☐	☐
System position*	☐	☐	☐	☐	☐	☐	☐
Others:	☐	☐	☐	☐	☐	☐	☐
	☐	☐	☐	☐	☐	☐	☐

Barriers

In a study from 2020 (see Wiech, M., & Friedli, T. (2020)), we identified specific barriers that plant leaders face with regards to inter-plant exchange.

From the network perspective, what are the main barriers for inter-plant exchange between plant leaders?

(We explain terms marked with * after pointing the mouse cursor on them.)

	No barrier at all		One of many barriers		Decisive barrier		n/a
Heterogeneity between plants*	☐	☐	☐	☐	☐	☐	☐
Lack of network mission*	☐	☐	☐	☐	☐	☐	☐
Lack of resources for exchange*	☐	☐	☐	☐	☐	☐	☐
Local focus*	☐	☐	☐	☐	☐	☐	☐
Interplant competition*	☐	☐	☐	☐	☐	☐	☐
Lack of individual-level ties*	☐	☐	☐	☐	☐	☐	☐
Organizational structure*	☐	☐	☐	☐	☐	☐	☐
Others:	☐	☐	☐	☐	☐	☐	☐

Incentives I/II

Please indicate in the following how the plant leaders are incentivized in your network.

	Never used	Sometimes used	Always used	n/a
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Financial remuneration (e.g.: monetary boni)	☐	☐	☐	☐	☐	☐	☐	☐
Reputation & Awards (e.g.: lean awards, nomination of a centre of excellence)	☐	☐	☐	☐	☐	☐	☐	☐
Autonomy & responsibility	☐	☐	☐	☐	☐	☐	☐	☐
Others:	☐	☐	☐	☐	☐	☐	☐	☐

Incentives II/II

To get their (the plant leaders') incentive mentioned above, which performance categories are used for target setting.

	Never used			Sometimes used			Always used	n/a
Financial overall performance	☐	☐	☐	☐	☐	☐	☐	☐
Market & sales performance	☐	☐	☐	☐	☐	☐	☐	☐
Operational performance (e.g.: lead times, inventory levels, overall equipment efficiency)	☐	☐	☐	☐	☐	☐	☐	☐
Contribution for learning / qualification (e.g.: by sharing knowledge and experience with others)	☐	☐	☐	☐	☐	☐	☐	☐
Accordance with strategic goals (e.g.: mastering special projects, fulfilling a designated plant role)	☐	☐	☐	☐	☐	☐	☐	☐
Others:	☐	☐	☐	☐	☐	☐	☐	☐

15 Ende

Thank you very much for making it so far.

Based on the information provided up to now, we will pre-select Successful Practice Companies based on defined criteria. The shortlisted companies will be contacted via phone to verify the given information within a short interview (30 minutes). The five best companies will be selected by an industry consortium afterwards.

Your advantages at a glance:

- Opportunity to visit other "Successful Practice" companies
- On this occasion you have the possibility to discuss challenges and opportunities for your business
- You will receive a "Successful Practice" award by the University of St.Gallen

Would you like to be considered in the selection of successful practice companies based on the information provided so far and would like to exchange ideas with other companies at one of your sites?

Yes ☐

No ☐

I need more specific information ☐

Would you like to leave any further comments on the topic or the questionnaire?

Click on "Next" to end this survey. Afterwards you can no longer modify your data.

16 FinalPage

Thank you very much for your participation. You have successfully completed the survey.

We look forward to coming back to you with the results as soon as possible. We will be happy to answer any questions you may have.

The topics of this study will also be discussed with leading experts and decision-makers from the field at the **St.Gallen Production Management Conference** at the *Hotel Einstein* in *St. Gallen* on *October 26./27.2021* (event is held in German). As a participant of this study we would like to offer you a 10% discount; please note down "Global Production Strategies" in the comment field. You can find further information about the speakers more on: productionmanagementconference.ch. We are looking forward to seeing you soon!



We keep your data strictly confidential.

If you have any kinds of **questions, suggestions or remarks**, please do not hesitate to contact:

- Philipp Miedler (E-Mail: philipp.miedler@unisg.ch, Phone: +41 (0) 71 224 73 09) or
- Jens Kaiser (E-Mail: jens.kaiser@unisg.ch, Phone: +41 (0) 71 224 72 62).

Appendix B: Curriculum Vitae

Philipp Miedler

*11.05.1991 in Vienna, Austria

E-Mail: philipp.miedler@gmail.com

Education

2019 - 2023	Dr.oec., PhD in Management (PMA) - Production Management, University of St. Gallen
2010 - 2015	Master of Science Metallurgy, University of Leoben
2001 - 2009	High school, Franz Keimgasse Bundes-Real-Gymnasium, Mödling

Experience

Since 07/2022	Senior Manager at Syngroup Management Consulting GmbH, Vienna (AT)
09/2018 – 06/2022	Research Associate at Institute of Technology Management, University of St. Gallen (CH)
08/2016 – 08/2018	Senior Consultant at Syngroup Management Consulting GmbH, Vienna (AT)
01/2016 – 08/2016	Management assistance at Vermessung Miedler-ZT-Ges.m.b.H, Brunn am Gebirge (AT)
02/2015 - 06/2015	Master thesis at CMI UVK GmbH, Montabaur (DE)
09/2013	Internship at Lech Stahlwerke GmbH, Meitingen (DE)
04/2013 - 04/2013	Bachelor thesis at RHI AG, Leoben (AT)
01/2013 - 03/2013	Project engineer at Stranggusstechnik GmbH, Lebring (AT)
08/2011 - 09/2011	Internship at RHI AG, Vienna (AT)