Wittinger Maria Magdolna

Opportunities to support procurement decisions and balance processes - a novel diagnostic tool

Corvinus University of Budapest

Institute of Operations and Decision Sciences

Department of Supply Chain Management

Supervisor: Krisztina Demeter, DSc

Corvinus University of Budapest

Doctoral School of Business and Management

Wittinger Maria Magdolna

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PhD Thesis

"The truth is more magical – in the best and most exciting sense of the word –
than any myth or made-up mystery or miracle.
Science has its own magic: the magic of reality."

Richard Dawkins: The Magic of Reality: How We Know What's Really True

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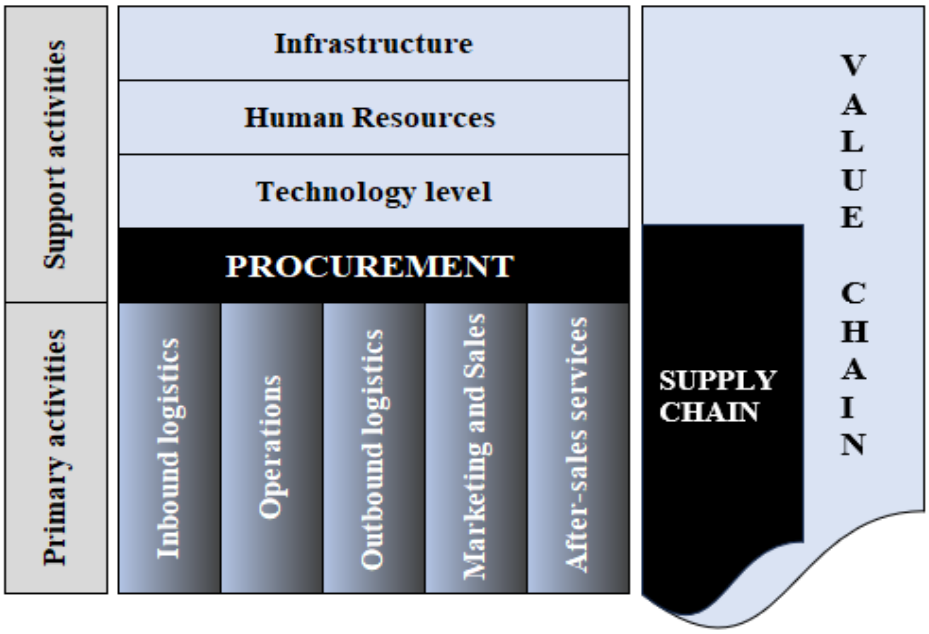
PART I: INTRODUCTION TO THE THESIS

1. FIELD OF RESEARCH

1.1. Relevance of the topic and objective of research

As a former purchasing professional, my interest in and orientation towards procurement[1] was evident. Procurement (Figure 1), is simultaneously a valuable part of the supply chain and "*the first step in the value chain*" (Çankaya & Sezen, 2019, p. 100). This positioning justifies the importance of this research field and the immense volume of studies, research, and literature connected to it and its various topics.

Figure 1: Procurement's interpretation domain



Source: Author's construction adapted from Porter (1985)

Having the research field established I turned to the literature searching for comprehensive purchasing models that help procurement operations and the decisions of purchasing managers. Nevertheless, although insightful, the articles gathered and analysed during the literature review concerning purchasing models may not cover the entire spectrum of factors encapsulated in the elaborated 4F4D (Four Forces and Four Drivers) model discussed in this thesis. In other words, the analysed models or concepts lack factors that should be represented

[1] The terms "procurement" and "purchasing" are used interchangeably and can indicate both the organization and the activity, depending on the context.

to ensure a holistic view, considering all elements and parts of real-life purchasing processes. However, at the same time, this analysis should be conducted solely at the procurement activities level (not at the supply chain level) to distinguish the operating areas (the functional units such as procurement, warehousing, logistics, etc.) from each other (Cousins, 2002), while still considering the complexity of the purchasing environment. By possessing and applying a diagnostic tool exclusively for procurement, the revealed weaknesses and inefficiencies could be linked to the contingency factors of purchasing processes, potentially facilitating resolutions. However, considering that **no easily applicable model is available to aid leaders in procurement decisions (as confirmed by the literature review and based on the case studies), this presents a gap in purchasing management**, as the following sections will underline.

Therefore, in response to this gap and today's challenges (i.e., the ongoing paradigm shift in terms of digitalization and collaboration schemes), the key objective of the study was to develop and validate a tool that enables the visualization of purchasing phenomenon within its complex environment and the understanding of procurement processes along their contingency factors. The thesis seeks answers to the following research objective:

Research objective: To develop and validate a purchasing model that can assist management decisions and balance purchasing procedures.

To reach this objective, besides the literature review, an examination of actual practice (including tools used) was necessary to reveal a model (framework) with a holistic viewpoint and potential diagnostic function. Subsequently, validation and applicability testing of the elaborated 4F4D model were required. Therefore, the thesis, through three research phases and primary data, has mapped the actual status of purchasing activities from multiple angles.

Note: The formulated research objective outlines the main orientation, while specific research questions will be presented in each article included in the thesis. The resolution of the main objective can be found in Article A (literature review and model validation), while the answers to questions regarding the present status of purchasing are addressed in Article B (case study descriptions and model applicability), Article C (Supplier Management aspects), and Article D (IT and digitalization aspects).

1.2. The background: changes in business and procurement activities

Today, both life and business processes are unstable and continuously changing due to pandemics, wars, climate change, and the complete digital-cyber transformation of Industry 4.0 (I4.0). To describe the background of the current environment that makes such a purchasing diagnostic tool essential, I wish to cite a few sentences from some studies that are considered to relevantly underpin the changes. Understanding this paradigm shift is essential since these circumstances will enforce new perspectives and certain behaviours from business players.

"*With a changing global marketplace comes changing suppliers, and the need for different relationships with those suppliers and back up the supply chain. With heightened global volatility across the supply base comes the need to rethink how we source."* (O'Brien, 2024 p. 23)

"The fast pace of transformations in I4.0 mandates organizations to innovate their SCs to take advantage of the emerging business opportunities, tackle disruptions and enhance competitiveness. One crucial function of supply chain management that can play pivotal role in this transformation is procurement." (Tripathi & Gupta, 2021, p. 439)

In addition, another endeavour was to understand today's purchasing practices more precisely, specifically what kinds of strategies and activities are followed by procurement professionals (leaders and subordinates):

"Are companies increasingly integrating purchasing and logistics together in streamlined supply chain organizations, or is the »left hand unaware of what the right hand is doing« scenario still the status quo?" (Ashenbaum & Maltz, 2017, p. 380)

"*Today's leading-edge businesses will position purchasing as a strategic function, often with board-level representation, and the function will have a clear remit to own and manage the commercial relationship with the supply base working in concert with the wider business. Smart organizations do not allow non-purchasing functions to make purchasing or buying decisions alone, but rather encourage a culture of collaborative working to identify and implement the most effective sourcing approach."* (O'Brien, 2024, p. 12)

Even though these are only a few words about areas such as Procurement (or Purchasing and Supply Management - PSM) or digitalization and I4.0., the volume of related research and studies indicates the main research streams in this area. Furthermore, they underscore the general viewpoint regarding the importance of topics and issues occurring in these research fields: the transformation of operations and relationships from both internal and external perspectives, as well as aspects related to digital changes and interconnections among devices and platforms (Ashenbaum & Maltz, 2017; O'Brien, 2024; Tripathi & Gupta, 2021).

As a consequence of the aforementioned circumstances, the role of the purchasing function in business has significantly increased in importance due to the emphasis on expenditures and business relationships (R. Handfield, Jeong, & Choi, 2019; Bendixen & Abratt, 2007). The purchasing environment has become complex and challenging, surrounded by risks, which can only be effectively managed with a comprehensive approach to procurement activities. Therefore, the appropriate relationships and information, as well as proper processes during procurement activities, must be evaluated so, as purchasing creates value-added services that trigger more efficient processes and operations. These improvements will result in cost-effectiveness and lead to an increased level of efficiency and competitiveness (Handfield, Cousins, Lawson, & Petersen, 2015).

1.3. Theoretical lens: complexity theory and contingency theory

The notion of "complexity" can be understood and linked to several theories, including computational complexity in fields such as computer science, mathematics, physics, economics, and linguistics (Hidalgo, 2021; Larsen-Freeman, 2007; Manson, 2001), as well as complexity in the context of complex networks (refer to network theory) and complex systems (or complex adaptive systems as part of it) within systems theory. In every instance, complex systems are constructed by interconnecting a large number of simple components, Therefore, complexity arises from the number of components and their interrelation, rather than from any significant complexity at the component level. Consequently, the formed system becomes greater in its nature than the sum of its parts (Pippenger, 1978).

Additionally, complexity theory partially explains how organized systems emerge from chaotic situations. For example, corporations cannot be viewed as static organizations, but as complex sets of self-organizing components made up of business units, resources (including employees), and stakeholders. The value of complexity theory to organizational research lies in its ability to account for the development of new structures within an organization (Sammut-Bonnici, 2014).

It can be assumed that each component in a complex system exists for a reason; therefore, the removal of any component could cause a malfunction in the system. However, it may also be true that an overall reorganization could result in a functioning system with fewer components (Pippenger, 1978). Consequently, complexity theory can also be applied in fields such as strategic management and organizational studies, as it emphasizes the interactions of elements and the accompanying feedback loops that impact systems. This thesis thus regards the purchasing environment as a complex system, with the elements of the elaborated 4F4D model serving as its (contingency) factors.

Contingency theory, which originated in the 1950s and 1960s and is connected to organizational theory, claims that even though there is no single best way to organize a corporation or make decisions, the optimal course of action is contingent upon (i.e. is dependent on) certain situations or elements (Fiedler, 1978). Although Fred Fiedler's contingency model primarily focused on leadership within organizations (emphasizing the relationship between leadership style and the favourableness of a situation), his theory asserts that effective leadership depends not only on the style of leadership but also on the control over the situation (Toluwase, 2017). In other words, decisions of any kind will depend on the understanding and management (control) of specific situations, such as those encountered during purchasing procedures.

Furthermore, contingency theory argues that organizations must adapt their structures based on contextual conditions. As such, the value of different assets (both physical and non-physical) and circumstances is, in part, determined by contingency (exogenous contextual) variables, which are generally beyond the control of organizations or managers (Chikán, 2023; Brandon-Jones & Knoppen, 2018). Consequently, a general conclusion drawn from the theory is that certain factors can be identified that influence the outcome of management decisions or even the output of a system (Miner, 2005).

In this context, the procurement organization can be regarded as a system, with its actions (results) serving as the output, and the elements of the purchasing environment acting as its contingency factors. The thesis posits that procurement processes (actions or activities) and decisions depend on these specific factors.

1.4. Introduction of the used terminologies (business structures and activities)

In the literature, some articles use the term “procurement” to depict the acquisition (buying) activity, while others refer to it as “purchasing” or “sourcing,” yet they all mean the same thing. Some argue that purchasing or sourcing denotes a more strategic behaviour, while procurement implies something more operational, as seen in Schiele (2019). Conversely, others consider “procurement” to be a more suitable term than “purchasing,” which is seen as having too narrow connotations, as suggested by Porter (1985). In real-life purchasing/procurement activities, the terminology used rather depends on the company culture and the region or country under study. For practical reasons, this thesis uses the terms "procurement" and "purchasing" interchangeably, as suggested by Miemczyk, Johnsen and Macquet (2012) and O’Brien (2024). These terms can also indicate both an organization and the activity, depending on the context.

The same disagreement exists regarding terms associated with business entities and their internal structures. A wide range of terms is used, such as “firm,” “company,” “corporate/corporation,” “venture,” “enterprise”, or “organization.” In the context of large and multinational companies, terms like “corporate/corporation” can refer not only to a single company but also to a group of companies authorized to act as a single entity (*Oxford English Dictionary,* 2004). In other words, it signifies a larger conglomerate (a group of companies), while terms like “venture” and “enterprise” are generally used for smaller companies. The term “firm” is also not appropriate in this context. Therefore, this thesis uses the term “company” to refer to the business entity itself, clarifying that it pertains to a commercial business, even if it is a multinational company. Additionally, the term “organization” is reserved for the internal structure of companies, acknowledging that large or multinational companies consist of many subdivisions (organizations or departments), in other words, BUFUs (business units and functional units) such as sales (as business unit) or purchasing organization (as functional unit).

1.5. Procurement as a functional area of the business activities

Location of purchasing function

Procurement (or PSM) manages the flow of external resources (goods and services) necessary for running and maintaining core activities, by supporting processes under the most favourable conditions (van Weele & van Raaij, 2014). Thus, procurement and supply chain facilitate value creation through various activities, starting from the procurement of feedstocks and including all processes that transform raw materials into final products, ultimately delivering the finished product (or service) to the customer (Schiele, 2019; Vörösmarty & Tátrai, 2012). As such, the supply chain integrates several organizations, their functions, processes, relationships, and value-added activities. Therefore, the operations of companies require strategic coordination, particularly in purchasing activities (Erboz & Szegedi, 2020).

The significance of purchasing work (and procurement organization) is also underscored by its critical role as "*the first step in the value chain*" (Çankaya & Sezen, 2019, p. 100), which legitimizes its function, operations, and strategies (Acquah, Essel, Baah, Agyabeng-Mensah, & Afum, 2021). This should serve as a guiding principle for companies that may sometimes overlook the role of procurement in value creation and achieving better supply chain performance (Bianchi, Bruno and Sarabia-Sanchez, 2019; Patrucco *et al.*, 2019; Rane, Narvel and Bhandarkar, 2020). As van Weele highlighted in several studies (Arjan J. van Weele & van Raaij, 2014; Van Weele, 1984), procurement is a risk-area for profit because its contribution is crucial to competitiveness and profitability. With value-added activities, the procurement organization should be the focal point of the supply chain, serving as its "*strategic centre*" (Blanchard, 2010, p. 55).

As all the company's organizations are responsible for carrying out their specific and relevant tasks in the most effective way (Tassabehji & Moorhouse, 2008), procurement serves as a functional unit that must perform its activity in line with internal requirements. This includes ensuring continuous supply mitigating risks, being flexible, and achieving cost- and time-effectiveness, all while considering the company's and co-department's strategy (Kakwezi & Nyeko, 2019). In the case of centralized procurement (apart from HR costs and taxes), the volume of spending is realized through purchasing activities, which underscores its importance and strategic role.

Key (internal) indicators of purchasing organizations

As the literature suggests, certain conditions (referred to as internal indicators) can influence purchasing work and its effectiveness. Several studies have developed concepts to determine and/or evaluate the components of the purchasing environment, listing elements such as work structure (Schiele, 2019; Schulze, Bals, & Johnsen, 2019; Cousins; 2002), organization maturity (Bals, Laine, & Mugurusi, 2018; Versendaal, Van Den Akker, Xing, & De Bevere, 2013; Schiele, 2007), knowledge level (Cousins, 2002; R. B. Handfield et al., 2015; Foerstl et al., 2013), centralization (Ashenbaum & Maltz, 2017; Schiele, 2019), organization size (Cousins, 2002; Bals, Laine, & Mugurusi, 2018) or state of strategy (Cousins, 2002; González-Benito, 2007). This part describes these indicators (internal elements or aspects) of the procurement environment, which are considered to have the highest influence on forming the background behind the purchasing activities.

Nevertheless, these conditions should be satisfied (i.e. a corresponding development level must be achieved) before organizations will have an opportunity to evolve or apply tools (such as business models) connected to different work segments. In summary, several elements can influence purchasing activity; however, some (as seen in Figure 2) could be considered to have a significant influence on activities in the realm of procurement. For a better understanding, the next part briefly defines the highlighted elements.

Figure 2: Key indicators of purchasing organizations

Source: Author's construction

Procurement strategy: This should be part of the company's strategy as it is crucial for value creation. Procurement involves purchasing products and services that contribute to sales, thereby generating value and revenue. For a viable strategy, the company needs a strategy map that defines and clarifies the logic of the value creation process – how a customer value proposition will lead to shareholder rewards. It also needs KPIs, because only what is measured can be managed, and only what is defined can be measured (Kaplan & Norton, 1992; Kaplan & Norton, 1993; Kaplan & Norton, 1996; Kaplan & Norton, 2004). Therefore, procurement must have its own functional strategy, procurement plan, performance measurements by KPIs (such as cost-savings, lead-times, cost/benefit analysis, etc). Without these, purchasing processes will be carried out randomly (Akın Ateş, van Raaij, & Wynstra, 2018).

Maturity level: Like the development of living organisms, companies and their BUFUs (business units and functional units as internal organisations) undergo development stages. They eventually reach a maturity level where processes become highly developed and strategic functions are established (Van Lith, Voordijk, Castano, & Vos, 2015). According to Foerstl,, the maturity level is "*the level of professionalism in the purchasing function*" (Foerstl, Hartmann, Wynstra, & Moser, 2013, p. 692), referring to the effectiveness of applied practices. A high maturity level is achieved by evolving purchasing approaches from simple administrative ("immature") to more strategic ("mature") functions (Kraljic, 1983; Reck & Long, 1988; Keough, 1993; Foerstl et al., 2013). A higher maturity level results in increased procurement and company performance (Schiele, 2007).

Degree of centralization: If a company makes purchases through a centralized procurement unit, purchasing redundancy can be avoided, and spending can be strictly monitored (Ashenbaum & Maltz, 2017). Therefore, owners and managers must pay attention to every expenditure, as each will eventually become a purchase, affecting everyone (directly or indirectly) through the financial state of the company. Given that each company needs external resources to manufacture its products, every sales process begins with a purchase. This process can be thoroughly monitored if centralized procurement exists, with special attention to the fact that companies spend more than half of their turnover on purchasing (Schiele, 2019).

Knowledge level: The knowledge level of procurement professionals is crucial for achieving proficiency at the organisation level. It can be improved through the application of talent management at the company or organisation level (depending on the company's management structure) or it could be originated from an external source (Andrea Stefano Patrucco, Luzzini, & Ronchi, 2017). Internal talent management is a combination of selective staffing, comprehensive training, and appropriate job structures (Delaney & Huselid, 1996; Youndt, Snell, Dean, & Lepak, 1996; Foerstl et al., 2013).

Organization size and work structure: These aspects should be tailored to the workload. The work structure of the procurement organization must fit the core activity, which can differ from one company to another. Nevertheless, the internal work can differ based on the particular processes (e.g. direct or indirect purchasing) or can be divided, for instance, based on purchasing categories, supplier size or geographical location, internal requestor, or purchasing connected to product development (Schiele, 2019; Gelei & Jámbor, 2018). These topics can also be part of SM or PSM, depending on how the purchasing management is structured (Schulze, Bals, & Johnsen, 2019; Araujo, Gadde, & Dubois, 2016). Even though these are important dimensions determining the effectiveness of the purchasing unit, they can be considered – at a given time – as aptness of the purchasing organization.

According to these descriptions, the thesis argues that procurement strategy, the degree of centralization, the maturity level, the organization's size, work structure, and knowledge level are the conditions that have the highest impact on procurement activity. While there can be other important elements, they will be assumed to be subdivisions of the listed ones or will become parts of the developed purchasing model. In addition, in a well-structured and mature organisation, operations must be at a highly developed level to have the opportunity to reveal weaknesses (if any) and to consider and solve them.

Therefore, this thesis will analyse companies and their purchasing function from other points of view, assuming that the purchasing organizations are at the most suitable evolution stage. This includes a centralized type of procurement activity, a high maturity level, a developed procurement strategy, effective operations through knowledgeable associates, an ideal organizational size (tailored to the workload), and the best-organized work structure (e.g. by category management). It is essential to mention that while these requirements are assumed to be met, several dimensions could differ from one company to another.

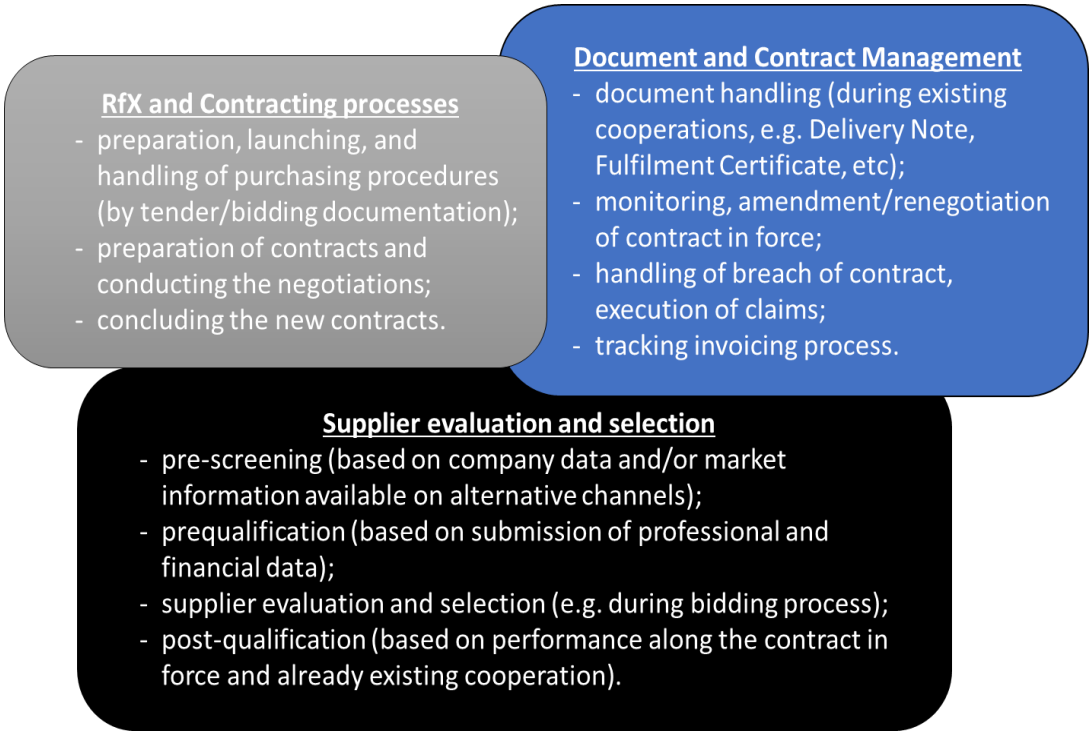
Features of purchasing tasks

Although there is quite a large amount of time and work invested in purchasing procedures, procurement professionals might face dissatisfaction from both internal and external sides, as noted by Ellegaard & Koch (2014). For example, purchasing professionals could receive negative opinions (complaints) from the internal requestors' side, such as procurement being the reason for delays in supply, shortages in materials, or deficiencies in the contractual fulfilment of suppliers. Similarly, suppliers might complain about unrealistic requirements being transmitted to contractors in terms of technical, financial, or scheduling demands. Therefore, purchasing procedures need prudent decisions, and procurement should give special attention to some activities, including but not limited to the following:

- Satisfy internal requirements (as launched by purchase requisitions) while keeping deadlines and minimizing lead times.
- Mitigate supply risks (e.g., through pre- and/or post-evaluation activities).
- Translate the company's requirements to suppliers effectively.
- Cooperate efficiently with suppliers and maintain the best possible relationships with them.
- Enforce the company's interests by ensuring the best conditions through contracts.
- Comply with internal regulations and external laws, and address issues (e.g., handle complaints or, if necessary, participate in litigation processes in case of a breach of contract).

Considering the similarities and interrelations among purchasing activities – even though they are complex – these tasks could be grouped into three categories, as Figure 3 suggests. According to the literature, the main foci during procurement activities are: RfX procedures and contracting process (Araujo, Gadde, & Dubois, 2016; Úbeda, Alsua, & Carrasco, 2015); risk mitigation (where risk is understood as expected negative aspects of adverse events - Nagy & Venter, 2012), which is integral to supplier evaluation-selection in procurement (González-Benito, 2007; Handfield, Petersen, Cousins, & Lawson, 2009); and document and contract management, ensuring legal compliance tied to purchasing procedures (Venter, 2007; Kırılmaz & Erol, 2017).

Figure 3: Main purchasing tasks



Source: Author's construction

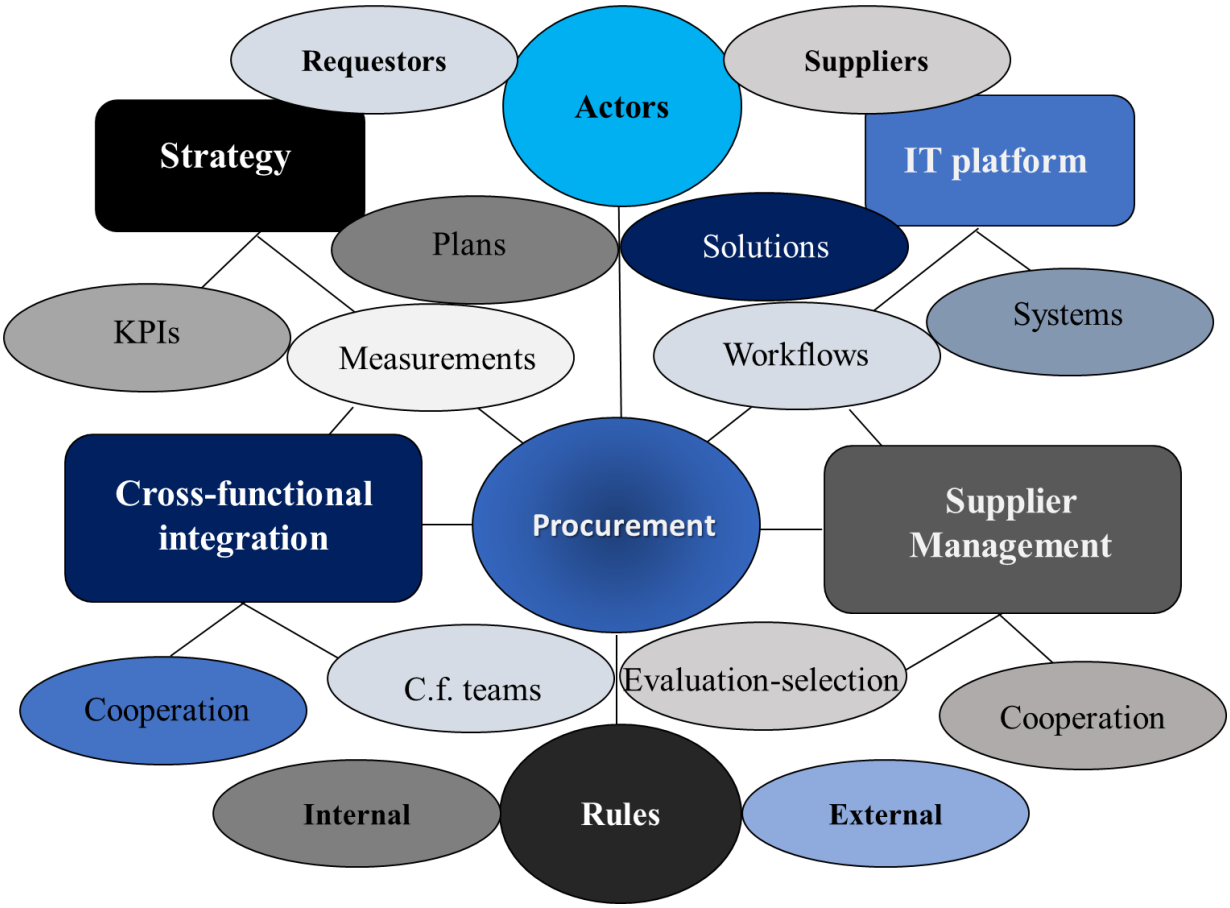
Thus, procurement must meet the requirements related to its activities, considering that the following goals simultaneously represent today's purchasing values and can serve as evaluation criteria during supplier management processes (Schulze et al., 2019; Van Lith et al., 2015). These aspects will collectively contribute to the company's competitiveness and success (González-Benito, 2007).

- ✓ Stability of the supply.
- ✓ Flexibility in demand change.
- ✓ Precise delivery (in terms of time, quantity, capacity, etc.).
- ✓ High technological and quality levels (of supplied materials, goods, assets, services).
- ✓ Cost-effectiveness based on value-based pricing.
- ✓ Outstanding reputation of suppliers.
- ✓ Long-term partnership with suppliers.
- ✓ Synergy development within the company.
- ✓ Collaborative product development.
- ✓ Consideration of environmental issues in terms of sustainable and green supply.

1.6. Preliminary thoughts about the model, the mind map

Based on my professional knowledge, which includes two decades of executive practice in the supply chain, there is no doubt that the chief foci of purchasing work stem from certain circumstances. These factors include relationships and cooperations both inside and outside of the company, as well as conditions of digitalization and the state of strategies. From the very beginning, I recognized that these elements are the driving concepts that shape procurement processes. Consequently, these factors became the primary groups, with accompanying notions emerging as subdivisions of these concepts. The elaborated mind map (Figure 4) enabled me to construct an intuitive framework around the central concept of procurement, where the words (items) were linked to and arranged around my subject using a non-linear graphical layout (Buzan & Buzan, 2006).

Figure 4: Mind map



Source: Author's construction

Thus, I organized the concepts using mind mapping, which transforms a lengthy list of monotonous information into a colourful, memorable, and highly organized diagram that aligns with the brain's natural way of processing information (Buzan & Buzan, 2006). However, while attempting to clarify and classify these concepts and design their segments or groups, it became evident that there were more factors than could be incorporated into a single framework. At this stage, I began to consider reducing the number of elements and analysing which factors share similar qualities and weights. The next chapters will address these questions.

1.7. Structure of the thesis

This study consists of two parts: the first is the introductory part of the thesis, while the second part includes the articles that form the basis of the thesis.

Part I: Introduction to the Thesis

This section comprises three chapters covering the following topics:

Chapter 1: Field of research

This chapter discusses the relevance of the topic and the objective of research, provides background on the subjects, offers insights into contingency and complexity theory, introduces the business terminologies used, describes the procurement area, presents the mind map, and outlines the structure of the thesis.

Chapter 2: Literature review and the 4F4D model

This chapter reviews the related literature and describes the 4F4D model and its factors.

Chapter 3: Research methodology: terminologies, applied methods and articles' interconnections

This chapter covers terminologies (including definitions of key research terms) and a discussion of the research methods employed. It briefly depicts the articles involved in the thesis and interconnections among the articles, as well as their relation to the 4F4D model.

Part II: Articles of the Thesis

This section includes four articles presented as separate chapters, following the logical structure outlined below:

Chapter 1: "Guidance on How to Balance the Purchasing Environment and Processes to Save Resources – A Validity Examination of a Holistic Model"

This article validates the model through case studies and survey research. Model validation is essential to assess its correctness, completeness, and functionality for practical use. Therefore, this article includes the validation of the model, which was conducted through five case studies involving in-depth interviews and survey research across five multinational and large companies.

Chapter 2: "Applicability of a Strategic Tool to Reveal and Classify Problems and Mitigate Risks in Purchasing"

This chapter provides a detailed description of the cases and the information gathered during the interviews regarding real-life purchasing practices, highlighting both the weaknesses and strengths of the procurement organizations. Additionally, this section briefly examines the applicability of the model as a practical tool for detecting deficiencies.

Chapter 3: "Features of Supplier Management and Its Mechanisms – Insights into Hungarian Practice. How to Enhance the Effectiveness of Procurement Procedures"

The third article examines Supplier Management (as factor of the model) as one of the most complex aspects of purchasing activities, particularly due to the necessity for a continuous supply. The paper outlines the features of Supplier Management, focusing on cooperation and the evaluation and selection of suppliers, emphasizing that Supplier Management is a crucial **component** of the conceptual model. This study aims to clarify the status and specific characteristics of Supplier Management in practice, based on survey research findings.

Chapter 4: "Digitalization Aspects of Procurement Organizations in Supply Chains"

This article discusses one of the most critical aspects of contemporary business and the model itself: digitalization. It presents findings from survey research on the digitalization features of the surveyed companies, specifically highlighting aspects related to procurement activities, such as purchasing workflows and supplier evaluation and selection methods in terms of IT solutions. In today's landscape, electronic processes and digital platforms are integral to procurement; their implementation is essential for ensuring business success in purchasing procedures.

Figure 5 presents the articles that form the foundation of this thesis, highlighting their key information. It is important to note that the articles are cited in the thesis exactly as published, without any alterations.

Figure 5: Overview of the articles included in the Thesis

ARTICLES						
#	**Article title**	**Short title (topic)**	**Journal**	**Year**	**Category**	**Language**
A	**Guidance on How to Balance the Purchasing Environment and Processes to Save Resources – A Validity Examination of a Holistic Model**	**Validity**	Cogent Business & Management	2024	**Q2** (JSR)	English
B	**Applicability of a Strategic Tool to Reveal and Classify Problems and Mitigate Risks in Purchasing**	**Applicability**	Economics & Working Capital	2023	**–** (former category: **B** MTA)	English
C	**Features of Supplier Management and Its Mechanisms – Insights into Hungarian Practice. How to Enhance the Effectiveness of Procurement Procedures**	**Supplier Management (SM)**	Budapest Management Review	2019	**A** (MTA)	English
D	**Digitalization Aspects of Procurement Organizations in Supply Chains**	**Digitalization**	LOGISTICS TRENDS	2022	**A** (MTA)	Hungarian

Source: Author's construction

Note: To enhance clarity from the outset, readers will notice that certain sections of the published articles are incorporated into Part I (Introduction to the Thesis), while elements from Part I may also recur in various chapters of Part II (Articles of the Thesis). This approach aims to facilitate a better understanding of the study by introducing concepts and terminologies earlier in the text, even before they are explored in greater depth in subsequent chapters.

The next chapter of the introductory part of the thesis reviews the connected literature and provides a detailed description of the developed model. The final chapter of Part I outlines the research methodologies and methods employed, as well as delineating the interconnections between the model and the articles included in the thesis. Additionally, the thesis concludes with a list of abbreviations relevant to this study, followed by three appendices containing the interview guidelines and survey questionnaires.

2. LITERATURE REVIEW AND THE 4F4D MODEL

This chapter provides a review of the related literature on the influencing factors of procurement work and a brief overview of the purchasing models. It also describes in detail the Four Forces and Four Drivers (4F4D) framework, outlining its features.

2.1. Literature and purchasing models review

The articles of Part II of the thesis comprise the literature review connected to the discussed topics of each research, encompassing a considerable number of papers. Particularly, Article A (Validity) debates in detail the literature connected to purchasing models and their elements, as well as compares these models to the 4F4D framework and its selected factors. Specifically: **Forces, comprising Requestors, Suppliers, Internal regulations, and External rules; and Drivers including Strategies, IT solutions, Cross-functional integration, and Supplier Management.** Therefore, this review is intended to give a general overview and help in the understanding of related concepts.

Literature review on the contingency factors of purchasing applied for the 4F4D model

For the sake of clarity from the very beginning, this chapter introduces the literature review connected to the contingency factors applied for the 4F4D model earlier than it will appear in the subsequent chapters. **Thus, this part of the literature review is retrieved from Article A (Validity)** elaborated by Wittinger & Demeter (2024, p. 3-5).

"Requestors, suppliers, and regulations/rules as forces of procurement

Literature distinguishes actors and groups that could change/influence certain purchasing activities through pressures and incentives set by them (Seuring and Müller, 2008). Gelderman et al. (2017) emphasized that stakeholder pressures are driving forces toward the implementation of standards and codes of conduct. Based on the nature of purchasing activities, procurement organization is the intersection point of stakeholders belonging to suppliers and co-departments. Articles connected to suppliers accentuate their crucial role and their enforcing power (Ogunranti, Ceryan, & Banerjee, 2021; Padgett, Hopkins, & Williams, 2020; Gelderman, Semeijn, & Vluggen, 2017; Gelderman & Semeijn, 2006; Gelderman & Van Weele, 2005). Besides suppliers, internal requestors (co-departments) are those actors whose existence as forces is proven due to their roles.

They are the so-called BUFUs (business units and functional units, such as manufacturing, marketing, quality, R&D departments etc) that launch purchase requests (requisitions) towards procurement (Gebauer & Shaw, 2004).

In addition to these two actors, legal aspects are to be considered as forces because purchasing risks can be mitigated by the established legal requirements involved/stipulated in the processes and contracts in terms of external rules and internal regulations (Venter, 2007; Wittinger, 2022). Seuring and Müller (2008) also mentioned the government as forces. Nevertheless, as the 4F4D model suggests, the government should be substituted by external rules because this comprises a much larger population of local, domestic, and global authorities. If purchasing organization applies rules and follows established procedures (as features of the so-called formalization) this positively impacts purchasing performance (Akın Ateş et al., 2018).

Strategies: companies' and functional (purchasing) ones

Strategies describe how companies intend to create value for their stakeholders (Kaplan & Norton, 2006b)*, while functional strategies, as individual policies, must fit into the integrated pattern, and they will be deemed how they relate to other company's policies (Tilles, 1963). Thus, the purchasing strategy must be in line with and an interrelated part of the company's strategies, as collaborative purchasing strategies enhance project efficiency* (Eriksson et al., 2019).

This does not automatically lead to acceptance of purchasing strategy by co-organizations or management. Even though purchasing activities have a cumulative impact on corporate goals, procurement department must be regarded as acting legitimately, and whose procedures are desirable and appropriate (Suchman, 1995). Thus, legitimation means how accepted a given organization is inside its range of interpretation – a particular team or company (Acquah et al., 2021). *The internal legitimacy level of procurement corresponds to how significant its contribution is compared to the whole performance. The key factor for the improvement of a purchasing organization's acceptance is the alignment of its objectives/strategies to the other functional or company's ones* (Tchokogué, Paché, Nollet, & Stoleru, 2017).

Cross-functional integration: the internal cooperation of the company

Cross-functional integration is the cooperation among various divisions/functions of a company (Foerstl et al., 2013; Poberschnigg, Pimenta, & Hilletofth, 2020), in this case between procurement and requestors. Nevertheless, cooperation with requestors could lead to games inside the company where the outcome will depend on the power distribution among the involved actors (Bjerregaard & Jonasson, 2014; Pemer & Skjølsvik, 2016). Due to significant changes in operations, cross-functional integration and the involvement of cross-functional teams in projects become mandatory to increase purchasing performance (Ferreira, Pimenta, & Wlazlak, 2019). *Cross-functional team members integrate diverse perspectives and synthesize various knowledge and competencies (e.g., technology, production, and procurement knowledge), thus, purchasing procedures can be better adjustable to the requirements and goals become much more achievable* (Meschnig & Kaufmann, 2015). *Procurement will contribute to the future success if interrelated organizations cooperate with purchasing because business success and competitive advantage can be gained by working together* (Servajean-Hilst & Calvi, 2018).

However, still now, working and thinking together often results in failed cooperation. One barrier to internal knowledge transfer is occurring disagreement between the source (e.g. requestor) and recipient (e.g. procurement) (Szulanski, 1996). According to practice and in line with several articles, the inimical behaviour of organizations seems to survive the organizations' evolution in other sense (e.g. Goold, Campbell, & Alexander, 1998; Porter, 1985; Ferreira et al., 2019). Porter blamed both the source and recipient; saying that the source has no incentive to transfer any know-how, especially if it time consuming or risks leaking out of proprietary technology, also the recipient is rarely open to finding know-how elsewhere in the company (Porter, 1985). Other viewpoints are that it is difficult to make business units agree to pursue an interrelationship (Goold et al., 1998) and it is just a hope that one business unit could learn something useful from another (Porter, 1985). These points of view are still experienced today (as in Ellegaard & Koch, 2014 and Brandon-Jones & Knoppen, 2018), however, nowadays companies are recognizing the importance of cross-functional integration and are engaging in applying cooperation at different integration levels (Barki & Pinsonneault, 2005).

Supplier management: the management of the external relationships

Considering that reactive planning was long time ago replaced by proactive planning (Carter et al., 2000; Kraljic, 1983), and now the emphasis is placed on risk management, therefore, procurement should consider the changes in supplier relationships management as well (Hallikas et al., 2020; Ogunranti et al., 2021). While in the past procurement managers focused mainly on cost reduction, now they are placing more emphasis on the continuity and flexibility of supply, especially in case of systemic shocks, such as global pandemic circumstances (McEvoy & Ferri, 2020). *Due to the urgent necessity to mitigate such supply-side risks, procurement organizations and professionals must have higher skills/competencies and use more developed tools in terms of purchasing and supply management (Schulze et al., 2019; Araujo et al., 2016). These tools help procurement gain insights into suppliers' practices and risks and support purchasing in defining clear strategies for various types/categories of sourcing. Therefore, the most complex part of purchasing work is supplier management (SM) (Hallikas et al., 2020; Handfield, Petersen, Cousins, & Lawson, 2009; Wittinger, 2019). Without effective supply chain relationships, the effort to manage the flow of materials will be unsuccessful (Croom, Romano, & Giannakis, 2000). Hence, the role/activities of purchasing have significantly increased in importance to build/maintain appropriate suppliers' relationships (Bendixen & Abratt, 2007; Cousins, 2002; Handfield et al., 2009). Procurement should purchase goods/services using efficient supply chains that can provide supplies not only at the lowest cost, best quality, and highest flexibility, but also in a socially and environmentally responsible manner (Seuring & Müller, 2008; Zimmer, Fröhling, & Schultmann, 2016).*

In summary, effective SM methods can ensure continuous supply as well as help lower the number of suppliers, thus supporting greener procurement. Considering that suppliers will be evaluated several times during cooperation (at the beginning of a new cooperation or periodically to control the task fulfilment), efficient evaluation will reveal dispensable suppliers to make purchasing sustainable (Pónusz, Gosztonyi, Kővágó, & Kozma, 2020).

IT solutions: digitized workflows and procedures

The phenomenon called I4.0 is gaining ground primarily through business process digitalization; however, this is not just about the spread of technology but also about a complete paradigm shift in business processes (Tarigan, Siagian, & Jie, 2020). Therefore, for purchasing – considering the vulnerable supply channels of globalised markets – a way to increase effectiveness is to accomplish purchasing tasks through digitalized procedures since IT and e-procurement solutions are fundamental means for each company (Afolabi, Ibem, Aduwo, Tunji-Olayeni, & Oluwunmi, 2019; Chae, Yen, & Sheu, 2005; Nivetha, 2021; Ronchi, Brun, Golini, & Fan, 2010). Procurement by using digitized solutions increases the effectiveness of activities since these solutions allow procurement to improve comprehensive purchasing intelligence, faster processes, accelerate decisions by better access to information, boost flexibility in working, and reduce costs (Garrett, 2017). These solutions also support instant reporting possibilities (procedure status, lead-time, purchasing volume, spending). Nevertheless, the adaptation of IT systems and applications triggers essential changes in both organizational and process architecture necessitating their (partly or totally) reorganization (Centobelli, Cerchione, Converso, & Murin, 2014)(Centobelli et al., 2014).

Therefore, connected to digitalization and the paradigm shift, it is worth mentioning DC theory (Dynamic Capabilities framework); it suggests that competitiveness (income generation) in rapid technological changes depends to a large extent on enhancing internal technological, organizational, and managerial processes. It focuses on the adaptation of an organization to the changing environment and analyzes how by this adaptation the company purposefully modifies its resource base (Teece, Pisano, & Shuen, 2009; Demeter, Losonci, & Nagy, 2021). For example, companies can introduce new or upgrade available IT systems since these become key drivers of cooperation in supply chains (Van Lith et al., 2015). *To use adequate notions of digitalization, however, requires a mutual understanding of what the term digital technologies mean. The most often used terms are: BigData technologies, IoT and IoS (Internet of Things and Services), cloud and mobile technologies, social media applications, additive manufacturing, virtual reality, cognitive technology and more (Kane et al., 2016; Srai & Lorentz, 2019).”*

Purchasing models review comparing to the 4F4D model

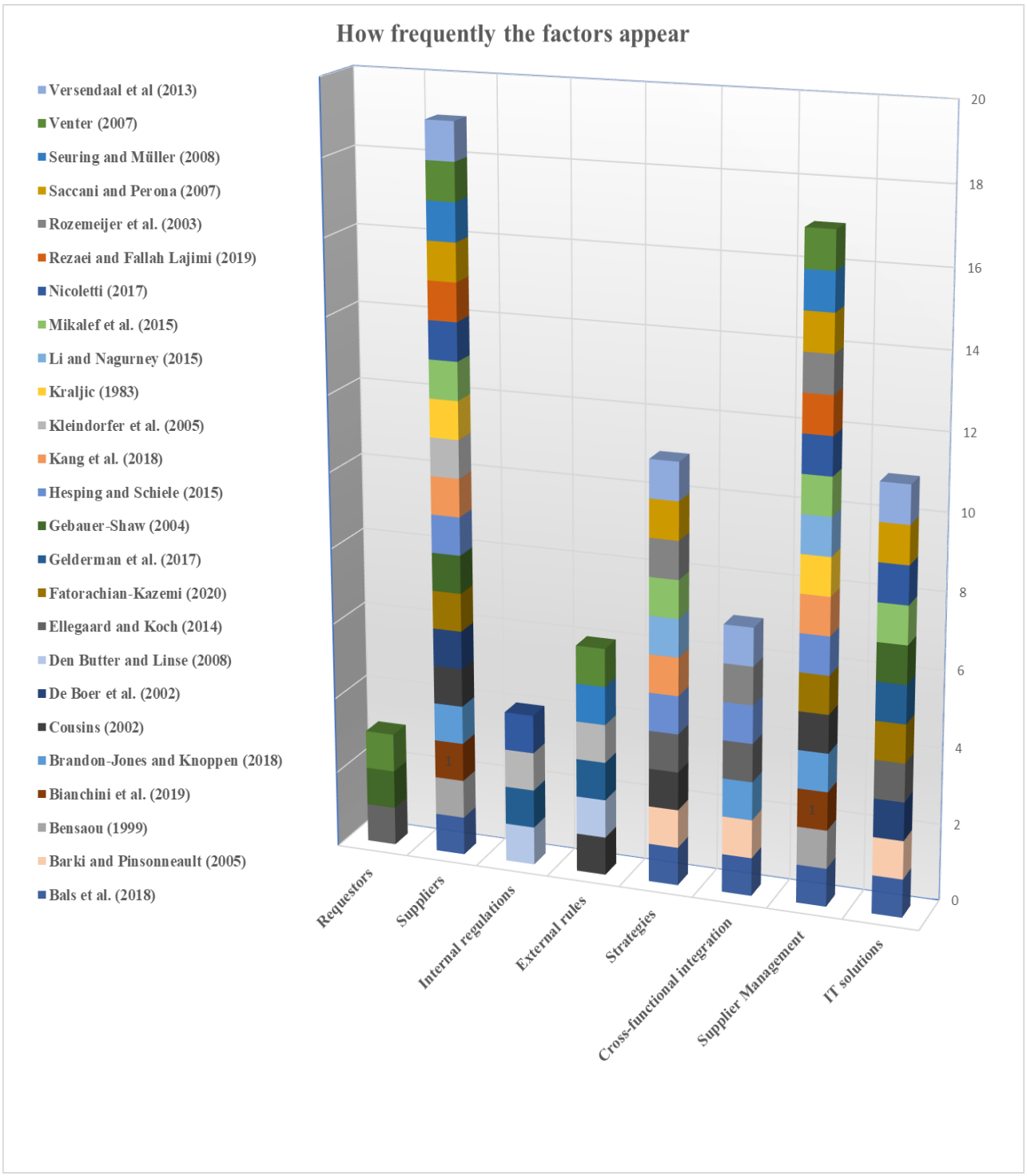
There is a large body of papers related to studies or models that debate concepts connected to notions – as factors of purchasing – such as supplier management (in terms of portfolio-, evaluation-selection, or contract management, such as Gelderman, Semeijn, & Vluggen, 2017; Gelderman & Semeijn, 2006; Gelderman & Van Weele, 2005; Kraljic, 1983; Bruno, Esposito, Genovese, & Passaro, 2012; Osiro, Lima-Junior, & Carpinetti, 2014; Wittinger, 2019; Paranikas, Whiteford, Tevelson, & Belz, 2015, etc.); cross-functional integration (such as Foerstl, Hartmann, Wynstra, & Moser, 2013; Barki and Pinsonneault, 2005; Ellegaard & Koch, 2014; Brandon-Jones & Knoppen, 2018; etc.); IT and digitalization (e-procurement) aspects (such as Den Butter & Linse, 2008; Johnson & Klassen, 2005; Seyedghorban, Samson, & Tahernejad, 2020, etc.) or strategies (such as Eriksson *et al.*, 2019; Tchokogué *et al.*, 2017; Robert S Kaplan and Norton, 2006; etc.). Figure 6 gathers the result of the reviewed literature, showing the appearance of the set of factors, more exactly how frequently they appear – as mentioned factors – in the relevant studies.

Even though many factors appear in these studies, there is a lack of a complex overview that comprehensively depicts purchasing, examining the operations only at its level. In some cases, the literature too widely approaches the purchasing area (e.g. from the supply chain point of view), instead of putting the accent on the functional unit only. Because "*the unit of analysis should be at the product, service or commodity level and not at the firm level*" (Cousins, 2002, p. 71). However, in this way, the tasks, responsibilities, as well as successes of an organisation, could be clearly defined at its level. Also, there will be an opportunity to state and control the specific KPIs (Key Performance Indicators) and to identify (if any) the deficiencies in organizations' operations. In other cases, the articles are too deeply immersed in detail (more than necessary) in some features, however, missing parts remain.

This comparison approaches the factors from the perspective of the 4F4D model. Given that no studies have developed models or concepts from identical elements, the extent of related literature on these discussed elements cannot be processed in a single study with a different focus. Therefore, this comparison aims to highlight differences between the literature and the 4F4D model, while the emphasis is placed on structures and elements.

Therefore, this section provides a brief review of papers deemed to be most relevant to the model, emphasizing their similarities with the 4F4D model in arrangement and/or concept, or the presence of elements with similar characteristics.

Figure 6: How frequently the factors appear



Source: Author's construction

While many studies have initiated the analysis of purchasing processes from the point of issuing a purchase request (requisition) by the internal co-department, as observed in Gebauer and Shaw (2004), Ellegaard and Koch (2014), and Venter (2007), others have omitted the presentation of procurement activities from the very beginning. In other words, they do not start from **requestors** who demand purchasing services and launch the procedure. Even in the study by Versendaal *et al.* (2013), which provides a detailed examination of purchasing processes, the analysis starts from the point when purchasing places an order, and they do not portray the preparatory phase of all purchasing activities. Similar patterns are found in other studies; although Bals, Laine, and Mugurusi (2018) and Nicoletti (2017) analyse various internal factors of the company related to purchasing activities, they do not specify requestors and their requisition processes. Gelderman, Semeijn, and Vluggen (2017) identify actors influencing procurement; but they appear to not recognize requestors as those actors embodying the purchasing requirements.

In other studies, not only the requestor but also the purchasing organization (specified separately) is a missing part of the process descriptions. However, **procurement** departments should be the focal point of the supply chain (Blanchard, 2010). Thus, even though the examinations focus on procurement procedures, it appears that they are either not directly involved or are not analysed at their relevant level. In summary, it is not possible to adequately describe the supply chain and the relationship between suppliers and manufacturing when purchasing is omitted, as observed in Kleindorfer, Singhal, and Wassenhove (2005) and Seuring and Müller (2008), or only superficially mentioned as in Fatorachian and Kazemi (2020).

Regarding **internal and external rules**, despite their protective role in supply and their enforcing power in contracts, in some studies, their representation is lacking, even in those that discuss other elements of purchasing in detail, such as the IT aspects by De Boer et al. (2002). However, IT processes must be aligned with internal regulations (i.e., approval levels and their order). In the case of Bals, Laine, and Mugurusi (2018), neither internal nor external factors involve regulations or rules. Others, such as Den Butter and Linse (2008) and Venter (2007), incorporated aspects of regulations, especially in the realm of risk management.

The most extensive literature addresses **suppliers**, acknowledging their immutable role in procedures, placing a high emphasis primarily on **supplier management** (SM) because of its increased importance arising from higher risk factors and the need for continuity and flexibility (Ogunranti, Ceryan, & Banerjee, 2021; Padgett, Hopkins, & Williams, 2020; McEvoy & Ferri, 2020; Hallikas et al., 2020; Wittinger, 2019; Handfield, Petersen, Cousins, & Lawson, 2009). In this context, articles related to SM deeply discuss terms such as the evaluation and selection of suppliers, risk management, and more (as seen in Kraljic, 1983, the first published matrix, and several other studies that built on this model, such as Bianchini et al., 2019; Rezaei & Fallah Lajimi, 2019; Kang, Hong, Bartnik, Park, & Ko, 2018; Hesping & Schiele, 2015; Ateş, Wynstra, & van Raaij, 2015; Bensaou, 1999; Saccani & Perona, 2007). Unfortunately, these studies focus primarily on suppliers and their aspects, lacking a comprehensive review of the complex purchasing environment in other terms.

Strongly connected to supplier management (SM), we must mention **information technology** (IT), considering that the SM system itself, especially in developed organizations at high maturity level, is an IT system that operates on IT platforms. Consequently, IT continues to revolutionize the purchasing environment, as these e-procurement solutions are vital for companies to reduce costs and process lead-time (Pattanayak & Punyatoya, 2020; R. Handfield, Jeong, & Choi, 2019; Garrett, 2017; Ronchi, Brun, Golini, & Fan, 2010; Nivetha, 2021; Afolabi, Ibem, Aduwo, Tunji-Olayeni, & Oluwunmi, 2019; Chae, Yen, & Sheu, 2005). Future transactions are increasingly based on digitized and automated procedures, transferring various value-creation processes to platforms because the requirement is to manufacture complex digital and interconnected system solutions (Veile, Schmidt, Müller, & Voigt, 2021). The effective management of a multitiered supply chain network (and its suppliers), as depicted in Li and Nagurney (2015), cannot be achieved without IT and SM system support, although this study does not shed light on these solutions.

The role of **cross-functional integration**, defined as cooperation among divisions/functions within a company (Poberschnigg, Pimenta, & Hilletofth, 2020; Foerstl et al., 2013), is crucial for enhancing purchasing performance, as processes become much more achievable and better adjusted to requirements (Meschnig & Kaufmann, 2015). However, poor cooperation and internal politics within a company can hinder its effectiveness (Bjerregaard & Jonasson, 2014; Ferreira et al., 2019; Pemer & Skjølsvik, 2016).

As depicted, cross-functional integration contributes to the effectiveness of procedures; therefore, many studies consider this factor in their models and concepts (e.g., Barki & Pinsonneault, 2005; Bals, Laine, & Mugurusi, 2018; Ellegaard & Koch, 2014). However, some studies, such as Cousins (2002), dismiss this aspect even when examining operations from a stakeholder perspective. Another study related to this topic is Rozemeijer, Van Weele, and Weggeman (2003), which, although examining the role of "cooperation across units," used the more general "cross-functional" term only two or three times in the entire study. In summary, cross-functional integration/cooperation should be considered when depicting operations at the purchasing level, as it interconnects requestors with the purchasing function.

The significance of procurement is emphasized by its critical role as "*the first step in the value chain*" (Çankaya & Sezen, 2019, p. 100), leading to the legitimization of its function, operations, and **strategies** (Acquah et al., 2021). This should serve as a guiding principle for companies that may sometimes overlook the role of procurement in value creation and achieving better supply chain performance (Bianchi, Bruno and Sarabia-Sanchez, 2019; Patrucco *et al.*, 2019; Rane, Narvel and Bhandarkar, 2020). Studies like that of Hesping and Schiele (2015) transparently depict the complex nature of purchasing strategies. However, their study does not clearly distinguish between the development of strategies (as concepts) and their mandatory implementation (when they become regulations), as suggested by Morris and Jamieson (2005).

In summary, even though the selected studies make valuable contributions to various aspects of procurement, the 4F4D model offers a more comprehensive and interconnected framework at the purchasing level. The model's distinctive classification of factors as forces and drivers, coupled with its emphasis on interconnections, offers a holistic understanding of the procurement processes. Although insightful, the selected studies may not cover the entire spectrum of factors encapsulated in the 4F4D model. Alternatively, some studies evaluate operations from a much broader perspective (such as the supply chain), without specifically addressing activities at the purchasing level. Thus, this review underscores the novel and comprehensive nature of the model in the procurement landscape.

2.2. Introduction of the 4F4D model

Building upon the mind map and informed by a comprehensive literature review of existing models and concepts, a procurement model has been developed to clearly delineate purchasing procedures and their components. This model utilizes a limited number of factors to categorize elements that share similarities, thereby standardizing these components for enhanced clarity and coherence. Therefore, the 4F4D model serves as a framework that maps out the general patterns of purchasing procedures, employing a concise set of factors that effectively represent real-life processes within this domain.

The novelty of the 4F4D model lies in the careful selection of factors (even well-known) along with their arrangement and classification into two distinct groups: forces and drivers. This structured classification enables a systematic approach to analysing the purchasing status through a checklist, allowing for the identification of key elements and the description of their interconnections. By comprehensively mapping purchasing activities, the model connects all relevant issues to one or more factors. This linkage helps to identify existing weaknesses in operations and highlights procurement challenges, making the framework a valuable diagnostic tool for identifying areas for improvement. The primary objective of the model is to enhance operational efficiency, support developmental initiatives, and facilitate resource savings.

Given the limitations in the articles for in-depth exploration of the 4F4D model, this chapter aims to fill that gap by providing a comprehensive understanding of the model's structure, its components (contingency factors), and their interrelationships. This elaboration is vital for recognizing the model's significance as a strategic diagnostic tool in purchasing management. By examining each factor – the drivers more detailed due to their characteristics – this chapter will clarify their roles, interconnections, and contributions to effective procurement practices.

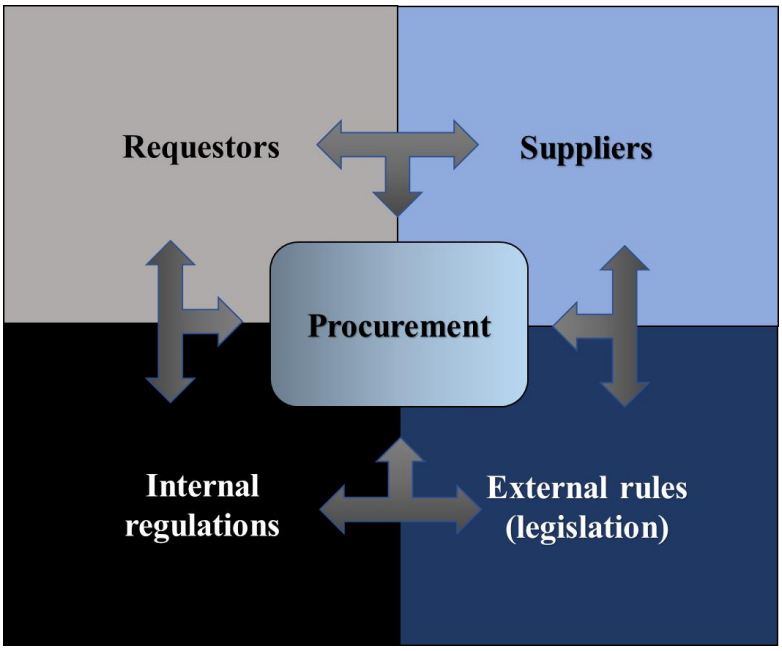
2.2.1. Model's shape and its contingency factors

The 4F4D model consists of two main groups: **forces** and **drivers**. **Forces** (comprising requestors, suppliers, internal regulations, and external rules) are key actors or stakeholders within the purchasing system (procedures and contracts). In contrast, **Drivers** (including strategies, IT-solutions, cross-functional integration, and supplier management) represent the concepts, mechanisms, procedures, and platforms that facilitate connections among these key actors. The model is structured into two parts: an **internal part** (left side) and an **external part** (right side). This division reflects the distinction between elements that fall within the organization's control and those that are more heavily influenced by external factors. Designed to standardize the procurement process, the model serves as a checklist to capture all relevant aspects impacting procurement. It provides a balanced representation of the procurement environment, its components, and their interactions.

A. Four forces of purchasing work

The forces represent the essential actors in the procurement environment that exert influence over purchasing activities. These forces are constant participants in procurement processes. Figure 7 illustrates the forces and their interconnections, while the detailed description of these linkages can be found in the "Interconnections" section.

Figure 7: Four forces of procurement



Source: Author's construction

Requestors

- **Description:** Internal stakeholders from various business and functional units (BUFUs) within the company who initiate purchase requisitions.
- **Role:** They define the purchasing needs and expectations, directly impacting procurement's focus and priorities.

Suppliers

- **Description:** External entities that represent the supply market, providing goods, services, or materials necessary for the company's operations.
- **Role:** Suppliers are critical in ensuring supply chain continuity and are essential for fulfilling internal demands.

Internal regulations

- **Description:** These encompass the objectives and directives set forth by the company's owners and top management, essentially forming the regulatory framework for operations (such as policies, guidelines, and regulations) that govern procurement practices.
- **Role:** Internal regulations shape and guide operations and workflows across various domains (including tax and accounting, finance and treasury, strategic investments, human resources, health, safety, and environment – HSE, and legal aspects), ensuring compliance with company's objectives and ethical standards.

External rules

- **Description:** Legal frameworks and regulations imposed by government authorities (local or domestic) that reflect mandatory regulations governing the company's operations; therefore, they must be adhered to in their procurement activities. This includes legislation relevant to core activities and business relationships, such as Competition Law and the Accounting Act, as well as local regulations regarding environmental protection, building codes, and operating permits.
- **Role:** External rules ensure that procurement processes align with legal and regulatory requirements, protecting the organization from potential liabilities.

In summary, based on the procurement procedures pattern, the key actors involved in purchasing activities, as highlighted by Miemczyk et al. (2012), include the focal firm (or customer), represented by the internal requestor who demands purchasing services, and its suppliers. In this context, the term "market" exclusively refers to suppliers, as procurement professionals in multinational companies (operating within matrix organizations with distinct functional areas) typically do not engage with the sales side of the market. Since these roles are integral to the procurement process and their presence is essential for initiating any purchasing action, they are classified as forces within the 4F4D model.

To ensure smooth processes, manage uncertainty and risks, and develop robust supply networks, it is essential to engage with other institutional actors through appropriate regulations (Maccarthy, Blome, Olhager, Srai, & Zhao, 2016). Given that procurement is responsible for ensuring effective purchasing through the legal clauses of the contracts in place, thereby guaranteeing the continuous fulfilment by suppliers (Changalima, Mchopa, & Ismail, 2022), it becomes vital to consider the legal environment as an integral force in the procurement model. This legal environment encompasses both external and internal regulations, serving as a foundational actor represented by the clauses articulated in contracts. Its presence as a force is also justified by the critical need to safeguard supply operations against issues such as defective performance, breaches of contract, and failures in fulfilment, thereby ensuring the reliability and stability of procurement activities.

Purchasing organizations may not have the power to alter the existence of these fundamental factors, as they are essential components of any purchasing activity. However, they do possess the ability to influence certain behaviours from the purchasing side regarding how to operate or which terms to include in procurement contracts. Consequently, the forces in the procurement model represent elements that exert constraining influences on purchasing activities, including market characteristics (represented by suppliers), internal demands (from requestors), and regulatory factors (both internal and external rules).

These forces are consistent elements in purchasing operations, as they cannot be excluded from procurement procedures under any circumstances. The established pattern of purchasing activity dictates the roles of the actors involved. While a specific supplier could be replaced, its role remains a constant in the procurement process that cannot be omitted.

Thus, there are no other fundamental elements in procurement activity beyond these defined roles. Additionally, there exists an inseparable connection between the actors and the rules that govern their interactions, reinforcing the dynamic relationship between the forces influencing procurement activities. This interplay underscores the necessity for purchasing organizations to navigate these established forces effectively to ensure successful procurement outcomes.

Interconnection among Forces

Understanding the interconnections among the four forces within the 4F4D model (Figure 8) is crucial for comprehending the dynamics of procurement processes. The interconnections among these forces illustrate the fragile nature of procurement processes and the dependencies between various stakeholders. Each force influences and interacts with the others, forming a complex web of relationships that drives procurement activities. Below is a detailed description of how these forces interact with one another:

Requestors and Suppliers:

- **Direct link:** Requestors are directly connected to suppliers through contract fulfilment, as they define the requirements and expectations that suppliers must meet.
- **Indirect link:** This connection is facilitated through procurement, which acts as the intermediary that manages the relationship and negotiations with suppliers on behalf of requestors.

Requestors and Internal regulations/External rules:

- **Direct link:** Requestors are directly linked to internal regulations through their operational activities, ensuring that their purchasing requests align with company policies and guidelines.
- **Indirect link:** They are indirectly connected to external rules through the contracts established by procurement, which must adhere to both internal and external compliance standards.

Suppliers and Requestors:

- **Direct link:** Suppliers have a direct relationship with requestors when executing the tasks outlined in contracts, ensuring delivery and quality as specified.
- **Indirect link:** This connection can also be mediated indirectly through procurement, which manages supplier interactions and contract negotiations.

Suppliers and External rules/Internal regulations:

- **Direct link:** Suppliers are directly linked to external rules through the contracts they sign, which must comply with applicable laws and regulations governing business practices.
- **Indirect link:** They are indirectly connected to internal regulations through the clauses embedded in contracts established by procurement, which may impose specific operational or compliance requirements.

Internal regulations and External rules:

- Internal regulations must align with external rules but often offer more specificity and detail, allowing organizations to tailor processes and operations to meet internal objectives while complying with broader legal standards.

Procurement and all Forces:

- Procurement serves as the central hub in this network, maintaining direct links to all four forces. It is the heart of purchasing processes, coordinating interactions, enforcing compliance, and ensuring that all activities are aligned with internal and external expectations.

Figure 8: Interconnections of Forces

Forces	Direct link	Indirect link
Requestors → Suppliers	Through contract fulfillment	Through procurement
Requestors → Internal Regulations / External Rules	Through operational activities	Through relevant clauses of procurement contracts
Suppliers → Requestors	Through executing contract tasks	Through procurement management
Suppliers → External Rules / Internal Regulations	Through contracts	Through internal clauses of procurement contracts
Internal Regulations → External Rules	Compliance alignment	More detailed internal processes
Procurement → All Forces	Directly links all elements of the procurement network	-

Source: Author's construction

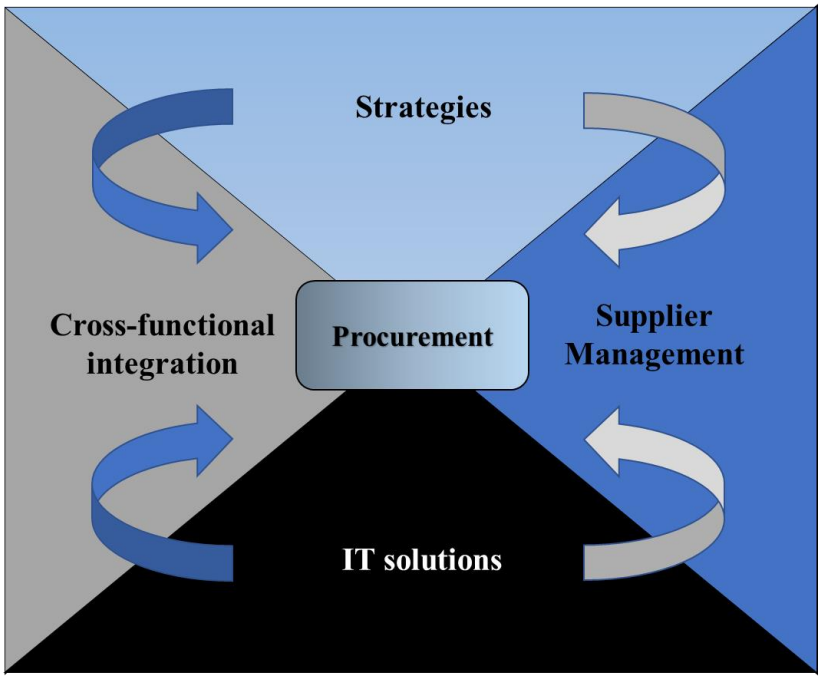
By analysing these interconnections, procurement organizations can identify areas for improvement, ensure compliance, and enhance collaboration among all involved parties, ultimately contributing to more effective purchasing practices.

B. Four drivers of purchasing work

In the context of the 4F4D model, drivers (Figure 9) serve as underlying frameworks that facilitate and guide procurement activities by interlinking various actors both within and outside the company. Unlike forces, which are integral components that directly influence purchasing procedures and cannot be omitted from operations, drivers provide the necessary support and structure for procurement functions and enhance procurement processes but can be adjusted or even temporarily removed in extreme situations.

Each driver plays a vital role in shaping the efficiency and effectiveness of purchasing processes, representing critical mechanisms that thoroughly influence procurement activities. Nevertheless, considering that changes to these drivers could fall within the scope of procurement organizations, this chapter provides a deep exploration of them. Below is a detailed overview of each driver, depicting their role and significance, characteristics and implications, as well as their interconnections.

Figure 9: Four drivers of purchasing work



Source: Author's construction

Strategies

- **Description:** The overarching guiding principles and flagship initiatives that define the focus and provide direction for all procurement operations. They shape priorities and direct all procurement operations, both internally and externally.
- **Role:** They provide the overall vision and serve as a framework that informs decision-making and operational priorities. They align procurement activities with broader goals; in other words, they ensure that procurement responds to market dynamics effectively.

Cross-functional integration

- **Description:** The internal cooperation and collaborative efforts among various organizations or units within the company to achieve shared procurement objectives. It is essential for aligning objectives and sharing information among stakeholders.
- **Role:** Cross-functional integration ensures that stakeholders collaborate effectively throughout the procurement process and work together toward common procurement objectives. It fosters internal cooperation and teamwork, enhances communication, and ensures alignment between procurement and internal requestors.

Supplier Management

- **Description:** The strategies and practices involved in managing supplier relationships to ensure effective cooperation and performance. This encompasses activities such as supplier evaluation, selection, collaboration with suppliers, and monitoring contract fulfilment to enhance procurement effectiveness.
- **Role:** Supplier management focuses on managing relationships with suppliers to secure reliable external supply. It is essential for maintaining strong supplier partnerships and mitigating supply risks.

IT solutions

- **Description:** The technological platforms encompassing various systems and applications that support procurement activities, enabling efficient workflows and data management. This includes software for procurement management, supplier relationship management (SRM), e-procurement platforms, etc.
- **Role:** IT solutions streamline processes, facilitate workflows and process traceability, and enhance visibility to improve decision-making capabilities and operational efficiency within procurement. They enable structured workflows and automated processes, ensuring the smooth execution of procurement activities.

Positions of Drivers and their influence on procurement

Strategies

- **Position:** At the top level of the hierarchy among all factors and activities.
- **Influence:** Strategies influence the entire procurement process by establishing priorities, defining objectives, and ensuring that procurement aligns with organizational goals, such as cost-effectiveness, quality improvement, innovation, and so on.

Cross-functional integration

- **Position:** Acts as a connector between procurement and requestors within the company.
- **Influence:** Effective cross-functional integration enhances information flow, fosters collaboration, and minimizes isolation within the company. It ensures that all stakeholders (such as requestors, finance, operations, and management) are aligned in the procurement activities.

Supplier Management (SM)

- **Position:** Serves as a linkage between procurement and suppliers in the supply chain.
- **Influence:** Strong supplier management is essential for ensuring a reliable supply chain, maintaining quality standards, and fostering long-term partnerships. It serves as a critical checkpoint for assessing supplier performance and ensuring compliance with contract terms.

IT solutions

- **Position:** Positioned as the foundational layer supporting all operational processes.
- **Influence:** IT solutions streamline operations, enhance data visibility, and improve communication among stakeholders. They enable automation of processes, effective data management, and integration of various procurement functions, thereby supporting the strategic goals set by the organization.

Figure 10: Positions and interconnections of Drivers

Drivers	Position / Role	Influence / Interconnections
Strategies	Central guiding principles affecting all factors and activities.	* Influence **IT solutions** by defining system requirements and functionalities. * Guide **cross-functional integration** by promoting collaboration toward common goals. * Shape **supplier management** practices by outlining criteria for evaluation and selection.
Cross-functional integration	Facilitator of collaboration, ensuring alignment with strategies and effective supplier management by both parties (Procurement-Requestors).	* Promotes alignment with **strategies** by ensuring all departments contribute to procurement objectives. * Relies on **IT solutions** to enable communication and collaboration across units. * Influences **supplier management** by ensuring all relevant departments are involved in supplier selection and evaluation processes.
Supplier Management (SM)	Essential for operational success, relying on strategic direction and integrated approaches.	* Aligns with **strategies** to ensure supplier capabilities meet organizational goals. * Utilizes **IT solutions** for effective supplier performance monitoring and relationship management. * Benefits from **cross-functional integration** by involving various departments in supplier collaboration and assessment.
IT solutions	Enabler of processes that support strategies and enhance internal integration and supplier management.	* Support **strategies** by providing the necessary tools for implementation and monitoring. * Facilitate **cross-functional integration** through shared platforms and data accessibility. * Enhance **supplier management** through analytics, performance tracking, and communication tools.

Source: Author's construction

The interactions among the drivers are essential for creating a robust procurement environment because these relationships significantly influence processes and determine the interconnections among all involved parties. These interconnections reflect how each element influences and supports the others, creating a cohesive procurement environment. Figure 10 provides an overview of the positions of the drivers and the nature of their interconnections.

Understanding the positions and interconnections among the drivers within the 4F4D model is critical for grasping how procurement processes operate and the influence of these drivers on overall purchasing activities. By understanding the characteristics of the drivers and the dynamics among them, procurement organizations can implement more effective strategies, optimize their processes, and enhance supplier relationships. This holistic approach contributes significantly to improving the overall procurement function and achieving organizational goals.

Characteristics of Drivers

1. Conceptual nature

- **Non-actor status:** Drivers do not represent direct actors or stakeholders within the procurement ecosystem. Instead, they serve as overarching concepts that guide how procurement is carried out. This differentiates them from forces, which are active participants in the procurement processes.
- **Guiding frameworks:** While they provide valuable direction and support, drivers remain conceptual tools that facilitate operational efficiency rather than define roles or responsibilities in the purchasing environment.

2. Functions for interconnection

- **Facilitation role:** Drivers act as bridges that connect various stakeholders involved in the procurement process. They ensure that different departments and external entities collaborate effectively to achieve procurement goals.
- **Support systems:** They create a structured environment where procurement activities can thrive, enabling smoother workflows and interactions among all involved parties.

3. Temporary excludability

- **Flexibility in implementation:** Unlike forces that are permanent fixtures in procurement, drivers can be excluded or adjusted during critical circumstances. For instance, in the absence of IT systems due to a failure, procurement activities must continue to ensure the operational integrity of the organization.
- **Historical context:** Procurement processes have existed long before the advent of sophisticated IT systems or the formalization of strategic frameworks, indicating that while drivers are beneficial, they are not strictly necessary for the core procurement activities to function.

Implications of Drivers and their impact on procurement

1. **Operational resilience:** In situations where drivers are temporarily unavailable (e.g., IT system failures), procurement must adapt and continue its essential functions to support manufacturing and sales processes. This emphasizes the resilience of procurement practices, highlighting the necessity for purchasing organizations to maintain alternative processes or manual interventions to ensure ongoing operations despite technological or structural disruptions. This ability to operate without modern frameworks (such as formal strategies or advanced IT solutions) underscores the fundamental nature of procurement activities, allowing organizations to adapt and evolve over time.
2. **Dynamic adaptability:** The nature of drivers allows procurement organizations to be agile in their approach. As such, organizations can flexibly adjust their use of drivers based on situational needs. When faced with unforeseen circumstances, such as market fluctuations or changes in organizational strategy or construct, procurement can modify or exclude certain drivers (e.g., temporarily reducing supplier management activities) to quickly realign with operational needs or emerging priorities. During periods of crisis or transformation, procurement may need to emphasize basic operational principles over strategic frameworks or technological integrations. This adaptability allows procurement organizations to respond dynamically to changes in the supply market or internal shifts. This responsiveness is crucial for maintaining competitive advantage and meeting evolving business needs.

3. **Operational alignment:** Drivers ensure that procurement activities are aligned with strategies and goals. By effectively managing drivers, procurement can enhance its contribution to broader company objectives, such as cost reduction, sustainability, and innovation.

Figure 11 shows the characteristics of drivers and their implications in terms of how they impact procurement activities.

Figure 11: Characteristics and implications of Driver

Drivers	Characteristics	Particular impact on procurement
Strategies	Provide procurement teams with a framework for decision-making. This structured approach helps procurement professionals evaluate options, prioritize actions, and measure success against established goals.	* Provide direction but not mandatory for operations (compare to Internal regulations) * Can be omitted in extreme situations
Cross-functional integration	Fosters a collaborative environment across different departments and functions. This collaboration is essential for ensuring that procurement aligns with internal requestors' needs and organizational objectives, ultimately leading to improved purchasing outcomes.	* Ensure cooperation across departments * Vital for alignment but could have various development stages
Supplier Management	Creates a foundation for sustainable partnerships. By prioritizing supplier relationships, procurement can mitigate risks, enhance quality, and secure favorable terms, thereby contributing to a more resilient supply chain.	* Oversee suppliers' interactions and evaluations * Essential (mainly) but flexible
IT solutions	Significantly enhance operational efficiency within procurement. By streamlining processes, improving data management, and facilitating real-time decision-making, they support the execution of procurement activities and reduce lead times.	* Support processes and workflows * Critical driver but can be (e.g. temporarily) absent

Source: Author’s construction

In summary, drivers, as the name suggests, are frameworks that provide a background for purchasing work by interconnecting actors both internally and externally. However, they are not forces, meaning they are neither actors nor stakeholders, they only drive procurement procedures. Unlike forces, drivers can be omitted from the purchasing procedures in extreme situations. For example, if IT systems were to collapse overnight, procurement must continue its activity because, without it, there would be neither manufacturing nor sales.

Procurement procedures existed even before the spread of IT systems and platforms. Similarly, strategies could be a missing part, especially if we regard "strategies" as guiding concepts rather than their implementation (at that point becoming internal rules). Strategies (like IT) did not exist in their current interpretation, but procurement processes still operated.

Supplier Management and Cross-functional integration are the same; these are also concepts, processes (systems), and workflows that support cooperation and relationship management. Unfortunately, these elements (approaches and systems) still do not exist in many companies, or their application is at a very introductory stage, especially in SMEs (small-to-medium enterprises), as mentioned in Bianchini, Benci, Pellegrini, & Rossi (2019).

Although the above features indicate that drivers are just platforms or concepts (however helpful for procurement), by emphasizing the interdependence of these drivers, purchasing organizations can better appreciate the importance of investing in each area to enhance overall procurement effectiveness and operational efficiency. Consequently, the hierarchical positioning and interconnections of the drivers in the 4F4D model create a robust framework for understanding procurement processes. This structure reveals how strategies shape operations, how IT solutions provide the necessary infrastructure for execution, and how cross-functional integration and supplier management facilitate cooperation and relationship management within the procurement landscape.

Remarks related to the 4F4D model

This interconnected framework underscores the necessity of a holistic approach to procurement, where all elements work together to support the organization's strategic objectives and operational needs. The distinction between forces and drivers in the 4F4D model is pivotal for understanding procurement dynamics. While forces cannot be modified or omitted, drivers can be adjusted or modified in the long run based on organizational needs. Drivers significantly enhance procurement processes by creating structured frameworks for action and interconnection; however, they remain flexible and, nonetheless, non-essential in critical situations. This understanding allows procurement professionals to navigate complexities and maintain operational continuity, regardless of the specific contextual challenges they may face. By recognizing the conceptual nature of drivers, organizations can better appreciate their strategic contributions while ensuring that fundamental procurement activities remain robust and resilient.

All the other factors not mentioned in the model should be considered default aptness or already involved in (or represented by) the previously stated forces and drivers. For example:

- Core business: The core business determines the industry and the market, which are considered aptness; on the other hand, the market (i.e., supply market) is already represented by suppliers.
- Not mentioned stakeholders: Stakeholders not mentioned (such as customers) should belong to other departments (e.g., customers to Sales), and therefore, they should be analysed accordingly in the context of other business or functional processes.

2.2.2. Significance of the 4F4D Model

The procurement landscape is increasingly complex and competitive, necessitating strategic approaches that can effectively diagnose and enhance purchasing processes. Despite the complexity and importance of this functional area, an overall model does not exist that provides a comprehensive overview of the operational context of procurement. The research revealed a lack of such a model, a map that identifies the dimensions of procurement work, synthesizes its factors, and integrates them into a single, comprehensive framework.

The 4F4D model serves as such a tool, providing a structured framework that facilitates the analysis of procurement activities through its distinct factors. This model not only allows organizations to assess their current procurement practices but also helps identify areas for improvement and strategic alignment. It can illuminate existing deficiencies and improper routines, along with their underlying causes, while also highlighting new challenges connected to the realm of purchasing.

Dynamics of factors' interconnections

1. **Cascading effects of Strategies on other factors**

   Strategies act as the guiding force that not only drives procurement activities but also significantly influences principles of cross-functional integration and supplier management. A strategic approach can determine how effectively teams collaborate internally and how relationships with suppliers are managed externally. In addition, strategies not only define the goals of procurement but also directly influence the selection and utilization of IT solutions, as well as operational workflows.

A well-defined strategy determines what kind of IT systems are implemented to support procurement processes. Moreover, effective IT solutions can enable the realization of strategic objectives through enhanced operational (internal and external) workflows.

2. Linkage of Cross-functional integration to Procurement and Requestors

Cross-functional integration is essential for ensuring that procurement operates in alignment with the needs and objectives of internal requestors. This driver strengthens collaboration and communication between departments, fostering a cohesive approach to procurement and ensuring that purchasing activities are responsive to internal demands.

3. Supplier Management's role in securing external supply

Supplier management is fundamentally connected to procurement, directly influencing how procurement professionals interact with suppliers. In this sense, SM links Procurement and Suppliers to each other, simultaneously securing roles for Requestors in cooperation with Suppliers (e.g., in selection and evaluation). Effective supplier management practices lead to stronger partnerships and better procurement outcomes, ensuring a consistent and reliable supply chain.

4. IT solutions influence on operational workflows

IT solutions, as the basis of all operational workflows (enabling them internally under the Cross-functional umbrella and externally under SM) link all Forces to all Drivers. Also, it is the platform for controlling each activity, facilitating the successful implementation of Strategies.

Key Functions of the 4F4D Model:

1. **Holistic overview:** The 4F4D framework provides a comprehensive map of purchasing procedures. It clearly indicates the complexity of the purchasing work, connecting contingency factors that influence procurement outcomes.
2. **Standardization:** By categorizing procurement elements into forces and drivers, the model standardizes complex procurement activities, making them more manageable and comprehensible.

3. **Strategic alignment:** It aligns procurement activities with other organizational strategies, ensuring that purchasing decisions contribute to broader business objectives.
4. **Diagnostic capability:** The model enables purchasing organizations to identify weaknesses and strengths within their procurement processes, allowing for targeted interventions and enhancements that leverage strengths and address the revealed weaknesses. In particular, the model identifies improvement areas, recognizing specific factors that may require enhancement or realignment to optimize procurement effectiveness.
5. **Support decision-making:** It fosters informed decision-making processes by understanding the underlying dynamics and relationships that impact procurement outcomes.

Figure 12 shows the differences in functions between the 4F4D framework and literature's models.

Figure 12: Comparison of key functions of purchasing models

Key Functions	4F4D model	Literature's models
Holistic overview	It has a holistic overview considering all contingency factors of real-life purchasing procedures.	There are missing parts in models or the operation level is not appropriate.
Standardization	It standardizes the factors that have the same characteristics into two groups.	They do not attempt to standardize the purchasing elements.
Strategic alignment	It totally aligns procurement activities with other organizational strategies due to the holistic viewpoint.	They partially align procurement activities with other strategies because of the gaps in concepts.
Diagnostic capability	It deeply diagnostics the status due to the comprehensive approach.	Due to the missing parts they partially diagnostics the status of purchasing.
Support decision-making	It comprehensively supports decisions considering all elements of procedures and their interrelations.	They support some decisions depending on the context of the models.

Source: Author's construction

A thorough understanding of the 4F4D model’s components and their interrelations is crucial for procurement professionals and their organizations. By comprehensively analysing the roles and dynamics of forces and drivers, this chapter provided a foundational understanding of this diagnostic tool, emphasizing the importance of both forces and drivers in shaping procurement activities. By clarifying the model's structure and its factors, this discussion sets the stage for further exploration of the practical applications and implications of the model in subsequent chapters. The insights gained from this examination will empower organizations to enhance their procurement strategies and achieve greater operational efficiency and effectiveness.

3. RESEARCH METHODOLOGY: TERMINOLOGIES, APPLIED METHODS AND ARTICLES' INTERCONNECTIONS

Considering that in the papers of the thesis there is not enough room to describe in detail either methodologies and methods/technics or their literature and relevance to justify their applicability, this part provides insights into research methodologies and their terms. In addition, it depicts the applied research methods and shows the interconnections among the articles.

3.1. Research terms: quantitative and qualitative analysis, validity and reliability

The goal of research is to study in detail subjects such as phenomena, people, events, materials and others to reach new conclusions or a particular understanding, as well as to discover new information and establish facts (Rubin & Babbie, 2011). To systematically investigate such topics as depicted above, researchers must decide the methodology and research method to be applied for data collection and analysis. At the beginning of social investigations, literature concentrated predominantly on research techniques; researchers and studies approached examination essentially from a quantitative and survey-based point of view. Today, the driving force behind research is not the selected methods but rather the questions that the researcher formulates (Somekh & Lewin, 2005).

Quantitative analysis means the numerical representation and processing of observations to describe and explain the phenomena that the observations reflect; therefore, it is the research method that emphasizes precise, objective, and generalizable findings (Rubin & Babbie, 2011). The notion of representativeness is linked – in most cases – to quantitative research because, by implication, explanations and descriptions derived from the analysis of a sample can enlarge the interpretation to the whole population. In other words, we assume that the quality of a sample has the same attributes, characteristics, and distribution as the population from which it was selected. Representativeness is enhanced by probability sampling and provides for generalizability and the use of inferential statistics (Rubin & Babbie, 2011). Nevertheless, the largest part of quantitative studies, even though they apply quantitative research methods, cannot be regarded as representative ones because of the above-described features.

The aim of **qualitative research** is to understand the meaning of events and their reality to individuals and groups. Therefore, researchers use qualitative approaches to explore the behaviour, perspectives, feelings, and experience of participants (Holloway & Wheeler, 2002). Since the researcher studies a real-life phenomenon in the field, this is called naturalistic inquiry, which is simultaneously the essence of qualitative research (Patton, 2005). The essential features of qualitative research include the variety of approaches and methods, the correct choice of appropriate theories and methods, the identification and analysis of different perspectives. and the researcher's reflections on his/her own research (Flick, 2009). Nevertheless, qualitative research is difficult to clearly define because it has no theory or methods that are distinctively its own. (Denzin & Lincoln, 2011).

Although qualitative researchers are often criticized for being journalistic (Holloway & Biley, 2011), further criticisms exist regarding their trustworthiness and claims of not involving subjective elements. However, researchers cannot distance themselves from qualitative inquiry and interviewees, otherwise, they cannot understand the phenomena and present entirely their meaning and experience. Because the researchers are involved, their experiences become a resource (Holloway & Biley, 2011). Additionally, "*most phenomena cannot be explained in isolation, which is a result of their complexity in reality*" (Flick, 2009, p. 15). Caulley suggests that qualitative researchers should be careful observers and capture concrete details in research journals. Therefore, it is worth recording (or taping) the individual's words , as this result in a research report that "*has a sense of realism, truth, authenticity, and authority*" (Caulley, 2008, p. 432).

Till today, some researchers are engaged in qualitative techniques only, while others are committed to using quantitative research methods. However, many studies apply mixed methods or combined methodologies, and several scholars often use a variety of methods within the same research. For the sake of comparing the two approaches, Figure 13 depicts the main features of quantitative and qualitative research.

Figure 13: Features of qualitative and quantitative research

	Qualitative	Quantitative
Aim	Exploration of participants' experiences and life world Understanding, generation of theory from data	Search for causal explanations Testing hypothesis, prediction, control
Approach	Broad focus Process oriented Context-bound, mostly natural setting Getting close to the data	Narrow focus Product oriented Context free, often in artificial or laboratory setting
Sample	Participants, informants Sampling units such as place, time and concepts Purposive and theoretical sampling Flexible sampling that develops during research	Respondents, participants (the term 'subjects' is now discouraged in the social sciences) Randomised sampling Sample frame fixed before research starts
Data collection	In-depth non-standardised interviews Participant observation/fieldwork Documents, photographs, videos	Questionnaire, standardised interviews Tightly structured observation Documents Randomised controlled trials
Analysis	Thematic, constant comparative analysis Grounded theory, ethnographic analysis etc.	Statistical analysis
Outcome	A story, an ethnography, a theory	Measurable results
Relationships	Direct involvement of researcher Research relationship close	Limited involvement of researcher Research relationship distant
Rigour	Trustworthiness, authenticity Typicality and transferability	Internal/external validity, reliability Generalisability

Source: Adapted from Holloway and Wheeler, 2002, p. 16

Researchers use the mentioned scientific methods during their examination since these are approaches to inquiry that attempt to protect against mistakes commonly made in casual human inquiry. Main features include viewing all knowledge as provisional and subject to refutation, searching for evidence based on systematic and comprehensive observation, and pursuing objectivity in observation and replicability (Rubin & Babbie, 2011).

Two requirements are strongly tied to each research: validity and reliability. **Validity** refers to how accurately a method measures what it is intended to measure, reflecting the feasibility of a concept. Although the ultimate validity of a measure cannot be proven, we can agree on its relative validity (such as content validity, construct validity), and conduct internal or external validation (Rubin & Babbie, 2011; Somekh & Lewin, 2005). Validity can be ensured by cross-case pattern matching, within-case analysis, and multiple-case analysis (Riege, 2003; Yin, 1994; Denzin & Lincoln, 2011).

Reliability means the quality of a measurement method that suggests the same data will be collected each time in repeated observations of the same phenomenon, independently of other circumstances (Somekh & Lewin, 2005). Additionally, concepts such as credibility and sincerity can be connected to the research. Credibility can be assured through a broad explanation of the concrete details (subject phenomenon, people, or processes), while sincerity is guaranteed by transparency about the method and challenges, as well as the bias-free behaviour of the researcher (Riege, 2003; Denzin & Lincoln, 2011).

3.2. Applied research methods

This part describes the applied methods during the research. Following the approach of combining methodologies, I employed both qualitative (case study) and quantitative (survey) methods, as suggested by Sjoerdsma and Van Weele (2015), Foerstl *et al. (*2013), and Kothari et al. (2005). A multi-method mixture minimizes the disadvantages of either approach while benefiting from the constructive nature of qualitative methodology and the analytical potential of quantitative methodology. Therefore, the use of multiple methodologies strengthens the robustness of the results (Huber, Sweeney, & Smyth, 2005).

Figure 14 depicts the research features. Considering the long titles of the papers involved in the thesis I will use their letter-code and topic only when referring to them (as shown in Figure 4).

Figure 14: Features of research

RESEARCH FEATURES	SURVEY (Supplier Management)	CASE STUDY	SURVEY (4F4D Model)
Research time interval	Q4 2017 - Q2 2018	Q2 2021 - Q1 2022	Q2 2022 - Q1 2023
Data collection	questionnaire (Qualtrics)	semi-structured interview	questionnaire (Qualtrics)
Methodology of data analysis	IBM SPSS	cross-case synthesis	IBM SPSS
No. of participants (FTE)	57	5	128
Participants	purchasing leaders (80%) and professionals (20%)	purchasing top executives	purchasing professionals
Keywords	Supplier Management Digitalization	Model validation Model applicability	Model validation
Scope	Examination of purchasing status (concerning SM, digitalization)	Validation of a purchasing tool, test of applicability	Validation of a purchasing tool
Connected articles	Article C (SM), Article D (Digitalization)	Article A (Validity), Article B (Applicability)	Article A (Validity)

Source: Author's construction

Based on the endeavour to use mixed methods, there were certain reasons behind selecting the applied research methods:

Reasons for qualitative research:

- My aim was to understand a phenomenon and examine it in its natural environment and context-bound manner.
- I wanted to use purposive and theoretical sampling.
- I applied in-depth, non-standardized interviews for data collection.
- I did not seek measurable results; instead, I aimed for a theory as an outcome, with findings that respect the uniqueness of each participant.
- I did not use statistical analysis since the data were detailed, rich, and complex.
- The rigor of the findings was based on authenticity and trustworthiness.
- The output consisted of detailed descriptions of the examined phenomenon, grounded in the perspectives of participants.

Reasons for quantitative research:

- My aim was to control the validity of presumptions and to test hypotheses; in this case, the endeavour was to examine the phenomenon in a context-free manner.
- I aimed to use randomized sampling.
- I applied standardized questionnaire for data collection.
- I obtained measurable results.
- I used statistical methods for data analysis.
- There was a clear distinction between me and the respondents of the survey.

3.2.1. Case study research

Connected articles: Article A (Validity – interviews' part) and Article B (Applicability)

The purpose of case study research (as employed in qualitative methodology) is to analyse hypotheses, understand phenomena through observation, examine contemporary events, explore potential problems, and draw adequate conclusions from studies. During the case study, behaviours cannot be manipulated; therefore, it relies on two sources of evidence: direct observation of the studied event and interviews with involved individuals (Yin, 1994).

Therefore, the case study provides an opportunity for a profound exploration and understanding of the context under discussion and inductive theory based on the processed case. This method is typically a step-by-step theoretical research form where the goal is to understand a real-life phenomenon while encompassing important contextual conditions (Yin, 1994). Additionally, the case study is the appropriate methodology when the questions are "how" or "why" regarding that contemporary phenomenon. Thus, such qualitative research consists of detailed narrative descriptions of the phenomena under study, in-depth interviews, and comparisons and interpretations of findings and patterns that emerge across the studied cases (Patton, 2005). This method emphasizes the depth of understanding and the deeper meanings of human experiences and aims to generate theoretically richer observations (Rubin & Babbie, 2011).

The next step is to decide the type of case study design. According to Yin (2012), we can differentiate four types of design (a two-by-two matrix): single or multiple-case study, analysed on its/their own as a holistic case or as embedded subcases within an overall holistic case. Since I examined more than one company, I applied a multiple-case study. Furthermore, Yin (2012) categorizes case studies into three groups: descriptive case studies, explanatory case studies and cross-case syntheses. The descriptive case study offers rich and revealing insights into the nature of a particular case, the explanatory case study seeks to explain how and why a series of events occurred (these are basically single-case studies), while the cross-case synthesis involves multiple cases. Since my thesis represents more than one case, I applied a cross-case synthesis method.

Apart from the various aspects of case studies, the main data collection method of all types should be the qualitative interview. The case study interview is the interaction between the interviewer and respondent, in which the interviewer has a general plan of inquiry but not a specific set of questions that must be asked in particular words or order. In an ideal situation, the interviewee does most of the talking, while the interviewer uses questions built up in advance, employing a guide that allows the respondent to answer open-ended questions (Rubin & Babbie, 2011). With this type of questioning, respondents are asked to provide their own answers rather than selecting from a list of possible responses created by the researcher, as in closed-ended questions (Somekh & Lewin, 2005). Thus, the purpose of using interviews is not only to obtain answers to questions or test hypotheses; being interested in others' viewpoints is the basic assumption underlying the interviewing technique. Therefore, the reason I chose to apply interviewing was my interest in understanding the meaning of the experiences of other individuals and how those experiences shaped their events.

The main task of the researcher is to build a thought-line structure and explore the interviewees' answers to the questions. The goal is to reconstruct their experiences within the topic under study (Seidman, 2006), as the answers and behaviour of each interviewee become meaningful and understandable when placed in the context of their life (Seidman, 2006). Without this context, there is little possibility of exploring the meaning of an experience (Patton, 2005). Hence, researchers must formulate the research questions and problems and specify potentially important variables while avoiding the temptation to think about specific relationships between variables and theories (Eisenhardt, 1989).

Once the “case” itself and the questions are determined, it is also necessary to define what will not be part of the case, as there is a tendency for researchers to attempt answering questions that are too complex or topics with too many objectives. To avoid this problem, it is suggested to place boundaries on a case, which will prevent overly deep immersion (Baxter & Jack, 2015).

As such, I applied case study research using semi-structured deep interviews, relying on the opinion of professionals in line with a reviewer’s viewpoint who stated: “*deep-interviews with 5 key experts of a certain domain has better scientific income than a questionnaire-based survey on a let's say sample of 100”* (unknown reviewer in a blind peer-review process). Considering that business decisions are made by top executives, such as the heads of purchasing, and their professional competencies are essential for managing processes, the target individuals for interviews were the top leaders of each purchasing organization under study (such as CPO - Chief Procurement Officer, procurement director, or head of procurement). Additionally, the interviewees were the heads of organizations because the opinions of top executives carry significant weight, as “*top managers certainly influence the values and strategy of their organizations and as stakeholders should have the most influence on supply chain management decisions*” (Meixell & Luoma, 2015, p. 84). Practices and experiences can serve as valuable resources to help validate scientific concepts, as the majority of papers revolve around conceptual frameworks or architectures, as emphasized by Govindan *et al.* (2024) in their study. [Note: see the discussion of the interviews in Article B, while the interview guidelines in Appendix A.]

The typical sampling strategy of the case study is theory-based sampling; thus, I followed this approach to find the best samples that fit the theory. All sessions were audio recorded during the semi-structured in-depth interviews, and notes were also taken. All interviewees provided their written consent by signing a statement for data processing.

3.2.2. Survey research

Connected articles: Article A (Validity - survey's part), Article C (SM), and Article D (Digitalization)

Survey research (as used in quantitative methods) presumes numerical and statistical analysis. One of the most popular tools for gathering answers to questions is the questionnaire, which is designed to retrieve information suitable for analysis. In survey research, structured (standardized) questionnaires are used along with closed-ended questions, where respondents are asked to select answers from a predefined list provided by the researcher (Sandelowski, 2000).

Besides closed-ended questions, the Likert scale (named after its inventor, psychologist Rensis Likert) is the most widely used approach to scaling responses in survey research. It is a type of composite measure developed to improve the levels of measurement in social research using standardized response categories. The categories of a typical five-level Likert item, for instance, could be as follows: strongly disagree, disagree, neither agree nor disagree, agree and strongly agree (Rubin & Babbie, 2011). When responding to a Likert item, respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements. Thus, the range captures the intensity of their feelings for a given item. Such items can be used in the construction of true Likert scales and can also be utilized in the construction of other types of composite measures, as there are various types of rating scales. However, the term "Likert scale" (or more precisely, "Likert-type scale") is often used interchangeably with other rating scales (Somekh & Lewin, 2005).

In my research, I employed both closed-ended questions and Likert-type scales to standardize responses, ensuring equal interpretation of the answers and facilitating analysis. The questions included in the questionnaires were connected to the factors of the 4F4D model (see survey questionnaires in Appendix B), as well as topics of strategy, cross-functional integration, supplier management and IT solutions as factors/drivers of the model (see the other survey questionnaires in Appendix C). The thesis sought responses to questions linked to the topics outlined below:

Strategies:

- On which organization level is the procurement organization situated within the company, and how accepted (strategically) is the procurement organization inside the company?
- Does any procurement strategy exist, and if so, is it applied?

Cross-functional integration:

- What kind of cooperation is taking place between procurement and requestors?
- Do problems arise during the cooperation, and if so, what kind of issues emerge?

Supplier Management:

- How much emphasis does procurement place on cooperation with suppliers?
- What supplier evaluation and selection methods does the company apply (if any)?

IT solutions:

- What IT systems, applications, and workflows are utilized by the companies?
- What is the degree of digitization of the solutions?

3.3. Articles' description and interconnections among them and with the 4F4D model

This chapter provides a brief summary (goals and results) of each article included in this study, displaying the interconnections among the four articles and the elaborated model. In addition, it also attempts to highlight some aspects of the discussed topics that are lacking in the articles due to space constraints; in this sense, the papers are supplemented with a few additional thoughts.

3.3.1. Article A (Validity)

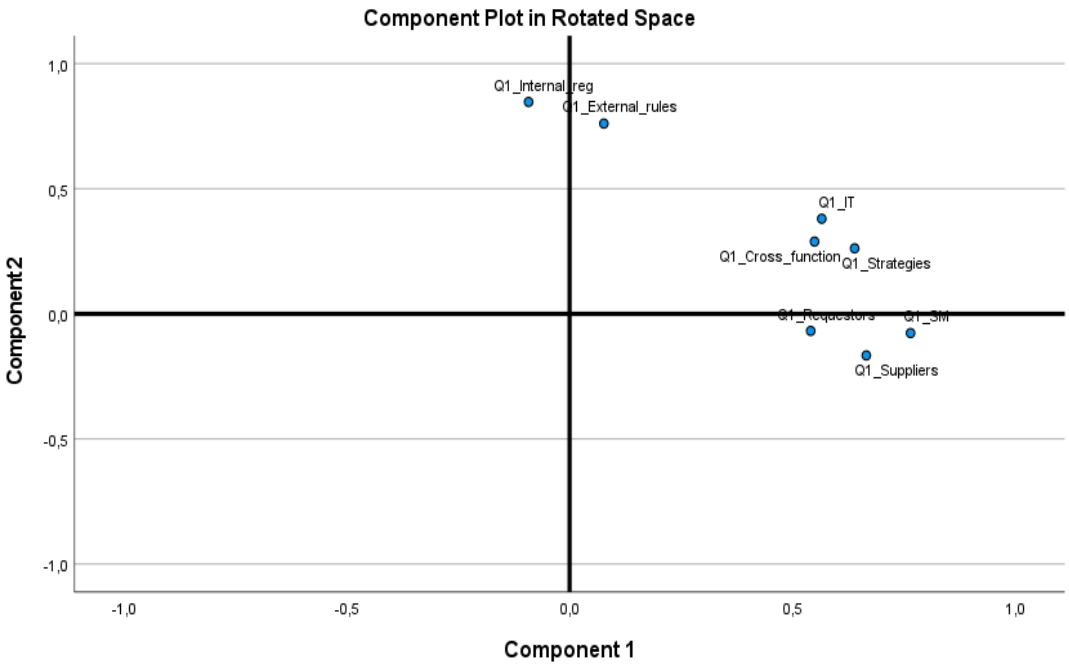
This article aimed to validate the 4F4D model from the correctness and completeness perspectives, which model was designed as a guidance on how to balance the purchasing environment and processes. The validation study comprises case studies and survey research conducted at five multinational companies, involving over 130 purchasing professionals.

In addition to the analyses involved in this article, to examine the elements related to the importance of the factors, Factor Analysis (FA) was also applied, interpreting the Likert-type factors as scale variables (as suggested by George & Malley, 2019). Principal Component Analysis (PCA) was used, with the rotation method being Varimax with Kaiser normalization, resulting in the graph in Figure 15.

Based on the physical location of the elements, clear similarities can be observed in the figure among the factors, forming the following groups:

1) Internal regulation and external rules
2) IT, cross-functional integration, and strategies
3) Requestors, suppliers, and supplier management (SM).

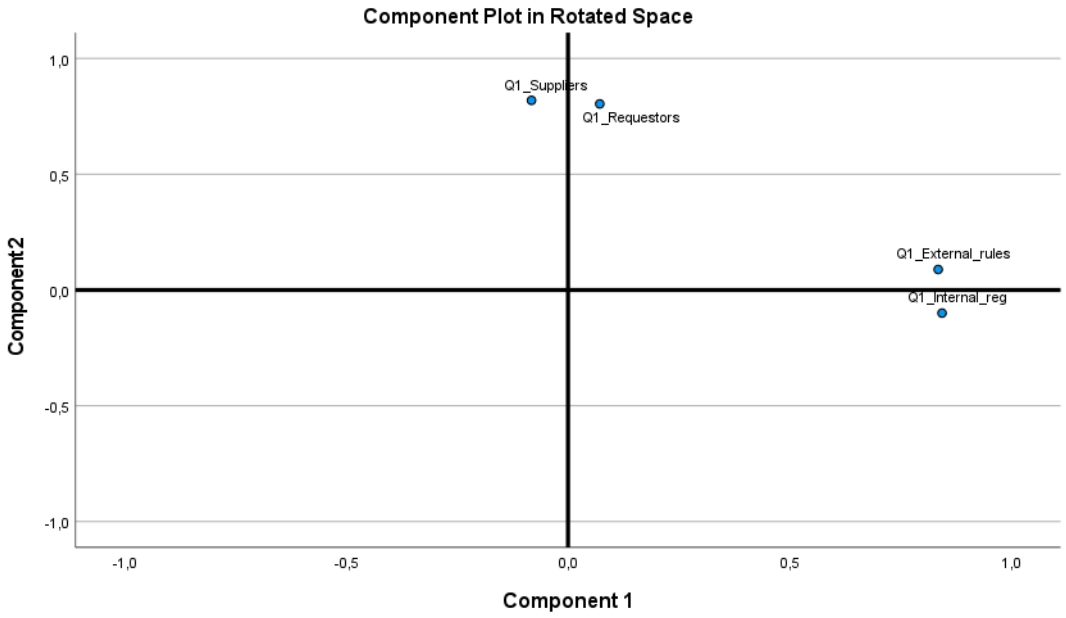
Figure 15: Factor analysis – all factors



Source: Author's construction

Given that the first and third groups (except SM) belong to the forces group and are located along the two axes, a new analysis was conducted using only the four elements of the forces, creating two new variables: Actors (involving suppliers and requestors) and Rules (involving external rules and internal regulations), as shown in Figure 16. The proximity of the elements remained stable, indicating the similarities and strengthening their cohesion.

Figure 16: Factor analysis – Forces



Source: Author's construction

For the remaining four elements (drivers group) a new analysis was performed with the following result: due to the similarity and proximity of the elements, a graphic representation of the principal component analysis was not possible. However, Figure 17 illustrates the features of the elements. Considering that the proximity of the elements within the forces group (two by two) can be clearly identified, the same is true for the drivers. Thus, the similarities among factors and their correct grouping in the model can be confirmed based on the factor analysis as well.

Figure 17: Factor analysis – Drivers

Component Matrix[a]	
	Component
	1
IT solutions	0,703
Cross-functional integration	0,595
Supplier Management	0,765
Strategies	0,769
Extraction Method: Principal Component Analysis.	
a. 1 components extracted.	

Source: Author's construction

As such, research and all the analyses (those involved in the article and the additional ones) proved the model's validity in terms of correctness (in shape), completeness (in elements), and applicability (in practice). In particular: interviewees (purchasing leaders) confirmed the model’s accuracy, comprehensiveness, and balanced nature, acknowledging its practical applicability. Meanwhile, survey respondents (purchasing associates from the same organizations) approved the elements and their classification, confirming completeness by not identifying any deficiencies in the model's arrangement.

3.3.2. Article B (Applicability)

Purchasing decisions, which have strong financial and production impacts, operate under continuous risks and exerting power due to the necessity of securing supply. The best solution to minimize such risks is to make proper (strategic) purchasing decisions, which involves identifying the factors that influence the procedures. Therefore, the key objective of this article was to demonstrate and test the practical applicability of the 4F4D model. The paper aimed to mitigate risks by identifying and classifying/grouping the factors that affect, influence, or determine business and purchasing procedures, as well as operations, KPIs, and financial outcomes. The applied methodology was case study research, in which semi-structured deep interviews were conducted with five heads of purchasing organizations at selected multinational/large companies (the same participants as in Article A).

During the interviews, each purchasing leader identified suppliers as a force and a source of risk in the procurement procedures. With special regard to such volatile market conditions, prudence in supplier selection and the working relationship with them is a key success factor. Even though the endeavour is to become more agile, lean, and green by lowering the number of suppliers (which increases dependency and consequently risk and vulnerability - Faisal, Banwet, & Shankar, 2006), and to reduce costs (for example, through joint product development to lower escalating R&D costs - Contractor & Lorange, 2002), these decisions could hide dangers and hinder processes. Figure 18 provides examples and highlights some possible bottleneck situations between purchasing and suppliers, particularly in relation to joint R&D efforts.

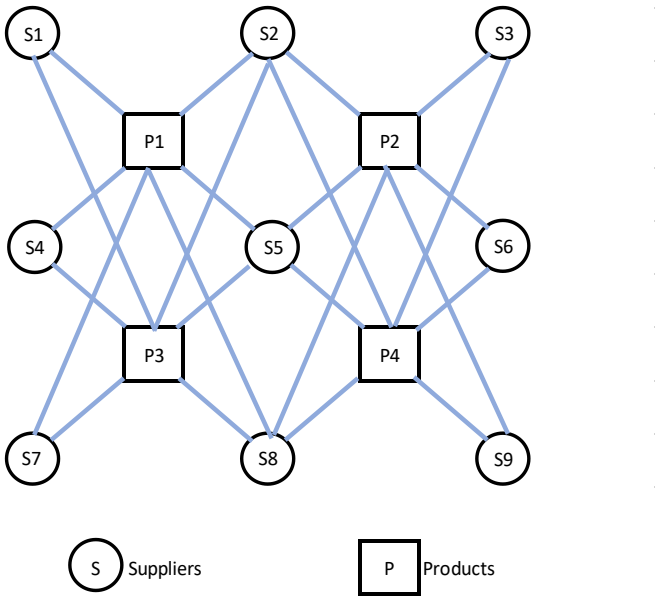
Figure 18: Cases of high dependencies (joint R&D)

Aspects	Buyer	Supplier
Interchangeability	Low number of alternative suppliers (or single one source; e.g. monopoly, licence, patent)	Low number of potential buyers (or single one market, e.g. tailored to specific Buyer)
Financial risk	High ratio of purchasing expenses paid to the given supplier	High sales revenue ratio from the given buyer
Product/service customization	Low ability to find new supplier depending on the complexity of manufacturing	Low ability to find new market depending on the complexity of supply

Source: Author's construction

The main task of purchasing remains to secure a continuous supply of raw materials necessary for manufacturing. However, this activity is only feasible through suppliers, which places great emphasis on balancing relationships, as suggested by Figure 19. As Ganesan (1994) indicates, a successful long-term relationship between a buyer and supplier relies on mutual dependence.

Figure 19: Balanced buyer-supplier relationship model



Source: Author's construction

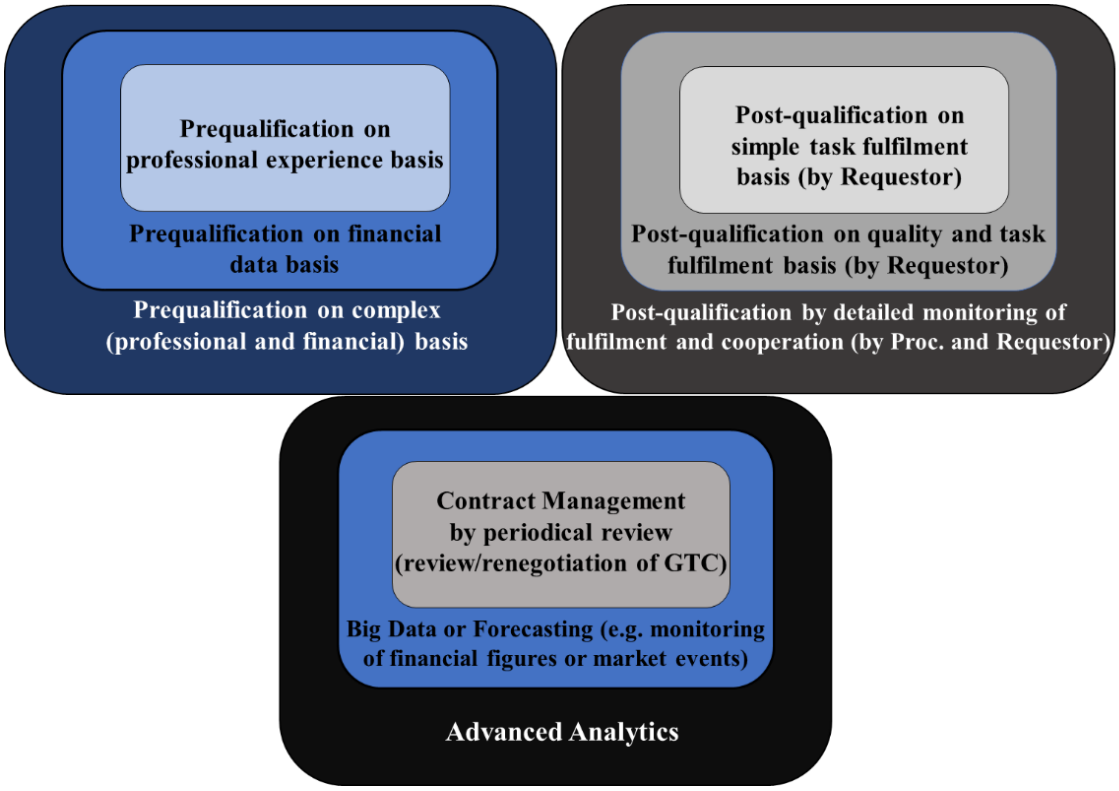
As confirmed during the interviews by the purchasing executives, there is no useful tool available to leaders for revealing and classifying the existing (internal and external) problems in purchasing that affect decision-making. They also validated the applicability of the developed model. In addition to testing the model's applicability, the article provides detailed practical examples and demonstrates the linkage between existing (revealed) deficiencies and the model's factors (drivers). These cases can help managers recognize weaknesses in their own organizations and can also serve as a compass for scholars exploring new research directions.

3.3.3. Article C (Supplier Management)

This article revolves around Supplier Management (SM) as both a practice/activity and a theoretical framework for handling suppliers. It presents the findings of research investigating the actual practice of SM within the surveyed procurement organizations. Given that the management of relationships, as well as the selection and evaluation of suppliers, are seen as crucial strategic issues (Araz & Ozkarahan, 2007), there are several methods (systems and concepts) for evaluating suppliers and their performance and efficiency. However, evaluation methods are not as straightforward to overview as one might think due to the variety and complexity of approaches across different companies. Additionally, data and methodologies may be protected by non-disclosure agreements.

The evaluation methods and their relevant aspects (items of specific models) can be quite complex and widely vary from one company to another. Evaluation systems consist of various questions, and the system ranks the answers accordingly. Therefore, the evaluation is conducted on a large scale to ensure an equal and unbiased assessment of suppliers. For a clearer overview, Figure 20 provides a graphical representation of the possible answers to the survey question regarding tools and methods of SM in terms of evaluation, grouped into three categories according to Question 19 of the survey research (Appendix C).

Figure 20: Methods of supplier evaluation



Source: Author's construction

Considering that the research revealed some deficiencies, the paper formulates suggestions for a more efficient SM practice. It argues that the procurement processes related to SM exhibit deficiencies that may originate from its component parts, such as supplier evaluation and selection, cooperation, and IT solutions.

3.3.4. Article D (Digitalization)

This article, written based on survey research, argues that one possible way to reduce risks is through the application of well-designed and efficient procedures. However, these processes require IT/electronic systems and applications, as well as automated processes. Therefore, this paper analyses the gaps in the procurement processes concerning IT solutions and digitalized processes.

According to the survey's results (Appendix C) the procurement-specific application (e.g. SRM - Supplier Relationship Management system) is at 40% while Supplier Management is only at 29% widespread, even though it could be considered a part of SRM.

Furthermore, this indicates a low emphasis on the risk management, as prudent and continuous SM (in terms of supplier evaluation) should help mitigate risks. As Figure 21 shows, there is a continuous need for supplier evaluation connected to selection and re-evaluation during the cooperation and while the contract is in force. For example, in the case of an existing quality assurance system (e.g., ISO), the evaluation of suppliers must be conducted on a yearly basis as a requirement for certification.

Figure 21: Process of supplier evaluation, selection, and (re)evaluation

Source: Author's construction

In addition, the frequency of e-auction and e-bidding systems (also parts of RfX procedures and Supplier Management) is significantly below the expected level of automation in today's digital world; the former is at 24%, while the latter is at 25%. This indicates that companies and their managers either do not prioritize resource-efficient digital solutions in this area or have not yet recognized their importance.

This lack of digital integration not only hampers efficiency but also exposes organizations to increased risks and operational inefficiencies. As procurement departments strive to enhance their capabilities, it is crucial to identify and address these gaps to foster a more resilient and agile procurement environment. Emphasizing the adoption of digital tools can facilitate better data management, streamline workflows, and improve communication across the supply chain, ultimately leading to more informed decision-making and enhanced overall performance.

According to the research findings, the adoption of necessary applications and systems remains relatively low, with many processes still relying on paper without adequate IT support. The article's theoretical contribution lies in examining the digitalization aspects of procurement practices through conducted research, presenting the findings, and reviewing pertinent literature.

3.4. Closing remarks concerning the articles' synopsis

This thesis consists of four articles (A-D) and three research studies (one case study and two surveys), covering the period from Q4 2017 to Q1 2023, as shown in Figure 22. The research focused on topics such as model validation and applicability, as well as current aspects of purchasing activities connected to supplier management and IT solutions (digitalization). The latter two elements are factors of the 4F4D model and represent key features of the ongoing paradigm shift, as depicted in the introductory part of the thesis. The research involved 190 purchasing practitioners, all of whom were exclusively high-level purchasing professionals, considering their positions (e.g., executives and senior-level professionals) and workplaces (e.g., large and multinational companies). This is stated because the requirements towards employees, connected to their skills and knowledge level, are stringent (at this company size and at both leadership and subordinate levels).

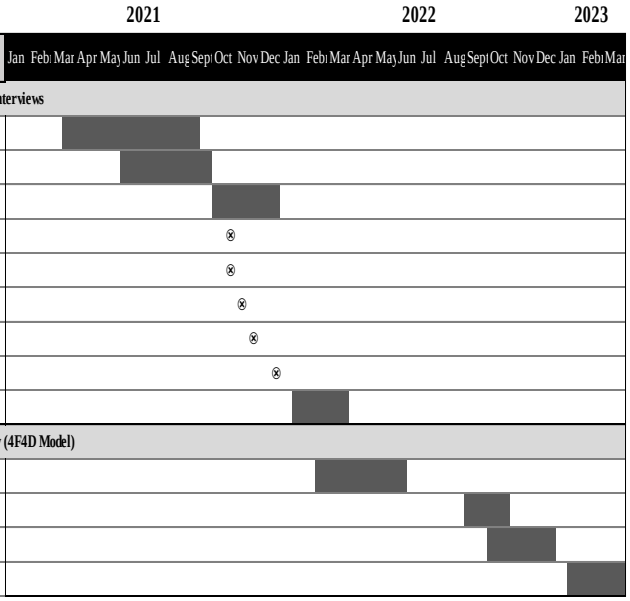
Figure 22: Schedule of research

Schedule of research

	ACTIVITIES	START	Duration (days) / Date (interviews)	END
SUPPLIER MANAGEMENT	Survey (Supplier Management)			
	Preparation of survey questionnaire	1-Oct-2017	60	30-Nov-2017
	Test of questionnaire	1-Dec-2017	14	15-Dec-2017
	Contact companies to launch survey	1-Nov-2017	44	15-Dec-2017
	Survey's time-interwal	15-Dec-2017	121	15-Apr-2018
	Processing of survey responses	15-Apr-2018	76	30-Jun-2018

Schedule of research

	ACTIVITIES	START	Duration (days) / Date (interviews)	END
MODEL VALIDATION	Phase I. Interviews			
	Preparation of model and interview guidelines	15-Mar-2021	184	15-Sep-2021
	Contact companies to schedule interviews	1-Jun-2021	121	30-Sep-2021
	Interviews' time-interwal	1-Oct-2021	91	31-Dec-2021
	Interview with Company A		*28-Oct-2021*	
	Interview with Company B		*29-Oct-2021*	
	Interview with Company C		*3-Nov-2021*	
	Interview with Company D		*16-Nov-2021*	
	Interview with Company E		*16-Dec-2021*	
	Processing of interviews	15-Jan-2022	75	31-Mar-2022
	Phase II. Survey (4F4D Model)			
	Preparation of survey questionnaire	15-Feb-2022	120	15-Jun-2022
	Test of questionnaire	1-Sep-2022	60	31-Oct-2022
	Contact companies to launch and respond survey	1-Oct-2022	91	31-Dec-2022
	Processing of survey responses	15-Jan-2023	75	31-Mar-2023



Source: Author's construction

Article A validates the model itself, as suggested by Maier, Moultrie, and Clarkson (2012), demonstrating the correctness of the concept. Articles B, C, and D provide a detailed description and analysis of the actual practices within purchasing departments, focusing on development opportunities in terms of supplier management (SM), IT, and digitalization, as well as the solutions and systems currently in use. Specifically, Article B employs case study research to depict the present purchasing practices, highlighting strengths and weaknesses while briefly testing the applicability of the 4F4D model based on insights gathered from purchasing leaders. Articles C and D utilize survey research to explore SM and IT solutions, which are drivers of the 4F4D framework. Particularly: Article C analyses the specificities of SM in the surveyed companies, while Article D examines their IT and digitalization features. Consequently, the articles included in the thesis are interrelated with each other and the developed framework, ensuring ***"topic coherence"*** across the discussed concepts.

Additionally, the various methodologies applied in the research, along with the different topics and questions analysed based solely on primary data, contribute to the diversity of the studies included in the thesis. This approach emphasizes the ***"differentiation"*** between the articles while maintaining synergies among them.

The primary goal of procurement is to effectively manage the purchasing organization, which can be achieved through efficient purchasing processes. Therefore, it is essential to identify weaknesses and balance operations. One of the key strengths of the 4F4D model lies in its ***"relevance"*** and applicability, as it clearly classifies factors into forces and drivers regardless of specific contexts. This structured approach provides a consistent framework for analysing and implementing purchasing processes. The model's holistic perspective and clear structure enhance understanding of the complex dynamics within purchasing, thereby underscoring its value in the procurement landscape.

PART II: ARTICLES OF THE THESIS

4. GUIDANCE ON HOW TO BALANCE THE PURCHASING ENVIRONMENT AND PROCESSES TO SAVE RESOURCES – A VALIDITY EXAMINATION OF A HOLISTIC MODEL

Wittinger, M.M., Demeter, K. (2024). Guidance on how to balance the purchasing environment and processes to save resources – A validity examination of a holistic model, "Cogent Business & Management, 11(1), 1-35.

Abstract

Despite the evolution of purchasing operations over many years, a comprehensive perspective is lacking in practice, leading to inefficiencies. This study aims to validate a model designed to guide how to balance the purchasing environment. It comprehensively delineates the general pattern (a map) of real-life purchasing procedures and standardizes these elements to provide clarity and coherence. The model's novelty lies in the thoughtful selection and arrangement of factors, and their classification into two groups forces and drivers. This facilitates a structured approach to analysing purchasing status through a checklist. By mapping purchasing activities, the model connects issues to its factors. After identifying existing weaknesses in operations by this linkage among the model’s elements and problems, the framework serves as a valuable diagnostic tool supporting managerial decisions and enhancing efficiency. The validation study comprised case studies and survey research conducted at five multinational companies, involving over 130 purchasing professionals. Research proved the model's validity in terms of correctness, completeness, and applicability.

Keywords: Cross-functional integration, IT solutions, Procurement, Purchasing, Strategies, Supplier Management

4.1. Introduction

Ensuring a continuous supply today is more challenging than in the past when business processes were better predictable. Thus, companies must develop practices and processes to secure the sustainability of their purchases and to mitigate risks arising from supply chains (Hallikas, Lintukangas, & Kähkönen, 2020; Miemczyk & Luzzini, 2019; Gualandris, Golini, & Kalchschmidt, 2014). Therefore, it is vital to analyze and balance purchasing[2] processes by managing and improving organizational capabilities (Maier et al., 2012) with special regard to the changes in the supply chain that impact the purchasing environment (such as the appearance of advanced services accelerating servitization, effects of blockchain mechanism etc) as suggested by several studies comprised in Rana (2022).

Purchasing, acting as a connection point of several areas by procurement services, entails factors that comprehensively depict its realm and are specific to this domain only such as supplier management (Carter, Carter, Monczka, Slaight, & Swan, 2000; Wittinger, 2022). To aid procurement practice, these factors must be revealed, and their status analyzed to create a balanced and comprehensive picture for purchasing operations. However, as research confirmed, there is little guidance on how to achieve this goal. Therefore, it would be worthwhile to employ a validated tool that can assist in examining the environment at the purchasing operation level and studying the factors and their interactions as suggested in Bals, Laine and Mugurusi (2018). In addition, a validated tool assures that the original intention of the author (when setting up a concept) coincides with the understanding of those model's appliers. As such, this condition proves the correctness of the concept (Maier, Moultrie, and Clarkson, 2012).

In the literature, there is an immense number of articles related to purchasing. Additionally, we encountered a substantial body of papers that have introduced or defined various models or concepts related to various aspects of purchasing processes. The advantage of such a purchasing model should be similar to that of strategic models such as the Balanced Scorecard (Kaplan & Norton, 2006a), or Porter’s 5 forces model (Porter, 2008).

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[2] Note: for practical reasons, we use the terms "purchasing" and "procurement" interchangeably, as suggested by Miemczyk, Johnsen and Macquet (2012). Furthermore, these terms can indicate both the organization and the activity, depending on the context.

These models provide strategic support for leaders to assess their companies' performance by reviewing a standardized set of factors that impact decisions.

In this study, researchers aim to validate a holistic purchasing model that provides guidance on balancing the purchasing environment and processes. The recently developed Four Forces and Four Drivers (4F4D) model (Wittinger, 2022) is validated at five multinational companies by conducting interviews with purchasing executives and using survey for purchasing subordinates. The primary endeavour of the authors was to assess the model in real-life practice.

The article's structure is as follows: the subsequent section briefly reviews the literature connected to the model's factors (forces and drivers). Then the 4F4D model is introduced, followed by a comparison between the 4F4D model and a set of conceptual models related to purchasing. This is followed by the research questions and hypotheses, methodology and data collection. Then, the presentation of results, subsequent discussion, practical implications, and closing remarks are provided.

4.2. Literature review on the factors of purchasing environment

A comprehensive literature review was conducted by Wittinger (2022) to establish the 4F4D framework, providing a detailed exploration of the four forces (requestors, suppliers, internal regulations, and external rules) and four drivers (strategies, IT solutions, cross-functional integration, and supplier management) within the model. Nevertheless, for the sake of clarity, this chapter provides a snapshot of the literature on the given factors of the purchasing environment.

Requestors, suppliers, and regulations/rules as forces of procurement

Literature distinguishes actors and groups that could change/influence certain purchasing activities through pressures and incentives set by them (Seuring and Müller, 2008). Gelderman et al. (2017) emphasized that stakeholder pressures are driving forces toward the implementation of standards and codes of conduct. Based on the nature of purchasing activities, procurement organization is the intersection point of stakeholders belonging to suppliers and co-departments. Articles connected to suppliers accentuate their crucial role and their enforcing power (Ogunranti, Ceryan, & Banerjee, 2021; Padgett, Hopkins, & Williams, 2020; Gelderman, Semeijn, & Vluggen, 2017; Gelderman & Semeijn, 2006;

Gelderman & Van Weele, 2005). Besides suppliers, internal requestors (co-departments) are those actors whose existence as forces is proven due to their roles. They are the so-called BUFUs (business units and functional units, such as manufacturing, marketing, quality, R&D departments etc) that launch purchase requests (requisitions) towards procurement (Gebauer & Shaw, 2004).

In addition to these two actors, legal aspects are to be considered as forces because purchasing risks can be mitigated by the established legal requirements involved/stipulated in the processes and contracts in terms of external rules and internal regulations (Venter, 2007; Wittinger, 2022). Seuring and Müller (2008) also mentioned the government as forces. Nevertheless, as the 4F4D model suggests, the government should be substituted by external rules because this comprises a much larger population of local, domestic, and global authorities. If purchasing organization applies rules and follows established procedures (as features of the so-called formalization) this positively impacts purchasing performance (Akın Ateş et al., 2018).

Strategies: companies' and functional (purchasing) ones

Strategies describe how companies intend to create value for their stakeholders (Kaplan & Norton, 2006b), while functional strategies, as individual policies, must fit into the integrated pattern, and they will be deemed how they relate to other company's policies (Tilles, 1963). Thus, the purchasing strategy must be in line with and an interrelated part of the company's strategies, as collaborative purchasing strategies enhance project efficiency (Eriksson et al., 2019).

This does not automatically lead to acceptance of purchasing strategy by co-organizations or management. Even though purchasing activities have a cumulative impact on corporate goals, procurement department must be regarded as acting legitimately, and whose procedures are desirable and appropriate (Suchman, 1995). Thus, legitimation means how accepted a given organization is inside its range of interpretation – a particular team or company (Acquah et al., 2021). The internal legitimacy level of procurement corresponds to how significant its contribution is compared to the whole performance. The key factor for the improvement of a purchasing organization's acceptance is the alignment of its objectives/strategies to the other functional or company's ones (Tchokogué et al., 2017).

Cross-functional integration: the internal cooperation of the company

Cross-functional integration is the cooperation among various divisions/functions of a company (Foerstl et al., 2013; Poberschnigg, Pimenta, & Hilletofth, 2020), in this case between procurement and requestors. Nevertheless, cooperation with requestors could lead to games inside the company where the outcome will depend on the power distribution among the involved actors (Bjerregaard & Jonasson, 2014; Pemer & Skjølsvik, 2016). Due to significant changes in operations, cross-functional integration and the involvement of cross-functional teams in projects become mandatory to increase purchasing performance (Ferreira et al., 2019). Cross-functional team members integrate diverse perspectives and synthesize various knowledge and competencies (e.g., technology, production, and procurement knowledge), thus, purchasing procedures can be better adjustable to the requirements and goals become much more achievable (Meschnig & Kaufmann, 2015). Procurement will contribute to the future success if interrelated organizations cooperate with purchasing because business success and competitive advantage can be gained by working together (Servajean-Hilst & Calvi, 2018).

However, still now, working and thinking together often results in failed cooperation. One barrier to internal knowledge transfer is occurring disagreement between the source (e.g. requestor) and recipient (e.g. procurement) (Szulanski, 1996). According to practice and in line with several articles, the inimical behaviour of organizations seems to survive the organizations' evolution in other sense (e.g. Goold, Campbell, & Alexander, 1998; Porter, 1985; Ferreira et al., 2019). Porter blamed both the source and recipient; saying that the source has no incentive to transfer any know-how, especially if it time consuming or risks leaking out of proprietary technology, also the recipient is rarely open to finding know-how elsewhere in the company (Porter, 1985). Other viewpoints are that it is difficult to make business units agree to pursue an interrelationship (Goold et al., 1998) and it is just a hope that one business unit could learn something useful from another (Porter, 1985). These points of view are still experienced today (as in Ellegaard & Koch, 2014 and Brandon-Jones & Knoppen, 2018), however, nowadays companies are recognizing the importance of cross-functional integration and are engaging in applying cooperation at different integration levels (Barki & Pinsonneault, 2005).

Supplier management: the management of the external relationships

Considering that reactive planning was long time ago replaced by proactive planning (Carter et al., 2000; Kraljic, 1983), and now the emphasis is placed on risk management, therefore, procurement should consider the changes in supplier relationships management as well (Hallikas et al., 2020; Ogunranti et al., 2021). While in the past procurement managers focused mainly on cost reduction, now they are placing more emphasis on the continuity and flexibility of supply, especially in case of systemic shocks, such as global pandemic circumstances (McEvoy & Ferri, 2020). Due to the urgent necessity to mitigate such supply-side risks, procurement organizations and professionals must have higher skills/competencies and use more developed tools in terms of purchasing and supply management (Schulze et al., 2019; Araujo et al., 2016). These tools help procurement gain insights into suppliers' practices and risks and support purchasing in defining clear strategies for various types/categories of sourcing. Therefore, the most complex part of purchasing work is supplier management (SM) (Hallikas et al., 2020; Handfield, Petersen, Cousins, & Lawson, 2009; Wittinger, 2019). Without effective supply chain relationships, the effort to manage the flow of materials will be unsuccessful (Croom, Romano, & Giannakis, 2000). Hence, the role/activities of purchasing have significantly increased in importance to build/maintain appropriate suppliers' relationships (Bendixen & Abratt, 2007; Cousins, 2002; Handfield et al., 2009). Procurement should purchase goods/services using efficient supply chains that can provide supplies not only at the lowest cost, best quality, and highest flexibility, but also in a socially and environmentally responsible manner (Seuring & Müller, 2008; Zimmer, Fröhling, & Schultmann, 2016).

In summary, effective SM methods can ensure continuous supply as well as help lower the number of suppliers, thus supporting greener procurement. Considering that suppliers will be evaluated several times during cooperation (at the beginning of a new cooperation or periodically to control the task fulfilment), efficient evaluation will reveal dispensable suppliers to make purchasing sustainable (Pónusz et al., 2020).

IT solutions: digitized workflows and procedures

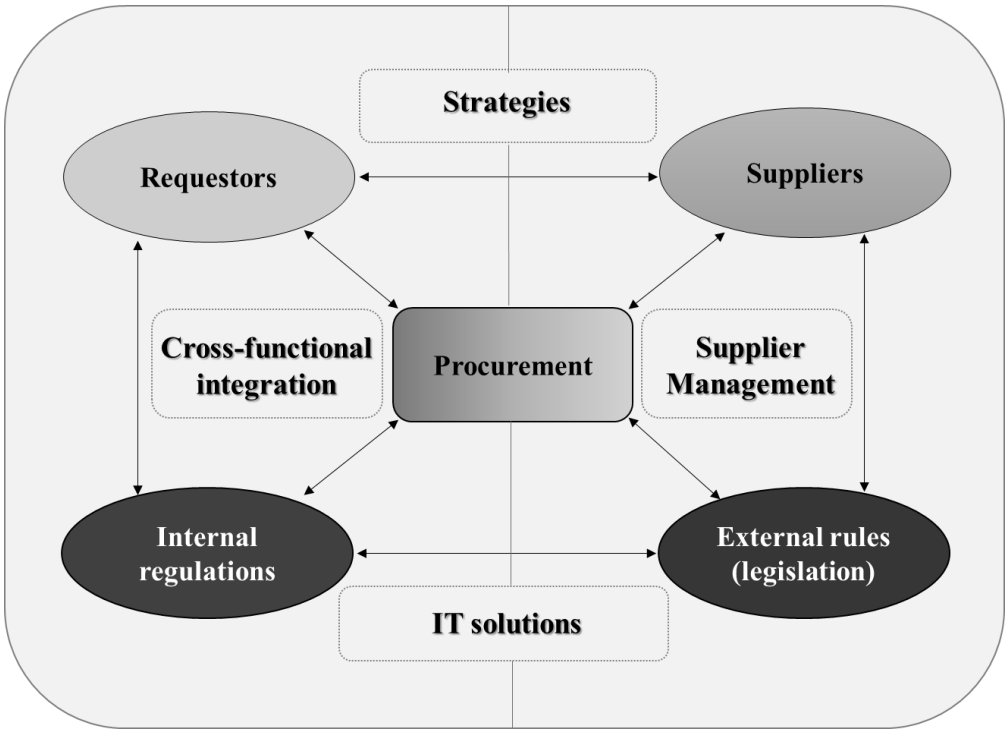
The phenomenon called I4.0 is gaining ground primarily through business process digitalization; however, this is not just about the spread of technology but also about a complete paradigm shift in business processes (Tarigan, Siagian, & Jie, 2020). Therefore, for purchasing – considering the vulnerable supply channels of globalised markets – a way to increase effectiveness is to accomplish purchasing tasks through digitalized procedures since IT and e-procurement solutions are fundamental means for each company (Afolabi, Ibem, Aduwo, Tunji-Olayeni, & Oluwunmi, 2019; Chae, Yen, & Sheu, 2005; Nivetha, 2021; Ronchi, Brun, Golini, & Fan, 2010). Procurement by using digitized solutions increases the effectiveness of activities since these solutions allow procurement to improve comprehensive purchasing intelligence, faster processes, accelerate decisions by better access to information, boost flexibility in working, and reduce costs (Garrett, 2017). These solutions also support instant reporting possibilities (procedure status, lead-time, purchasing volume, spending). Nevertheless, the adaptation of IT systems and applications triggers essential changes in both organizational and process architecture necessitating their (partly or totally) reorganization (Centobelli et al., 2014).

Therefore, connected to digitalization and the paradigm shift, it is worth mentioning DC theory (Dynamic Capabilities framework); it suggests that competitiveness (income generation) in rapid technological changes depends to a large extent on enhancing internal technological, organizational, and managerial processes. It focuses on the adaptation of an organization to the changing environment and analyzes how by this adaptation the company purposefully modifies its resource base (Teece, Pisano, & Shuen, 2009; Demeter, Losonci, & Nagy, 2021). For example, companies can introduce new or upgrade available IT systems since these become key drivers of cooperation in supply chains (Van Lith et al., 2015). To use adequate notions of digitalization, however, requires a mutual understanding of what the term digital technologies mean. The most often used terms are: BigData technologies, IoT and IoS (Internet of Things and Services), cloud and mobile technologies, social media applications, additive manufacturing, virtual reality, cognitive technology and more (Kane et al., 2016a; Srai & Lorentz, 2019).

4.3. Description of the 4F4D model and interpretation of its factors

The 4F4D model, as outlined in Wittinger (2022), was developed based on insights from literature and practical experience. However, this initial study presented the framework conceptually without any validation, leaving it as a theoretical model. The present research aims to validate this model. For clarity, this section offers a brief overview of the model and its factors (Figure 23). The model's purpose is to provide a clear depiction of real-life purchasing processes and their components, utilizing a concise set of elements that can be standardized due to their similarities. Consequently, the model comprises two main groups: forces (requestors, suppliers, internal regulations, and external rules) representing key actors/stakeholders in purchasing procedures/contracts, and drivers (strategies, IT solutions, cross-functional integration, and supplier management) representing concepts, mechanisms/procedures, and platforms that connect these actors/stakeholders.

Figure 23: Four Forces and Four Drivers (4F4D) model



Source: Wittinger, 2022

The model is divided into two parts: an internal (left side) and an external (right side) part. This division broadly reflects the distinction between elements that are within the organization’s control and those that are more influenced by external factors.

Considering that the model is designed to standardise the procurement procedure, it aims to capture (as a checklist) all relevant aspects that impact procurement, providing a balanced representation of this environment, its components, and interactions. The next section includes the interpretation of the factors and their characteristics that help classify the elements into two groups. (See Appendix B).

4.3.1. Forces

Based on the pattern of procurement procedures, the key actors in activities at the purchasing level, as noted by Miemczyk et al. (2012), are the focal firms (represented by the internal requestors) and their suppliers. In this context, the term "market" exclusively refers to suppliers for purchasing, as procurement professionals in multinational companies (matrix organizations with strong segmented areas of operation) do not have insights into the sales part of the market. As these roles are permanent in the processes, and the presence of these actors is mandatory to initiate a purchasing act, these factors are identified as forces.

To ensure processes, manage uncertainty and risks, and evolve supply networks, there is a need to engage with other institutional actors using appropriate regulations (Maccarthy et al., 2016). Considering that procurement is responsible for ensuring effective purchasing through legal clauses of the contracts in place to warrant the continuous fulfilment of suppliers (Changalima et al., 2022), therefore, we supplemented the forces with the legal environment (both external and internal). It should be considered as an actor embodied by the clauses formulated in the contract. As such, its role as a force is justified by the necessity to protect supply operations against defective performance, breach of contract, faults in fulfilment, etc.

Forces represent factors that exert restraining influences on procurement activities, including market characteristics (suppliers), internal demands (requestors), and regulatory factors (internal and external rules). They can enforce/impose certain behaviour in terms of how to act or what kinds of terms to incorporate into a contract. Furthermore, purchasing organizations cannot influence their existence, these factors being constant roles in operations (necessary ingredients of any purchasing activity), therefore they cannot be excluded from the procedures under any circumstances since the pattern of activity determines its actors/roles. This does not mean that an actor (e.g. a particular supplier) cannot be replaced, but the role remains a constant part of the operations that cannot be omitted. Apart from them, there are no other essential elements in the process.

Furthermore, there is an inseparable connection (according to the literature and practice) between actors and rules (Maccarthy et al., 2016).

4.3.2. Drivers

Drivers are frameworks providing a background for purchasing work by interconnecting actors both internally and externally. They are not forces (neither actors nor stakeholders), they drive procurement procedures only and can be omitted from the purchasing procedures in extreme situations. For example, if IT systems collapse overnight, procurement must continue its activity because otherwise manufacturing and sales would not be. Before the spread of IT systems and platforms procurement procedures run. Similarly, strategies could be a missing part, especially if we regard "strategies" as guiding concepts rather than their implementation (when they become internal rules). Strategies (like IT) did not exist in their current interpretation, but procurement processes operated. These features indicate that they are just platforms or concepts (however helpful for procurement), therefore, they are drivers.

Supplier management and cross-functional integration are even clearer; these are also concepts, processes/systems, and workflows that support cooperation and relationship management. Unfortunately, these elements (systems/approaches) still do not exist in many companies, or their application is at a very introductory stage, especially in SMEs (small-to-medium enterprises) as mentioned in Bianchini, Benci, Pellegrini, & Rossi (2019). In summary, drivers lead procurement processes and influence their operation and management because procurement procedures are driven by workflows, according to specific strategies, and rest on certain IT systems and applications (Wittinger, 2022). However, these factors may be missing from the operations.

4.4. Comparison of the 4F4D model to literature

This study aims to examine and demonstrate the validity (in terms of completeness and correctness) of the 4F4D model. Recognizing the gaps in the validation of purchasing models or concepts through literature review methods, this review approaches the subject from the perspective of the 4F4D model. Given that no studies have developed models or concepts from identical elements, the extent of related literature on these discussed elements cannot be processed in a single article with a different focus. Therefore, this chapter gives a brief review of papers deemed to be most relevant to the model, emphasizing their similarities with the 4F4D model in arrangement or concept, or the presence of elements with similar

characteristics. Nevertheless, this comparison aims to highlight the main differences between the literature and the 4F4D model (Figure 24), while the emphasis is placed on structures and factors.

While many studies have initiated the analysis of purchasing processes from the point of issuing a purchase request (requisition) by the internal co-department, as observed in Gebauer and Shaw (2004), Ellegaard and Koch (2014), and Venter (2007), others have omitted the presentation of procurement activities from the very beginning. In other words, they do not start from requestors who demand purchasing services launching the procedure. Even in the study by Versendaal *et al.* (2013), which provides a detailed examination of purchasing processes, the analysis starts from purchasing placing orders, and they do not portray the preparatory phase of all purchasing activities in terms of requestors and purchase requisition. Similar patterns are found in other studies; although Bals, Laine, and Mugurusi (2018) and Nicoletti (2017) analyze various internal factors of the company related to purchasing activities, they do not specify requestors and their requisition processes. Gelderman, Semeijn, and Vluggen (2017) identify actors influencing procurement; but they appear to not recognize requestors as those actors embodying the purchasing requirements.

Similarly, Mikalef, Pateli, Batenburg, & Van De Wetering (2015) examined how purchasing strategy can be effectively aligned with IT and what conditions facilitate this state, arguing that purchasing alignment is dependent upon patterns of multiple contingencies. However, several elements (such as strategic orientation) cannot be comprehended within this range of interpretation if requestors are not connected at all to purchasing. The authors did not mention the participation ratio of different company sizes; presumably, the majority should not belong to the large company size. Because in the case of a large/multinational company, the procurement department is not aware of the sales strategy orientation the operations being strongly segmented.

In other studies, not only the requestor but also the purchasing organization (specified separately) is a missing part of the process descriptions. However, procurement departments should be the focal point of the supply chain (Blanchard, 2010). Thus, even though the examinations focus on procurement procedures, it appears that they are either not directly involved or are not analyzed at their relevant level. In summary, it is not possible to adequately describe the supply chain and the relationship between suppliers and

manufacturing when purchasing is omitted, as observed in Kleindorfer, Singhal, and Wassenhove (2005) and Seuring and Müller (2008), or only superficially mentioned as in Fatorachian and Kazemi (2020). They researched the application of I.4.0-enabling IT technologies. Despite portraying supply chain specifics in a holistic manner, purchasing, as a whole (i.e., organization) was not considered in its own range of interpretation.

The significance of procurement and its strategy is emphasized by its critical role as "*the first step in the value chain*" (Çankaya & Sezen, 2019, p. 100), leading to the legitimization of its function, operations, and strategies (Acquah et al., 2021). This should serve as a guiding principle for companies that may sometimes overlook the role of procurement in value creation and achieving better supply chain performance (Bianchi, Bruno and Sarabia-Sanchez, 2019; Patrucco *et al.*, 2019; Rane, Narvel and Bhandarkar, 2020). Studies like Hesping and Schiele (2015) transparently depict the complex nature of purchasing strategies. However, this study does not clearly distinguish between the development of strategies (as concepts or the preparatory phase of regulations) and their mandatory implementation (when they become regulations), as suggested by Morris and Jamieson (2005). In addition, even though this study was elaborated to analyze the development of purchasing strategies (defining five levels), nevertheless, it seems that an overlap or a misunderstanding might be recognized among these levels in comparison with the practice. The lowest strategy level in terms of work segmentation generally is category management. The task of categories is to differentiate sourcing groups and their particularities and, thus, to allow and support distinctive approaches. If we consider that various procurement groups exist (such as raw materials, maintenance and spare parts of production in direct procurement, or IT, finance and HR services, fleet and facility management in indirect procurement), related purchasing requirements are managed based on category management that requires distinctive know-how/knowledge. In contrast, supplier strategies (as the way to handle an individual supplier) and sourcing levers (as tactics used, such as price/cost evaluations) are rather tools of supplier management. Several purchasing categories could apply the same supplier management tools while one purchasing category could use multiple supplier management methods. In summary, distinction, in terms of strategy, is to be made based on knowledge that could be unique and differ from one purchase category to another, while SM methods are not unique ones linked to these categories (as seen in Heikkilä, Kaipia and Ojala, 2018).

Figure 24: Appearance of the set of factors

APPEARANCE IN THE LITERATURE OF THE SET OF FACTORS OF THE 4F4D PURCHASING MODEL	Four Forces				Four Drivers				CONCEPT OF THE STUDY/MODEL
	Requestors	Suppliers	Internal regulations	External rules	Strategies	Cross-functional integration	Supplier Management	IT solutions	
Bals et al. (2018)		■			■	■	■	■	Depicts a contingency model for structural alternatives along internal and external factors
Barki and Pinsonneault (2005)					■	■		■	Model of organizational integration, relationship analyse between implementation and performance
Bensaou (1999)		■					■		Describes portfolios of buyer-supplier relationships based on the Kraljic-matrix
Bianchini et al. (2019)		■					■		Model of classification of suppliers (based on Kraljic-matrix) for lead-time reduction
Brandon-Jones and Knoppen (2018)		■				■	■		Researches the impact of two sequential dimensions of strategic purchasing (recognition
Cousins (2002)		■		■	■		■		Conceptual model of inter-organisational relationships with internal and external aspects
De Boer et al. (2002)		■						■	Model of impact (direct and indirect) of electronic procurement on purchasing (-related) costs
Den Butter and Linse (2008)			■	■					Examination of linkage between procurement and strategic decisions by hard and soft factors
Ellegaard and Koch (2014)	■				■	■		■	Model of functional integration and conflict between production and purchasing
Fatorachian-Kazemi (2020)		■					■	■	Researches the application of I.4.0-enabling IT-technologies that bring significant performance
Gelderman et al. (2017)			■	■				■	Model of sustainability by analyses of relations among actors, factors, and implementation
Gebauer-Shaw (2004)	■	■						■	The study assesses the success factors and impacts of mobile e-procurement applications.
Hesping and Schiele (2015)		■			■	■	■		Analysis of development in purchasing strategies by integrated sourcing categories and levels
Kang et al. (2018)		■			■		■		Alignment of purchasing portfolio management with the sourcing negotiation styles
Kleindorfer et al. (2005)		■	■	■					Sustainable operations management examining sustainability and the extended supply chain
Kraljic (1983)		■					■		How to manage purchasing by classifying and analysing the portfolio of supply
Li and Nagurney (2015)					■		■		Description of multi-tiered supply chain network model of competition between firms and suppliers
Mikalef et al. (2015)		■			■		■	■	Examine how purchasing strategy can be effectively aligned with IT and what conditions
Nicoletti (2017)		■	■				■	■	Elaboration of models related to purchasing work, IT and costs, supplier and contract management
Rezaei and Fallah Lajimi (2019)		■					■		Segmentation of supplies with the help of purchasing portfolio and supplier potential matrix
Rozemeijer et al. (2003)					■	■	■		Contingency model of how to create corporate advantage through purchasing performance
Saccani and Perona (2007)		■			■		■	■	Contingency model for shaping and managing buyer-supplier relationships
Seuring and Müller (2008)		■		■			■		Conceptual framework of sustainable supply chain management by several dimensions
Venter (2007)	■	■		■			■		Development of a three-dimensional procurement fraud risk matrix
Versendaal et al (2013)		■			■	■		■	Analize procurement maturity and IT-alignment as a key to organizational performance

Source: Authors' construction

Regarding internal and external rules, despite their protective role in supply and their enforcing power in contracts, in some studies, their representation is lacking, even in those that discuss other elements of purchasing in detail, such as the IT aspects by De Boer et al. (2002) although IT processes must be aligned with internal regulations (i.e., approval levels and their order). In the study of Bals, Laine, and Mugurusi (2018), they depict a contingency model for structural alternatives, defining macro-level dimensions of the purchasing organization/work. They also identified external and internal parts and enumerated several factors and dimensions. Although multiple dimensions have been considered, the total lack of regulations and rules can be observed; however, the interconnection between certain actors cannot be interpreted without these segments because there is a great accent on legal compliance during the purchasing processes, since this prudency will protect the supply and mitigate the risks.

Barki & Pinsonneault (2005) constructed a model of organizational integration that analyzes the relationship between implementation and performance. However, they also did not consider at all either internal or external rules, although the inter- or intra-connections among different organizations should be led by regulations/rules. Similarly, Gebauer & Shaw (2004) assessed the success factors and impacts of mobile e-procurement applications. They initiated the analysis of purchasing processes from issuing a purchase request (requisition) by the internal co-department. Like the 4F4D model, this study builds up interconnection (a correlation) among the requester (requestor), buyer (procurement), and supplier. Nevertheless, they did not mention and analyze the role and importance of internal and external rules; however, all purchasing workflows are driven and set up based on the connected regulations (e.g. RACI matrix, a chart of Responsible-Accountable-Consulted-Informed roles). Other studies, such as Den Butter and Linse (2008) and Venter (2007), incorporated aspects of regulations, especially in the realm of risk management.

The most extensive literature addresses suppliers, acknowledging their immutable role in procedures, placing a high emphasis primarily on supplier management because of its increased importance arising from higher risk factors and the need for continuity and flexibility (Ogunranti, Ceryan, & Banerjee, 2021; Padgett, Hopkins, & Williams, 2020; McEvoy & Ferri, 2020; Hallikas et al., 2020; Wittinger, 2019; Handfield, Petersen, Cousins, & Lawson, 2009). In this context, articles related to SM deeply discuss terms such as the evaluation and selection of suppliers, risk management, and more, as seen for example in

Kraljic, 1983 (the first published matrix), and several other studies that built on this model, such as Bianchini et al. (2019), Rezaei & Fallah Lajimi (2019), Kang, Hong, Bartnik, Park, & Ko (2018), Bensaou (1999), Saccani & Perona (2007), Hesping & Schiele (2016), Ateş, Wynstra, & van Raaij (2015), Perdana & Mulyono (2021), and many others. The (original) matrix of Kraljic (1983) is one of the few models that are nowadays used as well (even though old but still valid) because it fits today's real-life purchasing processes. Bianchini et al. (2019) developed a classification model of suppliers for lead-time reduction. Bensaou (1999) also examined the portfolios of buyer-supplier relationships based on the Kraljic matrix. Kang, Hong, Bartnik, Park, & Ko (2018) discussed the alignment of purchasing portfolio management with the sourcing negotiation styles. Saccani & Perona (2007) and Rezaei & Fallah Lajimi (2019) discussed and catalogued the buyer-supplier relationship and cooperation. Rezaei & Fallah Lajimi (2019) developed the segmentation of supplies with the help of purchasing portfolio and supplier potential matrix, while Saccani & Perona (2007) developed a contingency model for shaping and managing buyer-supplier relationships. However, all these studies depict how to manage purchasing by classifying and analysing the supply portfolio from several aspects, thus, they all strongly focus primarily on suppliers and their aspects but do not deal in any depth with other aspects. This means that these studies lack a comprehensive view (in other terms) of such a complex environment as purchasing.

Strongly connected to supplier management, we must mention information technology (IT), considering that the SM system itself (especially in developed organizations) is an IT system that operates on IT platforms. Consequently, IT continues to revolutionize the purchasing environment, as these e-procurement solutions are vital for companies to reduce costs and process lead-time (Pattanayak & Punyatoya, 2020; R. Handfield, Jeong, & Choi, 2019; Garrett, 2017; Ronchi, Brun, Golini, & Fan, 2010; Nivetha, 2021; Afolabi, Ibem, Aduwo, Tunji-Olayeni, & Oluwunmi, 2019; Chae, Yen, & Sheu, 2005). Future transactions are increasingly based on digitized and automated procedures, transferring various value-creation processes to platforms because the requirement is to manufacture complex digital and interconnected system solutions (Veile et al., 2021). The effective management of a multitiered supply chain network, as depicted in Li and Nagurney (2015), cannot be achieved without IT and SM systems support, although this study does not shed light on these solutions. Furthermore, Rozemeijer, Weele, & Weggeman (2003) developed a contingency model of how to create corporate advantage through purchasing performance.

They analysed several dimensions of purchasing but did not put any accent on factors such as IT systems (or regulations and rules), however, these particularities interconnect actors of purchasing procedures and drive procurement processes and workflows.

The role of cross-functional integration, defined as cooperation among divisions/functions within a company (Poberschnigg, Pimenta, & Hilletofth, 2020; Foerstl et al., 2013), is crucial for enhancing purchasing performance, as purchasing procedures become adjusted to requirements and, therefore, requirements turn into achievable goals (Meschnig & Kaufmann, 2015). However, poor cooperation and internal politics within a company can hinder its effectiveness (Bjerregaard & Jonasson, 2014; Ferreira et al., 2019; Pemer & Skjølsvik, 2016). As depicted, cross-functional integration contributes to the effectiveness of procedures; therefore, many studies consider this factor in their models and concepts (e.g., Barki and Pinsonneault, 2005; Bals, Laine, & Mugurusi, 2018; Ellegaard & Koch, 2014). However, some studies, such as Cousins (2002), dismiss this aspect even when examining operations from a stakeholder perspective. Another study related to this topic is Rozemeijer, Van Weele, and Weggeman (2003), although they examined the role of "cooperation across units," they used the more general "cross-functional" term only two or three times in the entire study. In summary, cross-functional integration/cooperation should be considered when depicting operations at the purchasing level as it interconnects requestors with the purchasing function.

Ellegaard & Koch (2014) elaborated a model of functional integration and conflict between production and purchasing. They studied in detail the conflicts and difficulties in cooperation between these functional areas and although they offered some alternatives for problem resolution, however, they did not reveal other opportunities used in the practice. One resolution applied is the cooperation between parties during tendering by forming a common evaluation committee for supplier evaluation (in terms of supplier management but using cross-functional integration). In this way, the parties will be forced to bear together the responsibility of supplier selection which will result in more cooperative willingness.

Brandon-Jones & Knoppen (2018) examined the impact of two sequential dimensions of strategic purchasing (recognition and involvement) on the development and deployment of dynamic capabilities. The authors argue that from a dynamic capabilities' perspective, purchasing recognition and subsequent purchasing involvement act as enablers of dynamic

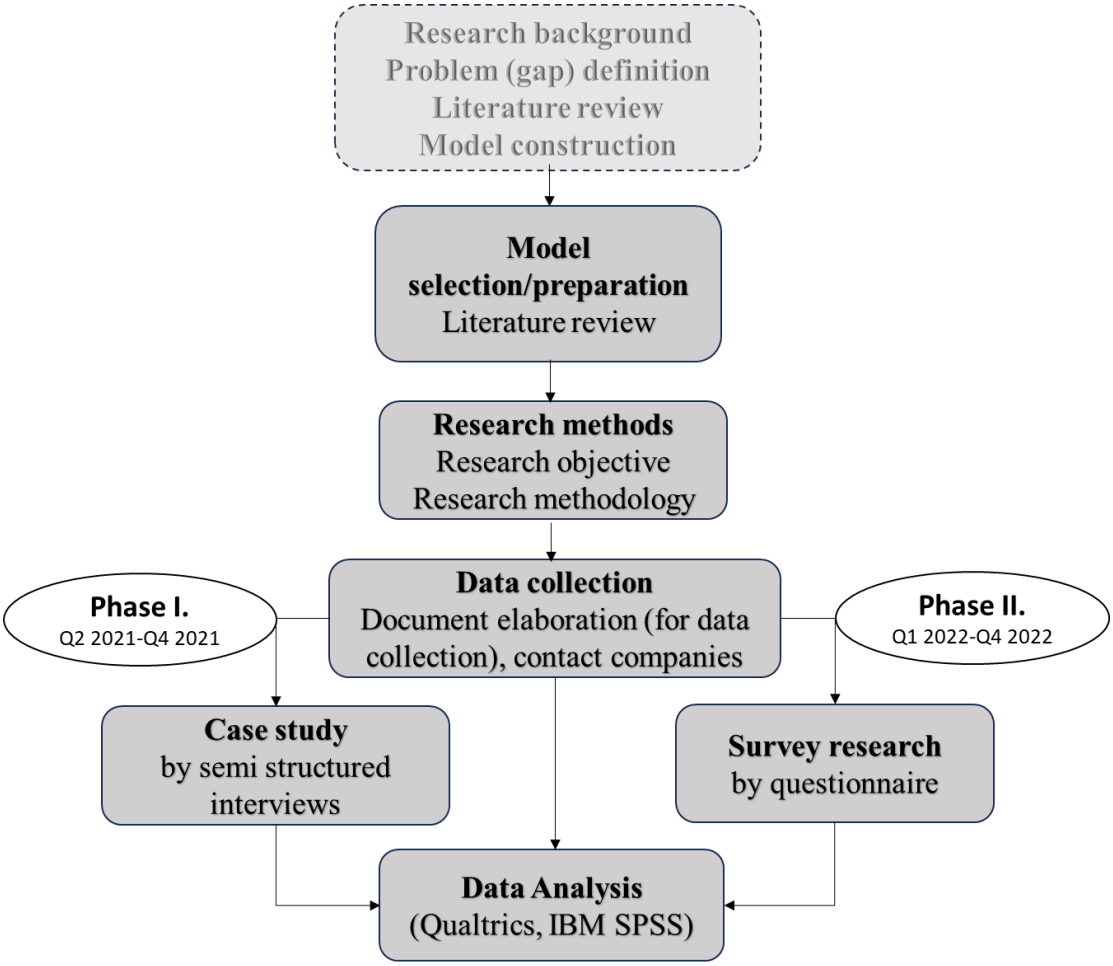
capability development by knowledge scanning. Although they put an accent on cross-functional integration, however, they did not mention and examine the knowledge scanning at the requestors (internal customers of procurement services) level. However, requestors must be most aware of the know-how behind purchasing requirements given that the professionals of BUFUs (co-organizations) are always responsible and accountable for technical specifications of purchasing requisitions (even in the case of strong category management from procurement side).

In summary, even though the selected studies make valuable contributions to various aspects of procurement, the 4F4D model offers a more comprehensive and interconnected framework at the purchasing level. The 4F4D model's distinctive classification of factors as forces and drivers, coupled with its emphasis on interconnections, offers a holistic understanding of the procurement processes. Although insightful, the selected studies may not cover the entire spectrum of factors encapsulated in the 4F4D model. Alternatively, some studies evaluate operations from a much broader perspective (such as the supply chain), without specifically addressing activities at the purchasing level. Thus, this review underscores the novel and comprehensive nature of the model in the procurement landscape.

4.5. Research: questions and hypotheses, methodology and data collection

The research was motivated by the recognition of a gap among existing purchasing models. Despite the extensive literature and its deep review, researchers found no model that comprehensively describes the realm of procurement, depicting all activities at this level in a generalized manner. The entire research process (including the elaboration of the conceptual model and associated documents, data processing, and more), lasted from 2021 to 2023, while the interviews and survey were conducted between Q4 2021 and Q4 2022. Researchers followed a structured approach to concept construction, as illustrated in the research method diagram (Figure 25).

Figure 25: Research method diagram



Source: Authors' construction

4.5.1. Research questions and hypotheses

Since Wittinger's (2022) study introduced the conceptual model of the 4F4D framework without validation, the aim of this article was to assess the model's validity through interviews and a survey. Consistent with Maier *et al.* (2012), the phase of developing a new or evaluating an existing model must be followed by the phases of validation (to ensure alignment between the author's intent and the user's understanding) and verification (ensuring the correctness of the results).

To guide this validation process, researchers formulated research questions (RQs) and hypotheses as follows:

Research questions	Hypotheses
RQ1: To what extent do the model elements influence procurement processes? Are all factors necessary in the purchasing procedure and is the importance of each factor considered at the same level?	**Hypothesis:** Each factor of the model is of high importance in purchasing work.
RQ2: Do respondents have any suggestions regarding new parts or elements of the model to be added? Are there missing parts from the current model that are necessary for carrying out purchasing processes, so is the model complete?	**Hypothesis:** There are no further relevant factors in purchasing activities, therefore the model is complete and comprehensive.
R**Q3:** Do the respondents correctly group the given factors into two categories (forces and drivers) as the model suggests? Are the elements of the model properly grouped into two different categories indicating the correctness of the model?	**Hypothesis:** The factors of the model are appropriately classified into the two groups, as the group of forces and drivers are clearly different from each other.

4.5.2. Research methodology

Researchers employed both qualitative (case study) and quantitative (survey) methodologies as suggested by Sjoerdsma and Van Weele (2015), Foerstl *et al. (*2013), and Kothari et al. (2005). The decision to combine these methods was driven by two reasons. First, using a multi-method mixture minimizes the disadvantages of either approach while benefiting from the constructive nature of qualitative methodology and the analytical potential of quantitative methodology. Therefore, the use of multiple methodologies strengthens the robustness of the results (Huber et al., 2005). Second, researchers aimed to test the model at both executive and associate levels. Usage of these two approaches provides real insights with arguments, while also covering a larger population, making the results more accurate. The differentiation between the methods used for executives and associates aims to ensure a thorough investigation of the model from multiple angles within procurement organizations.

In qualitative research researchers adopted a multiple-case study approach following Yin's (2012) methodology. In addition, after examining the cases individually, researchers applied a cross-case synthesis method. The sampling strategy was theory-based, aiming to identify a sample that best aligns with the theory under examination. Therefore, the authors selected leading companies within their respective industries, expecting well-established procurement organizations where purchasing procedures rest on integrated regulations and practice-based workflows exist because large firms are more complex in terms of organizational structures (Foerstl et al., 2013). Additionally, comprehensive concepts and models are not extensively utilized in small and medium-sized enterprises (SMEs) due to a lack of knowledge, awareness about their positive impact on the organization, and resource limitations (Bianchini, Benci, Pellegrini, & Rossi, 2019).

In terms of quantitative methodology survey research was applied. The questions formulated in the questionnaire were directly related to the components (factors) of the model. The questionnaire comprised both closed-ended questions and Likert-type 1-5 scales aimed at standardizing responses for consistent interpretation and facilitating analysis, as recommended by Somekh and Lewin (2005). Additionally, one open-ended question was included to allow respondents to provide independent opinions on the model, offering the opportunity to suggest potential additional components.

4.5.3. Characteristics of research

The five selected companies are large, multinational corporations with a global presence across multiple countries in Europe and worldwide. They operate in key sectors of the economy, namely, in the chemical-pharmaceutical, energy, and transportation-logistics industries. Each of these companies has a matrix organizational structure characterized by multiple and complex reporting levels, as well as cross-functional integration/cooperation, and advanced supplier management practices. Due to their advanced business processes, companies efficiently implement best practices, conduct operations based on benchmarking, and apply common standards of business management. The purchasing organizations within these companies are positioned at the third level (where the CEO is at the first level). Furthermore, procurement leaders in these organizations are highly qualified professionals with outstanding work experience. Figure 26 shows the key figures regarding companies.

Figure 26: Key figures of companies

Participant companies	Company A	Company B	Company C	Company D	Company E
Type of company	large/ multinational	large/ multinational	large/ multinational	large	large/ multinational
Industry	energy	energy	chemical-pharmaceutical	transportation-logistics	energy
Company employees no. (E) (FTEs on group level)	E > 15000 FTE	E > 15000 FTE	10000 < E < 15000 FTE	E > 15000 FTE	E > 15000 FTE
Procurement employees no. (E) (FTEs integrated number)	E > 250 FTE	E > 250 FTE	100 < E < 250 FTE	E < 100 FTE	E > 250 FTE
Procurement budget (B) (domestic - million EUR)	B > 500 M EUR	B > 500 M EUR	250 < B < 500 M EUR	250 < B < 500 M EUR	B > 500 M EUR
Average no. of new contracts (C) (pcs/year)	100 < C < 500 pcs/y	C > 500 pcs/y	C > 500 pcs/y	C > 500 pcs/y	C > 500 pcs/y
Average no. of suppliers (S) (pcs in force)	S > 10000 pcs	S > 10000 pcs	S < 5000 pcs	S < 5000 pcs	S < 5000 pcs
Level of Proc. Dep. (CEO is the 1st level)	3rd	3rd	3rd	3rd	3rd
Procurement experience of interviewee (years)	20 years	16 years	20 years	12 years	21 years
Interviewee's job position	Procurement Director	Chief Proc. Officer	Head of Procurement	Procurement Director	Head of Procurement

Source: Authors' construction

Researchers conducted in-depth interviews with purchasing leaders at the selected five multinational/large companies. The opinion of the top-executives of the purchasing organization holds significant weight, as "*top managers certainly influence the values and strategy of their organizations and as stakeholders should have the most influence on sustainable supply chain management decisions*" (Meixell & Luoma, 2015, p. 84). Studies indicate that leaders' support is one of the most powerful components of how employees perceive the department's support and guidelines (Amin, Zailani, & Rahman, 2021).

The respondents of the survey were the subordinates of the interviewed purchasing leaders as such working at the given five companies inside the procurement organization led by the interviewees. All of them are purchasing professionals, 80% of whom had over 5 or 10 years of work experience. Given their considerable expertise, it can be reasonably assumed that

they were well-equipped to provide appropriate judgments regarding survey questions related to the structure and components (factors) of the model. Figure 27 illustrates the distribution of work experience among the survey respondents.

Figure 27: Work experience of respondents

Source: Authors' construction

4.5.4. Data collection

For data collection (features in Figure 28) researchers applied semi-structured in-depth interviews (Appendix A) and survey research questionnaire (Appendix B). The interviews were structured into separate parts: one part encompassed general inquiries about the interviewee, including details such as job position, its starting date, length of the purchasing practice, and similar aspects; and questions about the company and the organizational unit were covered, encompassing factors such as FTE count of the company and department, the level of the purchasing organization, its budget, number of suppliers and contracts, and more. This section also involved questions about both strengths and weaknesses as well as factors influencing or impacting purchasing work. In the second part of the interview, researchers revealed the 4F4D model and sought respondents' opinions on various aspects, including its structure (arrangement) and factors (in terms of completeness and correctness) as well as the model's validity and applicability in practice.

The length of interviews was 80 minutes (on average), all were audio-recorded, and detailed notes were taken. The consent statements regarding data processing were collected from all

participants in written form. All of them restricted the data access allowing anonymous usage only. The interviews were complemented by direct, personal observations made during the interviews and the processing of additional information such as figures provided by the interviewees and publicly available data.

Figure 28: Data collection

Data collection / Participants	Company A	Company B	Company C	Company D	Company E
INTERVIEWS					
Date of interviews	28-Oct-2021	29-Oct-2021	3-Nov-2021	16-Nov-2021	16-Dec-2021
Data collection	audio recorded	audio recorded	audio recorded	audio recorded	audio recorded
Duration in time (hh:mm:ss)	01:35:20	01:38:13	01:15:05	01:41:07	00:32:05
Size (MB)	46,50 MB	48,20 MB	37,70 MB	49,50 MB	15,30 MB
Statement	signed	signed	signed	signed	signed
Consent to disclosure	No	No	No	No	No
SURVEY					
Date of completion	Nov-Dec 2022	Nov-Dec 2022	Nov-Dec 2022	Nov-Dec 2022	Nov-Dec 2022
Data collection	questionnaire	questionnaire	questionnaire	questionnaire	questionnaire
Type of data collection	anonymous	anonymous	anonymous	anonymous	anonymous
Survey respondents (FTE) (without 4 FTEs, where no data)	32	17	49	10	16

Source: Authors' construction

Prior to the launch of the survey, the questionnaire was tested by three professionals with extensive purchasing experience working at multinational companies. Their feedback indicated that no modifications were necessary, and they confirmed the absence of unclear questions or sections in the survey. After the pilot survey, respondents were invited to complete the questionnaire on online platform. Data analysis was conducted on the Qualtrics platform and using IBM SPSS. The survey gathered anonymous responses from 128 purchasing professionals without the use of personal data.

The model's factors, along with the meanings of the forces and drivers, were comprehensively explained in the survey. In addition, definitions and interpretations were provided before related questions were presented. Respondents were explicitly advised to carefully read these definitions to ensure a uniform interpretation, which was essential for the accurate and professional completion of the questionnaire. Researchers included only

professional questions (three connected to the model and two connected to the practice in terms of experience and company affiliation) to determine the necessity and extent of each factor in the purchasing processes. In addition, researchers sought insights into whether there were any potential additions to the model to enhance its completeness. Furthermore, they aimed to analyze the classification of the factors into groups of forces and drivers.

4.6. Findings

4.6.1. Case analysis

The detailed analysis of the case studies is presented in Wittinger, Demeter, and Avornicului (2023). Here, researchers focus only on results related to the correctness and completeness of the model. They identified the following factors influencing the purchasing work mentioned by the participants during the interviews. Researchers comprehended and synthesized the interviewees' responses in Figure 29.

- Each leader directly identified the requestor (the internal organization issuing the purchasing request and demanding purchasing services) and the supplier as "players" in the purchasing processes.
- All of them mentioned IT solutions in some form, such as IT systems, digital platforms, IT applications, digital solutions, IT-, electronic- or digital workflows, etc., allowing us to identify the "IT solutions" factor.
- All leaders mentioned internal regulations, such as financial, tax, treasury, legal, HR, etc., to be inserted into the concluded contracts.
- Some leaders remembered, while others forgot to mention separately (by themselves), factors such as external rules, strategies, cross-functional integration, and supplier management. However, most of them accentuated during the interviews the weight of government, external law or legislation (involved in the external rules), or the importance of the company's or procurement strategy (as strategies). Furthermore, when depicting daily work and problems during purchasing procedures, they all emphasized the significance of cross-functional integration/cooperation and supplier management.

After collecting answers about the influencing factors, researchers revealed the applied model to the interviewees. They inquired whether the model changed their opinion regarding the purchasing environment, its factors, and their interactions. Additionally, researchers

inquired if they had any suggestions regarding the present structure, whether something was missing or if any part was redundant/unnecessary in the model.

Figure 29: Elements mentioned by interviewees

ANALYSIS OF INTERVIEW DATA (mentioned elements yes=1, no=0)	Factors specified/mentioned by interviewees							
	Four Forces				Four Drivers			
	Requestor	Supplier	Internal regulation	External rules	Strategies	Cross-functional integration	Supplier Management	IT solutions
Company A	1	1	1	1	0	0	0	1
Company B	1	1	1	1	1	0	1	1
Company C	1	1	1	1	1	1	0	1
Company D	1	1	1	0	1	1	1	1
Company E	1	1	1	0	0	1	1	1
No. of opinion coincidence	5	5	5	3	3	3	3	5

Source: Authors' construction

When the model was revealed, some leaders expressed regret that they did not mention some parts themselves. Each leader confirmed that the model is comprehensive and complete, acknowledging that these are the factors (parts) of procurement work, and that this structure accurately depicts the purchasing processes. Only one leader suggested mentioning the "market" separately. However, researchers consider that this is already involved in the model, as it is completely represented by the suppliers. Apart from this view, they did not have any suggestions for adding or deleting parts. They welcomed the model, expressing satisfaction with its construction, considering it useful and applicable, and confirming the lack of an applicable tool in purchasing management in practice. They also expressed readiness to use it during their activities. Some opinions expressed by purchasing executives during the interviews: Company A: "*This model includes all that we can say and note about purchasing work.*" Company C: "*I just regret that I am not the one who figured out this model!"*

4.6.2. Survey results

This section outlines the analysis of survey data. In RQ1, researchers asked survey participants to indicate the extent to which the given elements influenced the procurement processes. In RQ2, they inquired about missing factors, if any, to analyze the completeness of the model. Furthermore, researchers investigated how the respondents categorized the factors as forces and drivers (RQ3) and searched for deeper relationships among the factors through cluster analysis. Lastly, they tested the neutrality of the model in terms of the working experience and affiliation of the respondents.

Figure 30 shows the responses to RQ1. Two factors, internal regulations and external rules, achieved the highest percentage of selection in the "completely" category, underscoring the mandatory nature and crucial importance of the legal environment, both internally and externally, during procurement procedures. Furthermore, the factors requestors and suppliers gathered the highest percentage of choices in the absolute sense, reinforcing the classification of these four factors as forces in the model. In summary, each factor, based on the highest percentage of choices, was most often placed in the "very" and "completely" categories by respondents, confirming the hypothesis that all the listed factors are considered as significant, as depicted in the established model. Nevertheless, factors IT solutions and supplier management received the lowest percentage of choices, although higher values and more pronounced importance were expected, especially in today's digital era.

Figure 30: Impact of factors on processes

Factors / Impact (highest rank highlighted)	Not at all	Slightly	Neutral	Very	Completely
Internal regulations (accounting-tax, finance, law, etc.)	0%	3%	6%	40%	**51%**
Requestors (internal customers)	0%	3%	10%	**68%**	19%
IT solutions (systems and applications)	1%	10%	30%	**49%**	9%
Cross-functional integration (cooperation among co-departments)	0%	9%	21%	**53%**	16%
External rules (legislation and rules)	0%	2%	16%	38%	**45%**
Suppliers (representatives of the market)	1%	5%	8%	**59%**	27%
Supplier Management (evaluation and selection of suppliers)	1%	9%	26%	**49%**	15%
Strategies (business principles)	0%	8%	23%	**50%**	20%

Source: Authors' construction

To address RQ2, researchers posed one open-ended question to discover whether respondents had any opinion on supplementing the model with potential (new) parts. Only ten suggestions were received, and Figure 31 illustrates the gathered elements.

According to researchers' analysis, all the elements mentioned by the survey respondents (i.e. considered by them as missing parts) can be matched, without any exception, by the already existing factors of the model, respectively: suppliers, procurement, and cross-functional integration. Nevertheless, the answers reflect that the mentioned factors could have aspects to be rethought.

(1) Market (suppliers): The market and its changes are represented by the suppliers and their current contractual conditions. Purchasing missing resources is exclusively executed through suppliers; therefore, suppliers embody the market from the purchasing point of view. They serve as the gateway for resources to enter purchasing organizations and facilitate manufacturing and sales in companies. Therefore, the "suppliers" factor is synonymous with the market for procurement professionals; in addition, in the survey, the definition of suppliers was made accordingly.

(2) Procurement: The purchasing organization is part (the heart) of the model. However, since the respondents did not see the entire model, they were unaware that procurement has already been integrated into the model.

(3) Cross-functional integration: Notions mentioned by respondents, such as communication, cooperation among actors and organizations, and behaviours, all fall under cross-functional integration, which is already involved in the model.

The absence of any new element further strengthens the completeness of the model.

Figure 31: Mentioned "missing" elements by survey

#	Answers (mentioned "missing" elements)	Factor matching
1	Procurement organization (maturity)	Procurement
2	Experience of purchasers in general (such as: MS Office, negotiation technique, market/industry knowledge, stakeholder management, based on career level), knowledge of buyers in the given company (internal processes, colleagues and internal stakeholders)	Procurement
3	Organizational communication, basic human skills (cooperation)	Cross-functional integration
4	Crisis situations - pandemic, war/embargo/energy crisis, natural disasters, political decisions, etc.	Suppliers (alias Market)
5	Inflation, share prices of commodities, war	Suppliers (alias Market)
6	"Habits" (in the bad sense); "abilities" of the actors; behaviour of actors that goes beyond internal and external regulations; market processes and effects	Cross-functional integration Suppliers (alias Market)
7	The existence of internal resources, i.e. the purchasing organization itself	Procurement
8	Time factor (how much time is available to conduct the procedure)	Procurement
9	Project schedules and preparation of annual plans for a uniform tendering of suppliers and to ensure supplier capacities. The market is finite, the supply capacity is finite, and the poorly timed, backlogged projects result in huge delays and additional financial burdens; these greatly influence procurement processes and create forced situations	Procurement Suppliers (alias Market)
10	Concurrency (how many requests are in progress at the same time)	Procurement

Source: Authors' construction

To address RQ3, the respondents were asked to categorize the factors into two groups: forces and drivers (as suggested by the 4F4D model). All factors (except strategies) were classified according to the model (based on the highest percentage of choices), supporting the validity of the model design (Figure 32). Even though strategies were placed in the forces group, the proximity between the two percentages (53% vs. 47%) indicates uncertainty among respondents regarding the classification of this element. This slight ambiguity around the strategies factor suggests that respondents may have had varying interpretations or

considerations regarding its classification. Nevertheless, this aligns with our assumption that the factors of the model are correctly classified into the stated forces and drivers groups.

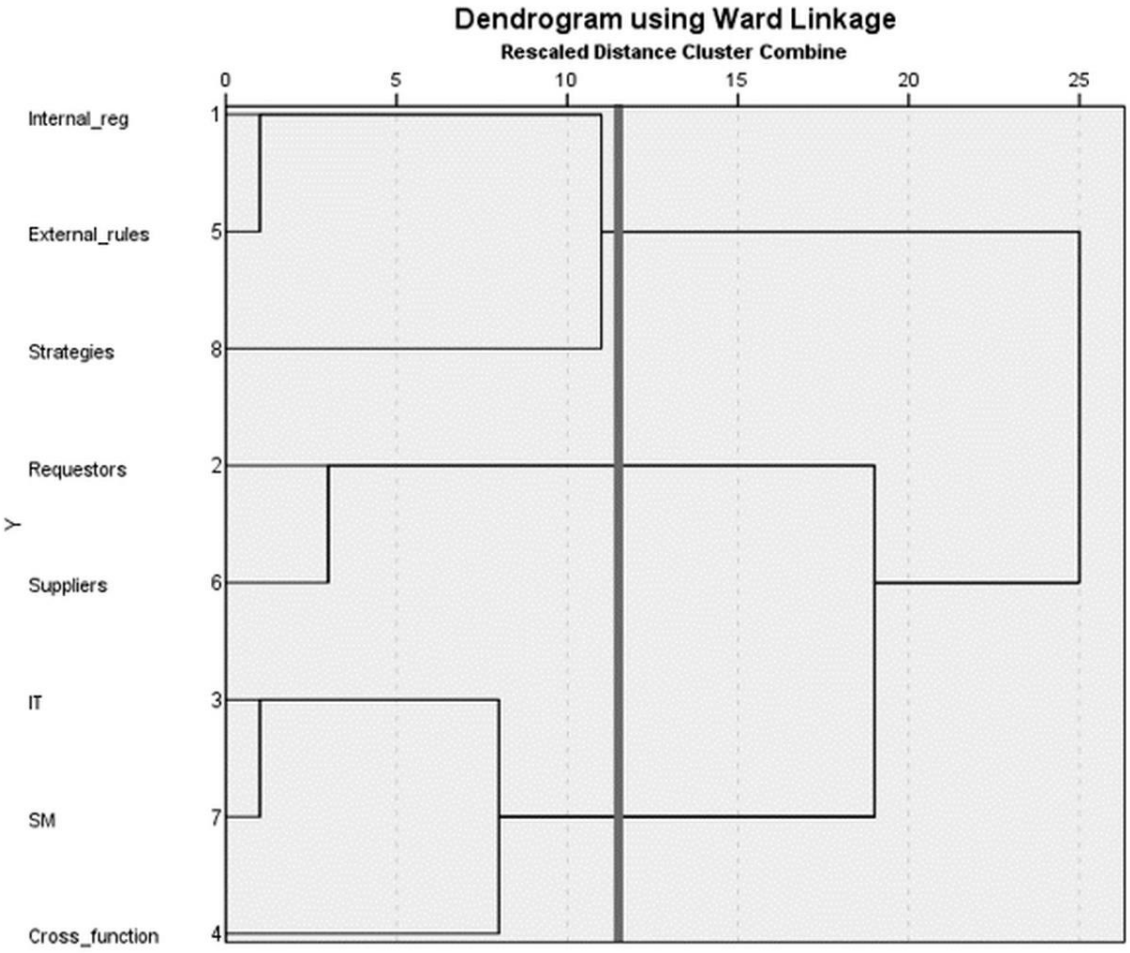
Figure 32: Classification of factors in two groups

Factors / Classification (highest rank highlighted)	**FORCE** It can enforce contractual terms	**DRIVER** It connects, drives, provides background and guides
Internal regulations (accounting-tax, finance, law, etc.)	**63%**	37%
Requestors (internal customers)	**60%**	40%
IT solutions (systems and applications)	14%	**86%**
Cross-functional integration (cooperation among co-departments)	23%	**77%**
External rules (legislation and rules)	**78%**	22%
Suppliers (representatives of the market)	**70%**	30%
Supplier Management (evaluation and selection of suppliers)	24%	**76%**
Strategies (business principles)	**53%**	47%

Source: Authors' construction

In addition to the analysis of survey data for RQ3, Cluster Analysis (CA) was employed to further examine the relationships among the elements of the 4F4D model. Hierarchical Cluster Analysis (HCA) with Ward linkage was applied for this purpose, and the results are presented in Figure 33. The clustering process aims to group elements that are more closely related to each other based on the respondents' perceptions.

Figure 33: Cluster analysis of factors



Agglomeration Schedule

Stage	Cluster Combined		Coefficients	Stage Cluster First Appears		Next Stage
	Cluster 1	Cluster 2		Cluster 1	Cluster 2	
1	1	5	1,574	0	0	5
2	3	7	3,152	0	0	4
3	2	6	4,873	0	0	6
4	3	4	6,841	2	0	6
5	1	8	8,948	1	0	7
6	2	3	11,531	3	4	7
7	1	2	14,438	5	6	0

Source: Authors' construction

The Cluster Analysis results based on SPSS and the elaborated dendrogram indicate distinct groups among the factors of the 4F4D model:

(1) **Internal regulations** and **external rules:** These factors appear closely related and form a cohesive group. Strategies also showed a weaker connection to this group, possibly due to confusion between strategies and regulations (discussed in the next chapter).
(2) **Requestors** and **suppliers:** Another well-defined group is formed by the factors of requestors and suppliers, indicating a strong connection between them.
(3) **IT** and **supplier management**, and to a slightly lesser extent, **cross-functional integration:** These factors constitute the third group, demonstrating similarities among them.

In summary, cluster analysis supports the original design of the 4F4D model, highlighting strong connections among its factors, with all factors (except strategies) belonging to their designated groups.

Researchers also applied Cross-tabulation analysis to provide insights into the relationship between the classification of elements (force or driver) and respondents' work experiences and workplaces; Figure 34 shows the findings by Chi-Square tests results on a 5% significance level:

(1) **Cross-functional integration and work experience:** The data suggest a weak relationship between work experience and classification of cross-functional integration. Respondents with more than ten years of experience classified cross-functional integration more often as a driver, indicating a potentially better awareness of the importance of cooperation and its impact on procurement processes. Of the 72 respondents, 61 classified cross-functional integration as driver and 11 as force.
(2) **External rules and work experience**: Similar to cross-functional integration, there is a weak relationship between work experience and classification of external rules. Respondents with more than ten years of experience tended to classify external rules as a force, emphasizing the significance of legal aspects in procurement activities. Of the 72 respondents, 62 classified external rules as force and 10 as driver.

These results suggest that increased professional experience may contribute to a more accurate classification of certain factors (cross-functional integration and external rules) and potentially enhance the awareness of associated risks.

Figure 34: Strength of connections (Chi-square p values)

Strength of connections (Chi-square p values) by Chi-square tests results on a 5% significance level (significant cells are highlighted)	Factors' classification (Force or Driver) and	
	Work experience	Company affiliation
Internal regulations (accounting-tax, finance, law, etc.)	0,613	0,123
Requestors (internal customers)	0,633	0,635
IT solutions (systems and applications)	0,659	0,809
Cross-functional integration (cooperation among co-departments)	**0,032***	0,351
External rules (legislation and rules)	**0,049***	0,765
Suppliers (representatives of the market)	0,359	0,418
Supplier Management (evaluation and selection of suppliers)	0,089	0,646
Strategies (business principles)	0,765	0,652

Source: Authors' construction

The analysis results indicate that there is no convincingly significant relationship between factors (forces and drivers) and respondents' work experience or company affiliation. Therefore, a general conclusion can be drawn that neither the company affiliation nor the work experience significantly influences the model's validity. This suggests that the 4F4D model's applicability and relevance appear to be consistent across different levels of professional experience and various company affiliations. The model's design, with its classification of factors into forces and drivers, seems to offer a consistent framework that procurement professionals find applicable and relevant irrespective of their specific work contexts.

4.7. Discussion of the results

This research verified the correctness, completeness, and usefulness of the model in terms of an adequate structure with elements that are desired and represented in the right place, as well as applicable in practice. The interviewees acknowledged the holistic nature and validity of the model, while the analyses of survey data also supported the hypothesis that the model had a correct shape and was complete in its design. Thus, the validity, correctness, and completeness of the 4F4D model were proven. Based on the analyses of the cases and data, the research questions were answered and the hypotheses were confirmed. Nevertheless, some minor discrepancies occurred between subordinates' and leaders' opinions or between subordinates' opinions and the constructed model, which are resolved in this chapter.

4.7.1. Comparing the interviews and survey RQ1

To identify any mismatch between the opinions of executives and subordinates regarding these factors, researchers compared the results. They looked at the factors mentioned in the interviews, and the factors ranked as having a high impact on work in the survey. They attempted to determine whether there were discrepancies (D) or coincidences (C) between these two approaches. They coded the answers with 1 or 0 as follows: for interviewees, if the number of answers that mentioned the same factors was equal to five, the code should be 1; in other cases, it is 0. For respondents, if the weight of the factors in terms of importance is higher than or equal to 50%, the code should be 1; otherwise, it is 0. Figure 35 shows the comparison result.

Figure 35: Comparison of answers ranking

COMPARISON OF ANSWERS RANKING Interviewees (1, if pcs of answers ≥5; 0, if pcs of answers <5) Respondents (1, if factors weight ≥50%; 0, if factors weight <50%)	Interviewees vs. Respondents opinions							
	Four Forces				Four Drivers			
	Requestor	Supplier	Internal regulation	External rules	Strategies	Cross-functional integration	Supplier Management	IT solutions
Interviewees	1	1	1	0	0	0	0	1
Respondents	1	1	1	0	1	1	0	0
Discrepancy (D) or coincidence (C) in answers	C	C	C	C	D	D	C	D

Source: Authors' construction

Discrepancies were not discovered in the case of forces; all participants judged them in the same way. Nevertheless, it can be observed that external rules seem to be less accentuated than the others; a reason could be that participants accept this element as default, so they do not invest time in its analysis. Supplier management has the same feature; however, in this case, there could be more opportunities to develop this element.

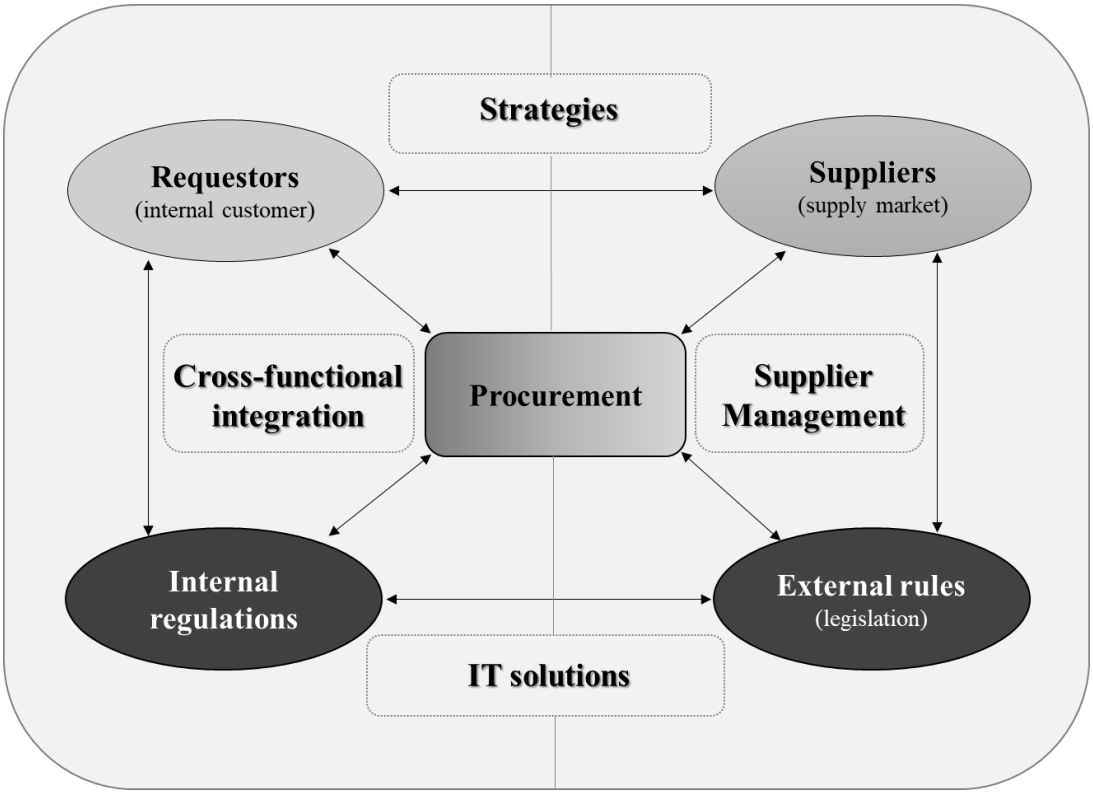
Researchers did not experience coincidence at the three drivers (strategies, cross-functional integration, and IT solutions), but the approaches were different. Subordinates consider strategies and cross-functional integration to be more important than leaders, whereas leaders regard IT solutions as more vital. This opinion was strengthened during interviews because leaders accentuated the high importance of digital platforms and systems in several cases and from diverse aspects. Subordinates regarded strategies and cross-functional integration as more important; the reason could be that they are more affected during the daily work by cross-functional integration, while they do not have perspectives on strategies.

4.7.2. Processing of elements mentioned in RQ2

Based on the responses to the open-ended survey question (RQ2), it became apparent that the answers revolve around three factors identified as missing elements: market (suppliers),

procurement, and cross-functional integration. In light of these findings, researchers propose minor adjustments to the descriptions of these factors. Since procurement is an integral component of the 4F4D model, the authors suggest enhancing the clarity of the original model by incorporating explanations related to the factors of suppliers and requestors (Figure 36). This refinement aims to ensure a clearer understanding of the model's components and their interconnections.

Figure 36: Modified 4F4D model



Source: Adapted from Wittinger, 2022

- To include in the requestors' box the internal customer (in brackets) to indicate that the requestors represent the internal customers who demand purchasing services and who are interconnected by cross-functional integration (communication and cooperation) with procurement.
- To include in the suppliers' box the supply market (in brackets) to indicate that the purchasing organization is directly connected to this market. This correction is significant because there were remarks concerning the market as a missing element in the survey and even one remark during the interview.

4.7.3. Misunderstanding of Strategies in RQ3

In the case of RQ3 (classification of factors as forces or drivers by subordinates), there is only one minor discrepancy between their opinions and the model structure regarding strategies. Additionally, this is the only case where the classification percentages were as close as possible to each other (53% vs. 47%). The reason for this contradiction is – presumably – the confusion between the creation (as a guide or concept) and implementation (as a mandatory action) of the strategies. More precisely, associates could consider that creation and implementation are the same. This is a confusion at the subordinates' level only, since they do not take part in strategy development; thus, they are not aware of the difference between these two terms. For example, if we talk about a strategy (for instance, an investment strategy), it refers to future action (e.g., investments in or acquisitions of something in the future only); thus, it is a concept because it is a planned project only, and it should be considered as guidance because it will be implemented later (or, in some cases, never). Therefore, it is a driver.

If we talk about a rule (even connected to a strategy, such as investment regulation), it is a mandatory instruction because it is connected to something already existing; thus, it must be immediately executed, and therefore, it is a force. As Morris & Jamieson (2005) suggest "*strategy is a means of thinking through and articulating how an organization's corporate goals and objectives will be achieved. This strategy is then typically operationalized at a "strategic" business unit [SBU] level; strategic initiatives are then often clustered into portfolios of programs and projects for implementation*" (Morris & Jamieson, 2005, p. 5). In summary, when a strategy becomes a mandatory element to be executed/operationalised, we talk about a rule (as force, e.g., investment regulation); before this point, we talk about principles (as drivers).

In summary, this research underscored the completeness and correctness of the model, highlighting its applicability to purchasing activities. As emphasized by Govindan *et al.* (2024) in their study, the majority of research papers revolve around conceptual frameworks or architecture, raising the need for more mixed methods, such as those that can be applied during real-life procurement procedures. Delke *et al.* (2023) underlined in their study the existing debate regarding the gap between academia and practice (in terms of business and management studies) for a long time. Their research confirmed, among other things, that practitioners tend to emphasize operating issues compared to academics. These findings

confirm the necessity of an easily usable tool in practice that helps map purchasing operations.

4.8. Practical implications

The research did not aim to test which particular (decision-making) questions could be supported by the developed model. The crucial goal is to effectively run a purchasing organization that is achievable through efficient purchasing processes. Therefore, it is necessary to reveal weaknesses through tools and balance operations. Considering that there is no easily applicable model in the hands of leaders (as confirmed during the case study), this presents a gap in purchasing management.

In the long run, only scientific models that accurately describe practical processes will become valuable. Models, such as the Balanced Scorecard (BSC) or Kraljic matrix, are accepted and used in practice because they exactly follow and adequately depict real processes. To assess the viability and applicability of the model in practice, we gathered some issues based on interviews and from suggestions of the open-ended questions in the survey.

Considering that the 4F4D model mirrors real-life purchasing procedures it holds significant practical implications. Therefore, uncovered topics or issues could not occur. As a result, the 4F4D model can be practically applied to address weaknesses or issues in purchasing processes. This tool provides an opportunity to match possible solutions to the revealed weaknesses, offering valuable insights into potential solutions by connecting identified issues with specific factors within the model. This approach enables organizations to develop tailored strategies to effectively address their unique challenges. As demonstrated in this thought experiment (Figure 37), any general issue can be linked to one or more factors (forces or drivers) of the model. If multiple factors are intertwined in causing a particular issue, a holistic or multifaceted solution might be necessary for complex resolution. However, literature identifies numerous solutions for all the issues considered in the table. This approach allows organizations to leverage the comprehensive framework provided by the 4F4D model to enhance their purchasing practices and mitigate risks.

Figure 37: Practical applicability of the model

ISSUES (examples)	TO BE ADJUSTED TO or STRENGTHENED	
	FACTORS	ACTIONS (examples)
Inefficient cooperation with the internal requestor	Requestors	Try to amend the daily work with the co-department for instance by a more frequent (and cooperative) meeting to enhance the trust among associates.
	Cross-functional integration	Try to understand better the co-worker's point of view, and adjust or alter - if possible - your own opinion.
Too long lead-time	Internal regulations	Revise/modify the internal regulations in case this is the root of the delay; explain that there is a need to comply with the internal requirements.
	IT solutions	Revise/modify the IT solutions in case this is the root of the delay; gather and show the features of delay that are coming from improper IT solutions.
Inappropriate suppliers are selected	Strategies	Define better the purchasing strategies to be followed.
	Supplier Management	Apply a more efficient or introduce a new Supplier Management System.
Failed fulfilment by the supplier	Internal regulations	Revise the internal regulations to avoid - on the purchasing contract basis - an undesired supplier.
	Supplier Management	Be more prudent in how to evaluate and select your partners.
Disadvantageous conditions in cooperation with suppliers	Suppliers	Try to apply a better purchasing strategy, for instance, spread the risk by keeping a vendor pool or seeking new suppliers.
	Internal regulations	Try to modify the compulsory clauses to be applied through a proactive and cooperative attitude inside the company.
Unclear understanding of requirements by procurement associates	Strategies	Train (or replace) the purchasing professionals if they do not understand the company or department strategies.
	Cross-functional integration	Clarify the co-department's requirements if this is the root of the problems.
Inefficient IT workflows	IT solutions	Try to modify/personalize the IT workflows if this is an obstacle (gather the reasons why) in the daily work.
	Cross-functional integration	Explain to the associates of the co-department how to boost - for instance by a more efficient usage - the appliance of the IT workflows.
Uncertainties and market changes	Suppliers	Seek new markets (suppliers) and be prepared for market changes by applying forecasting and prudent cooperation.
	Supplier Management	Change/update (or introduce a new) Supplier Management System adjusted to the actual challenges.
Ineffective usage of modern IT-solutions	Internal regulations	Change the internal regulations to be in line with the new possibilities (e.g. e-auction, e-bidding, etc.)
	IT solutions	Change/update (or introduce new) IT systems, and applications to serve your requirements.
Disadvantageous legislation conditions	Internal regulations	Try to apply smart internal regulations to fend off the mandatory legislation clauses to be applied.
	External rules	Try to apply gradual lobby activity - in case you are a multinational company - to modify to some degree the compulsory clauses to be applied.

Source: Authors' construction

It is essential to recognize that while the 4F4D model can provide practical (viable) solutions to identified issues in purchasing processes, it may not comprehensively address every deficiency. The model focuses on connecting specific factors with corresponding problems identified by purchasing leaders and survey respondents, rather than attempting to address all potential issues in purchasing. Furthermore, it is important to note that the applicability of the model may vary depending on the organization's maturity level and operational structure. Organizations with high maturity levels, featuring centralized activities and formalized operations, are likely to benefit most from the model's use. However, companies in earlier stages of development may need to prioritize achieving this level of maturity before fully leveraging the model's capabilities.

4.9. Contributions, limitations, and closing remarks

Leading multinational companies typically have well-structured and smoothly operating organizations (Foerstl et al., 2013), developed over many years of practice. However, as confirmed during the interviews, there is a lack of a holistic view or checklist for the purchasing operations. Therefore, there is a need for a tool that can assist in procurement management.

This model can support structuring elements of the purchasing procedure, revealing potential weaknesses for further improvement. It can be utilized as a map or checklist to guide procurement decisions by uncovering weak areas. Moreover, the model has implications for practitioners, serving as a tool for teaching and training professionals (both leaders and subordinates), to recognize weaknesses through factor alignment and subsequently balance them considering that the success of purchasing and supply management largely depends on professionals' knowledge and skill levels (Stek & Schiele, 2021). The 4F4D model also has theoretical potential. Scholars can apply it to comprehend the complex procurement environment, explore the interaction of factors, and identify new research topics. Thus, this model offers both practical and theoretical contributions to the field.

This study has certain limitations that should be acknowledged. The small number of cases and exclusive focus on large companies may restrict the generalizability of the findings. Further research could explore the practical applicability of this model in different company contexts. Additionally, investigating the relationships and interactions among different elements of the model could be a valuable avenue for future research. This involves delving

into each factor as a separate research objective to gain a deeper understanding of its dynamics and impact on procurement processes.

The study emphasizes that novelty in a conceptual framework can stem not only from introducing new elements but also from providing a fresh perspective and arrangement of existing elements. It draws an analogy to a recipe, where using known ingredients in different quantities or combinations results in something new. Similarly, while the individual factors of the model are well-known elements that have been studied previously, the novelty arises from their unique combination and structure within the model. The arrangement, classification (forces or drivers), and interrelations of these few factors contribute to the comprehensiveness of the model in depicting real-life procurement procedures. This study underscores that the model's simplicity and transparency enhance its applicability in practice.

Furthermore, the model can serve as a practical toolkit for diagnosing and addressing common procurement challenges. By applying the 4F4D model, purchasing departments can identify key areas for improvement, such as enhancing IT workflows and/or fostering better cross-functional integration. Its application can also be translated into more streamlined operations, better supplier relationships, and reduced process lead-time. Thus, implementing the model's recommendations can lead to a more agile procurement process. The model's application in purchasing can indirectly benefit society by promoting more efficient and sustainable procurement practices. This could lead to improved resource allocation, reduced waste, and ultimately, products and services that are more aligned with societal needs and ethical standards.

The research findings underscore the significance of the 4F4D model as a valuable tool for practical application in the field of purchasing, addressing a gap in available models. Drawing on the insights of over 130 purchasing professionals with extensive experience across multinational companies, coupled with a deep review of existing literature, the model has been validated as both comprehensive (complete in process description) and accurate (correct in shape). One of the key strengths of the 4F4D model lies in its applicability across various contexts, thanks to its clear classification of factors into forces and drivers. This structured approach provides a consistent and general framework for analysis and implementation, regardless of the specific industry or prior purchasing experience. The model's holistic view

and lucid structure offer a clear understanding of the complex dynamics within purchasing processes, facilitating its adoption in practical settings.

The insights gathered from interviews with purchasing executives highlight the pressing need to bridge the gap between theoretical concepts and practical application. Researchers are committed to furthering this goal by ensuring that their work not only contributes to theoretical understanding but also provides actionable guidance for both professionals and scholars. By applying the 4F4D model in practice, researchers aim to support practitioners in addressing real-world challenges and achieving greater success in their purchasing endeavours.

5. APPLICABILITY OF A STRATEGIC TOOL TO REVEAL AND CLASSIFY PROBLEMS AND MITIGATE RISKS IN PURCHASING

Wittinger, M.M., Demeter, K., Avornicului, M. (2023). Applicability of a strategic tool for identifying and classifying problems and mitigating risks during the purchase, Economics & Working Capital 8 (1-2), 2-9.

Abstract

Despite the increasing importance of supply chains especially today, when terrifying changes (war, pandemic situation, Industry 4.0, and so on) take place, there is no useful tool to reveal and classify the existing (internal and external) problems in purchasing that affect decisions. The purchasing decisions have a strong financial and production impact because there is a continuous risk and an enforcing hurry on how to grant the supply. A way to minimize risk is to make the proper strategic decisions based on identifying factors that influence purchasing procedures since there are factors that are specific to the purchasing environment only and comprehensively depict this complex work.

The key objective of the article is to show – and also to test – the applicability in the practice of a tool that could mitigate risks by the help on how to identify and classify/group the factors that affect, influence, or determine the business and purchasing procedures, therefore, operations, KPIs as well as financial outcomes.

The applied methodology was case studies research where semi-structured deep interviews were conducted with the head of purchasing organisations (highly qualified professionals/leaders, e.g. CPOs). The research took place at five multinational and/or large companies in Hungary which are at a high maturity level with well-established business procedures. There are detailed practical examples described in the article as well as the applicability of the tool is shown; the cases can help managers to recognize the deficiencies in their own organisations, while they can be also a compass for scholars on what the research topic could be.

5.1. Introduction

Despite the increasing importance of supply chains especially today, when terrifying changes (war, pandemic situation, Industry 4.0, and so on) take place (Sárközy, Balog, & Kumar, 2022), there is no useful tool to reveal and classify the existing (internal and external) problems in purchasing that affect decisions. The purchasing (as strategic) decisions have a strong financial and production impact (Tóth, Gyurcsik, & Karabassov, 2020) because there is a continuous risk and an enforcing hurry on how to grant the supply. A way to minimize risk is to make the proper strategic decisions based on identifying factors that influence purchasing procedures since there are factors that are specific to the purchasing environment only and comprehensively depict this complex work. (Note: purchasing or procurement, the words are used interchangeably, also as substitution of the purchasing division – in this case, written by a capital letter.)

Although it is clear that nowadays procurement has a significant role in how sustaining competitiveness, and a crucial contribution to business success, however, only a few procurement models appear which could be used by procurement managers as a guideline to support purchasing decisions; according to our literature review, apart from the model of Wittinger (2022), we did not find other one that could be considered a comprehensive model, so involves all aspects, therefore, it can be efficiently used in practice (as other models can be used such as the BSC - Balanced Scorecard, Kaplan & Norton, 2006 or Porter's five forces, Porter, 2008); unfortunately, the approach of the studies to purchasing matters is too deep (discussing the entire company) or partial (considering only some parts of procurement); nevertheless, we found a large body of articles that have introduced or defined important models or concepts related to various aspects of business and purchasing processes, as highlighted below:

Kleindorfer et al (Kleindorfer, Singhal, & Wassenhove, 2005) constructed a model to explain the (extended) Supply Chain from the sustainability point of view; nevertheless, between "Suppliers" and "Production" there is no Procurement shown at all. Seuring & Müller (2008) also defined a conceptual model of sustainable supply chain management, where triggers are identified. Unfortunately, the framework of the model the same oversteps the boundaries of the procurement; furthermore, it depicts superficially only the parts which are involved in the relations. The model analyses the relations at the company level, instead of analysing them

at the organisational level. Also, De Boer et al (De Boer et al., 2002) developed a conceptual model to analyse the impact of electronic procurement on the purchasing process and purchasing costs, on the organisation and IT systems; they made distinctions among several electronic procurement forms and investigated their impact – one by one – unfortunately on the Purchasing department and "*Rest of the organisation*" level only.

Li & Nagurney (2015) developed a multitiered supply chain network model, where the competitive behaviour of each tier of decision-makers is described along with several strategic variables. Other articles studied and put the greatest accent on cross-functional integration and internal cooperation such as Ellegaard & Koch (2014) and Barki & Pinsonneault (2005) or Rozemeijer, Weele, & Weggeman (2003), while Rezaei & Fallah Lajimi (2019) and Saccani & Perona (2007) discussed and catalogued the buyer-supplier relationship and cooperation. Furthermore, models exist in the literature to address procurement fraud risk problems such as the article of Venter (2007) that can be applied as a comprehensive internal framework for risk managers and auditors to limit the companies' exposure to procurement fraud.

Nicoletti (2017) depicted in his work the increasing complexity of the business environment, especially of procurement, which requires a significant intervention in the process- and information-management. He developed several models in his work, that describe the business, financial and communication channels, and agile solutions; nevertheless, there is no model which consists of internal and external parts at once, furthermore, involves all the affected stakeholders at the same time. Den Butter & Linse (2008) also discussed various types of costs that managers need to consider in purchasing decisions; they distinguished objective "hard" and subjective "soft" factors, where further internal and external factors are set up.

Gelderman et al. (2017) developed a model to depict relations between actors, factors, and implementation at the organisational level; according to them, "Actors" are the top managers, procurement professionals, and budget owners, while "Factors" are the management support, information/communication, organisation, and external pressure. However, the mentioned actors belong to the internal part of the company only (for instance Suppliers are not represented at all), while the presented "external pressure" among the factors should be part of the external features.

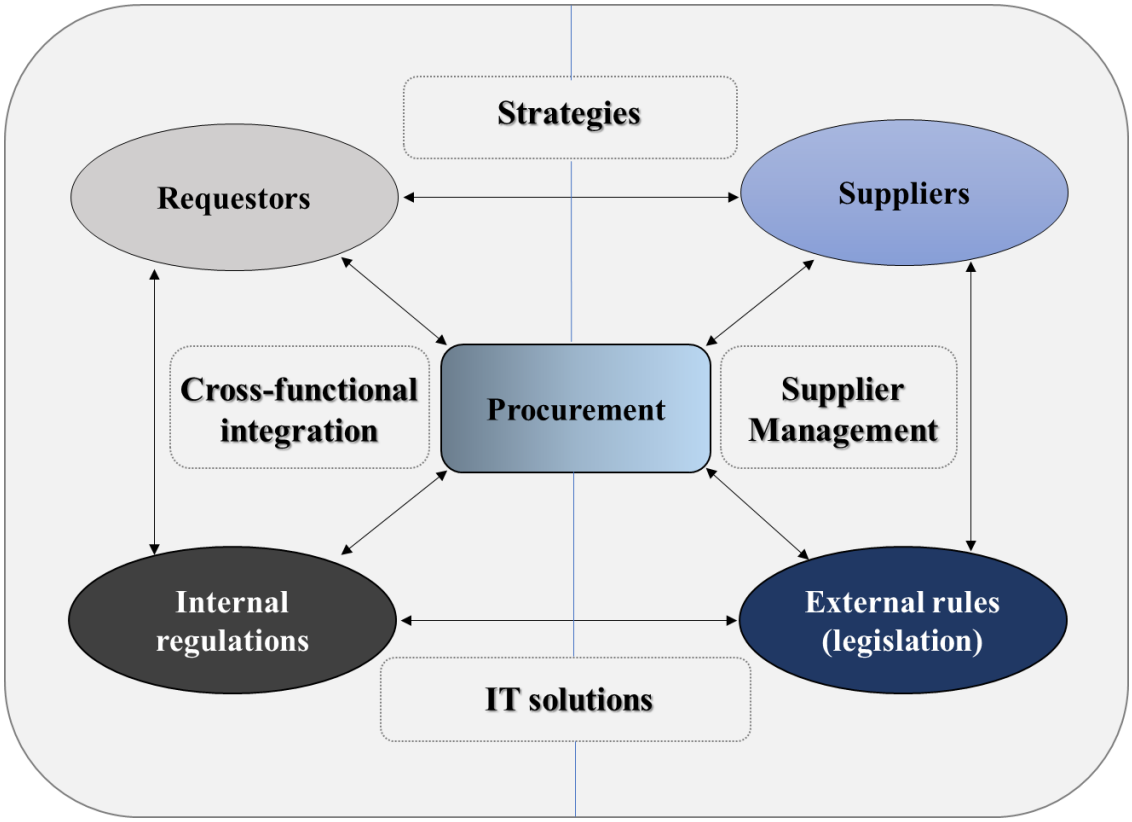
The model of Cousins (2002) highlights Suppliers and identifies Internal and External groups, however, both of them have missing parts. The same, Bals, Laine, & Mugurusi (2018) defined the macro-level dimensions of the purchasing organisation/work; they also identified External and Internal parts and enumerated several factors and dimensions, nevertheless, we can recognize – for instance – the lack of regulations and rules, however, during the purchasing processes there is a great accent on the legal compliance since this prudency will protect the supply and mitigate the risks.

The matrix of Kraljic (1983) is one of the few models that are still valid today and actually used – even though it is old. It focuses on the supply side but does not deal in any depth with other aspects. Apart from its partial discussion only of the purchasing work, several other studies and articles rest on the Kraljic matrix such as Perdana & Mulyono, 2021; Bianchini et al., 2019; Rezaei & Fallah Lajimi, 2019; Kang, Hong, Bartnik, Park, & Ko, 2018; Hesping & Schiele, 2016; Bensaou, 1999, and many others.

Thus, with regard to the literature – and its short review above – we decided to use for our case studies the comprehensive model of Wittinger (2022); because the key objective of this article was not to only show the practical examples of five large and multinational companies but also to test the applicability of a chosen model as a solution for detecting purchasing deficiencies.

Wittinger (2022) constructed a purchasing model (Figure 38) that consists of factors forming two groups, the group of forces (requestors, suppliers, internal regulations, and external rules) and drivers (strategies, IT-solutions, cross-functional integration, and supplier management), while the model also has two parts, an internal (the left one) and an external (the right one). If we pay attention to the whole environment of the purchasing work, we consider that this model involves all the aspects having an impact on procurement.

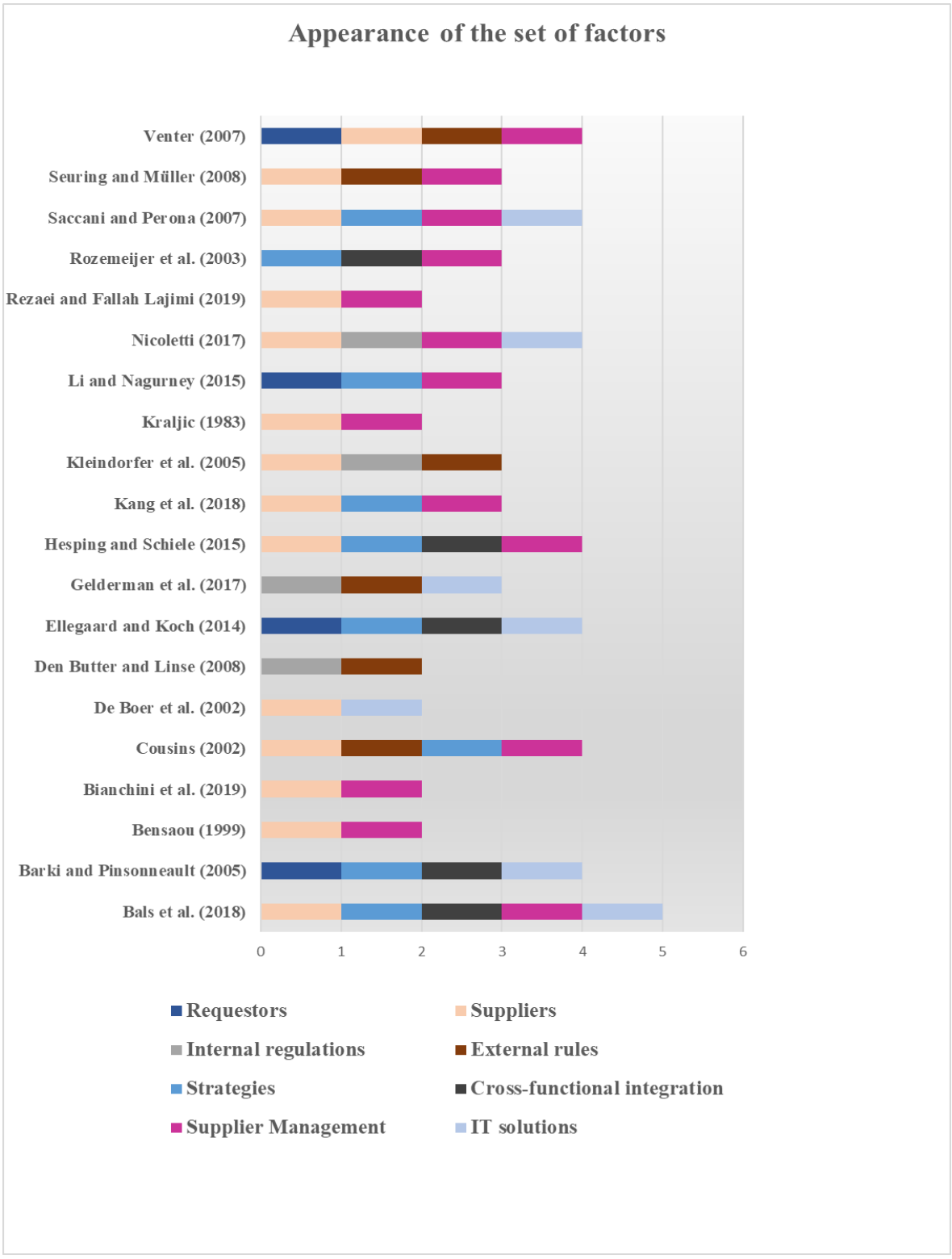
Figure 38: Four forces and four drivers (4F4D) model



Source: Wittinger, 2022

Based on the chosen model and the gathered articles depicted above we applied a synthesis of the set of factors enumerated in the given literature; Figure 39 is to show the result of the comparison, it depicts the appearance of the factors. We will discuss the applicability of the factors in the analysis part (another chapter) of this study.

Figure 39: Appearance of the set of factors



Source: Authors' construction

5.2. Methodology and data collection

As the aim of the research was to explore and understand, therefore, as research methodology we applied case study research. The purpose of case study research is to understand phenomena by observation, explore potential problems, and draw adequate conclusions from studies (Yin, 2012).

We used multiple-case study research and semi-structured in-depth interviews for data collection that were held – at each company – with the head of purchasing organisation; the interviews were supplemented with direct (personal) observations during interviews and processing additional information (data, figures, and documents) provided by the interviewees. The interviews lasted between 80 and 100 minutes and all of them were audio-recorded and notes were made as well. After examining the 5 cases one by one, to analyse the factor matching we used a cross-case synthesis method.

The sampling strategy was based on theory to find the best sample that fits the theory. We chose leading companies that are representative ones in their industries (chemical-pharmaceutical, energy, and transportation-logistics) because these companies are forced to follow the most dynamic development. We wanted to examine large companies because we assumed to find organisations at a high maturity level of development, with well-established procurement/supply chain procedures that are continuously monitored and developed, and where integrated regulations and practice-based workflows exist.

In Figure 40 we show the details regarding the research and its participants: short data about the inquired companies and purchasing departments (the company size and the level of procurement organisation) and figures of participants (the name of the leader's position, the interviewee's professional experience), furthermore the time (i.e. interval of time) when the research took place.

Figure 40: Features of interviews

Studied companies by research	Type of company	Level of Proc. Dep. (CEO is the 1st level)	Interviewee's job position	Professional (procurement) experience of interviewee	Date of research (between)
Company A	large/ multinational	3rd	Procurement Director	20 years	Q4 2021 - Q4 2022
Company B	large/ multinational	3rd	Chief Procurement Officer	16 years	Q4 2021 - Q4 2022
Company C	large/ multinational	3rd	Head of Procurement	20 years	Q4 2021 - Q4 2022
Company D	large	3rd	Procurement Director	12 years	Q4 2021 - Q4 2022
Company E	large/ multinational	3rd	Head of Procurement	21 years	Q4 2021 - Q4 2022

Source: Authors' construction

The interview consists of two separate parts. The first part of the interview involved general questions about the interviewee (e.g. job position, its starting date, the length of the professional experience in purchasing area, etc.), about the company and the organisational unit (FTE - Full-time equivalent - of the company and department, the level of the purchasing department and its budget, number of suppliers and contracts, etc.); it has also incorporated questions about weaknesses and strengths as well as questions regarding factors that influence the purchasing work and/or have an impact on it. In the second part* of the interview, we revealed the applied model and inquired respondents about their opinion in connection with it, its factors, and its validity. (* *Note: the second part of the interview is discussed in another article since it outsteps – in length and topics – the boundaries of this paper.)*

5.3. Description of the cases

The selected companies (Figure 41) are large and multinational companies with a presence in several countries in Europe and worldwide that belong to the key sectors of the economy, namely the chemical-pharmaceutical, energy, and transportation-logistics industries. All these companies are matrix organisations in terms of the company's business structure; t; therefore, they apply multiple and complex reporting levels, as well as cross-functional integration/cooperation and advanced Supplier Management.

Figure 41: Features of companies

KEY FIGURES OF COMPANIES		A	B	C	D	E
No. of employees - on company's group level (FTE)	More than 15000 FTE	■	■		■	■
	Between 10000 and 15000 FTE			■		
	Less than 10000 FTE					
Size of proc. department - integrated number (FTE)	More than 250 FTE	■	■			■
	Between 100 and 250 FTE			■		
	Less than 100 FTE				■	
Value spent on procurement - domestic company only (million EUR)	More than 500 M EUR	■	■			■
	Between 250 and 500 M EUR			■	■	
	Less than 250 M EUR					
Average no. of new contracts/year (pcs/y)	More than 500 pcs/y		■	■	■	■
	Between 100 and 500 pcs/y	■				
	Less than 100 pcs/y					
Average no. of suppliers (pcs)	More than 10000 pcs	■	■			
	Between 5000 and 10000 pcs					
	Less than 5000 pcs			■	■	■

Source: Authors' construction

Their statistical staff count is more than 15 000 FTE (on average), with large procurement departments, a high purchasing budget (generally more than 500 million EUR the minimum is also above 250 million EUR), over 500 pcs of new contracts yearly (on average) and thousands of suppliers. Since the companies are at a highly developed level regarding the business processes, they all apply efficiently the best practices, run the operations based on benchmarking, and use the common standards of business management.

In the next part, we describe the background of the procurement organisations; we depict the collected information regarding the departments' practice (in terms of deficiencies and strengths), as well as data about the general conduct of purchasing procedures.

5.3.1. Company A

Currently, there is no detailed procurement regulation; the purchasing processes are run based on the LDA (List of Decisions and Authorities) and on purchasing guidance which involves and describes shortly the procurement principles. The multinational company runs integrated procurement procedures due to several companies and subsidiaries included in the group.

The leader mentioned as main problems the following ones:

Procurement does not always clearly understand the business requirements and goals, due to the lack of professional knowledge connected (in terms of category management) to that particular requestor area. It could be a reason why procurement associates experience such opinions (and conduct) from requestor areas that at their organisational unit everyone has already possessed such procurement skills that are needed during the purchasing processes – even though they are not buyers; therefore, procurement associates and their purchasing knowledge are not evaluated at their proper value. Furthermore, the requestor organisation does not always trust Procurement. It tends to avoid involving it in the purchasing processes; in other cases, the requestors think that some purchasing cannot be done otherwise than on the exemption from bidding mode only (i.e. without any bidding procedure). But in this case, there will not be enough accent on the suppliers' selection, even though nowadays there is a huge supply risk because of uncertainties and market changes. As the leader sees, there is a need to change the mindset, to implement an operating model based on strong category management, and the responsibility must be understood on the end-to-end pattern.

The main strengths mentioned by the leader are as below:

Despite the evaluation of the purchasing associates by the colleagues of other units, they have strong procurement skills, they possess advanced purchasing professional knowledge. Therefore, the contracts are concluded circumspectly, the associates pay attention to the risks coming from suppliers and try to handle them by proper clauses/conditions involving all the needed internal regulations in the contract.

5.3.2. Company B

In Company B there is procurement regulation; the purchasing processes are run based on that, on the LDA and on the RACI matrix as well as on several other internal regulations. The Procurement budget consists of two parts, OPEX (Operating Expenditures) and CAPEX (Capital Expenditure), where the operating costs are 2,5-3 times bigger than the investment expenditures. They also launch as often as possible competitive procedures on the integrated level (if possible) affecting more countries to realize as much as possible savings during the bidding.

The leader mentioned as main problems the following ones:

Sometimes there is a lack of professional knowledge regarding the specialization of the requestor areas, therefore, learning skills need to be developed. Even though there are often competitions launched, Procurement does not profit duly from the e-action opportunities, the associates do not like to use it during the procedure. Furthermore, Procurement does not have the necessary strategic thinking, the associates do not feel and understand the strategic reasons. Also, the manner of the behaviour must be changed, there is a need to boost the company's internal cultural level and conduct.

The main strengths mentioned by the leader are as below:

The purchasing associates have advanced negotiation skills as well as everyone is at a developed level of assuming responsibility for his/her decisions.

5.3.3. Company C

There is procurement regulation, the purchasing processes are run based on its rules on an integrated level. The acknowledgement of Procurement depends on the particular purchase category; in some cases, is better in others, less so. The procurement planning is done only on the previous year-basis, therefore there are sometimes discrepancies between the plan and reality.

The leader mentioned as main problems the following ones:

Procurement does not possess the appropriate IT systems and solutions, thus IT-platforms must be strengthened. The e-auction opportunities should also be strengthened, even if there are associates and partners (e.g. suppliers) who do not support it. There is a lack of technical

codes and standards and of advanced maintenance planning; it could be a reason why the design and schedule of requests are of relatively poor quality several times. Although the acknowledgement/legitimacy of Procurement can be experienced, however, in most cases, there is no chance that the purchasing work to be evaluated with these three words at once "good, cost-saving, and fast."

The main strengths mentioned by the leader are as below:

There is a good company culture, the cooperation among colleagues works smoothly; there is a high problem-solving skill in the purchasing organisation, its credibility level is good as well as the professional knowledge in terms of (some) purchase categories. There is great purchasing potential due to the company's size, its well-known name and prestige, and its liquidity.

5.3.4. Company D

There is procurement regulation, the purchasing processes are run based on its rules and with the help of existing IT-platforms. Several IT-systems (e.g. purchasing-specific ones) were introduced in the very few years. The acknowledgement of Procurement has evolved more in the past years; it runs its activity connected to the subsidiaries based on SLA (Service Level Agreement).

The leader mentioned as main problems the following ones:

There is a quite fragmented state of IT systems and solutions, these must be reorganised in some sense. There are deficiencies in the interconnection among applications or in their usage. There is also a quite low level of maturity and the knowledge transfer in terms of category management is at a low level as well. Procurement must develop soft skills, such as change management, communication, people and organisation development. Procurement must also put a bigger accent on how to classify the supply risks.

The main strengths mentioned by the leader are as below:

The procurement is a good community, the associates trust each other. There is also good cooperation among different organisations, systematic meetings are scheduled, and the procurement area is acknowledged by the colleagues inside the company. The associates have strong procurement skills, and they act in a proactive manner. Now, procurement strategy

exists, and it is well-known, because previously the associates had not known in detail strategy, therefore they did not see the whole strategic process.

5.3.5. Company E

There is procurement regulation, the purchasing processes are run based on its rules, based on an integrated level (connected to several group companies). During the procurement procedure, the company always sets up and applies Evaluation Committee for bias-free bidding evaluations.

The leader mentioned as main problems the following ones:

The purchasing processes - in general - can be quite poorly planned, therefore, the purchasing requests need to be developed from the time-management point of view since the scheduled requests are too often too late launched. There is a need for a higher level of transparency and strategic support; trust among different organisations (e.g. between procurement and requestor departments) is at a quite low level. There is also a need to enhance the digital platforms, since not all IT platforms are the proper ones.

The main strengths mentioned by the leader are as below:

There is generally known that purchasing and saving are not synonyms, these two are not equivalent. It is also acknowledged that procurement creates value. The category management stands on a strong professional basis/pillar.

5.4. Analysis of cases, the cross-case factor matching

We argue that the reasons behind the deficiencies (if any) can be derived from the enumerated purchasing factors and the problems can be also solved with their help (Wittinger, 2022); therefore, in this part, we will analyse the applicability of factors – more exactly of the drivers only – as potential solutions to the revealed deficiencies. The reason why we will consider the drivers only is that the purchasing cannot influence the forces (the actors of the procedure), nor their existence because they are constant elements (Wittinger, 2022). The cooperation always takes place between two parties (customer-supplier), while the regulations/rules are a must considering that procurement is surrounded by the law to protect the company against happenings such as faults in fulfilment, breach of contract, and so on. Thus, since we argue that the chosen model is a comprehensive one (it involves all the factors that could affect the purchasing work), the solution is to find a problem-solving opportunity

among the drivers. In the next part, we will shortly explain how we understand the drivers and why they could be problem-solving opportunities.

The drivers connect – internally and externally – the parties of purchasing processes and drive the procedures; because the procurement procedures are driven by the workflows (in line with stipulated strategies), and they take place on certain IT systems and applications. Thus, these elements create the framework of and provide a background for purchasing work, lead the procurement processes, and influence their operation and management (Wittinger, 2022). Based on the above explanations, in the next part, we will discuss the drivers only.

5.4.1. Strategies

The literature argues (and the interviewees confirmed it) the importance of strategies (of procurement as well), because "*strategy describes how an organisation intends to create value for its stakeholders*" (Kaplan & Norton, 2004, p. 1); also, the collaborative procurement strategies – as an integrated part of all strategies – can enhance the efficiency in projects (Eriksson et al., 2019). Therefore, the purchasing strategy must be well understood by associates and in line with other departments' (functional and/or business) strategies, so, it is part of the entire company's strategy.

5.4.2. IT solutions

During the interviews, we experienced how big an accent the leaders put on IT solutions. The need to focus on core business and to increase effectiveness is accomplished – among others – by the opportunity and speed of information exchange inside and outside of the companies; such circumstances made IT solutions and e-procurement vital for companies and the entire global economy (Nivetha, 2021; Afolabi, Ibem, Aduwo, Tunji-Olayeni, & Oluwunmi, 2019; Chae, Yen, & Sheu, 2005; Ronchi, Brun, Golini, & Fan, 2010).

5.4.3. Cross-functional integration

The importance of cross-functional integration (cooperation among co-divisions) is unquestionable – interviewees see it the same – since the well-recognized function of cross-functional teams is to increase purchasing performance (Poberschnigg, Pimenta, & Hilletofth, 2020; Foerstl et al., 2013); because due to it – as the cross-functional team members integrate diverse perspectives and competencies during processes – the purchasing processes become much more achievable and the process will be better adjustable to the

requirements (Meschnig & Kaufmann, 2015). Nowadays, integration and involvement of cross-functional teams in common projects of the company is a must, since we build and value knowledge-based economies (Ferreira et al., 2019).

5.4.4. Supplier Management

A critical and so complex part of the purchasing work is the management of supplier relationships – the so-called Supplier Management (Hallikas et al., 2020; Wittinger, 2019; Handfield, Petersen, Cousins, & Lawson, 2009); the interviewed professionals have agreed with this viewpoint because the purchased materials will form a considerable part of the manufactured products (Tate, Ellram, & Dooley, 2012) and good cooperation between procurement and supplier can contribute significantly to the product value (Zimmer, Fröhling, & Schultmann, 2016; Seuring & Müller, 2008); also, because today the biggest accent is on the risks and their mitigation (Ogunranti et al., 2021; Hallikas et al., 2020; Lanier, Wempe, & Swink, 2019; Faisal, Banwet, & Shankar, 2006).

According to the part above we would like to show how we consider the factors (drivers) to be applied as problem-solving opportunities, more exactly how we can identify the deficiencies by matching them to the factors since each problem can be defined as an element in the model.

Figure 42 is to show the problems and deficiencies collected from the cases as well as depicts the possible solutions that could be feasibly by factors (drivers). In summary, to solve the problems aroused in the cooperation between the companies' co-organisations, cross-functional integration to be used; it must be enhanced and understood that only common aims (and problems) exist. Similarly, in the case that there is no proper understanding of strategies this knowledge and skills must be enhanced. To eliminate the risks in connection with the IT platforms and Supplier Management, in both cases the IT systems must be developed, and more conscious management of suppliers must be done.

Figure 42: Possible solutions to deficiencies

EXAMPLES OF DEFICIENCIES IN PURCHASING PRACTICE VS. FACTORS (DRIVERS) AS POTENTIAL SOLUTIONS	Four Drivers			
	Strategies	Cross-functional integration	Supplier Management	IT solutions
There is no clear understanding of business requirements by procurement associates.		■		
There is no proper accent on the evaluation scheme of suppliers in terms of risk classification.			■	
There is a need to enhance the digital platforms, since not all IT platforms are proper ones.				■
There is not enough trust between organisations (Requestor-Procurement).		■		
Procurement does not duly profit from the e-action opportunities.				■
There are deficiencies in the interconnection among IT applications or in their usage.				■
There is a need for an operating model based on strong category management.		■		
Procurement does not have the necessary strategic thinking.	■			
There is a lack of professional knowledge regarding the specialization of the requestor areas.		■		
Procurement associates do not like to use e-action opportunities during the procedures.				■
Procurement associates do not feel and understand the strategic reasons.	■			
Must be enough accent on the suppliers' selection; nowadays there is a huge supply risk because of uncertainties and market changes.			■	
Procurement does not possess the appropriate IT systems and solutions.				■
There are gaps in how to understand strategies and how to follow their appliance in the practice.	■			
There is a quite fragmented state of IT systems and solutions, these must be reorganised.				■
There is a need to boost the company’s internal cultural level and conduct.		■		

Source: Authors’ construction

5.5. Conclusion

There is a need for concepts that help procurement decisions in practice to avoid financial loss, highlighting the importance of systems-thinking orientation in purchasing as well as of purchasing practice evolution where the theory and practice move towards more conscious management. Because the practice and theory must evolve together to secure for leaders and their organisations keep pace with the rate of technological and environmental changes. We must, therefore, acknowledge the existence of and connection among several contingency factors of such a complex environment as the purchasing work.

Nevertheless, during the interviews, we experienced that, there is a lack of some applicable strategic tools in the practice while evergreen problems and deficiencies still exist even in the biggest companies with professional business operations. This paper provides an in-depth insight into the actual purchasing practice of large multinational companies through testing a holistic model. The selected model and its elements can be a useful tool for professionals and scholars how to consider the complex environment of procurement and understand the interaction of factors with each other. Furthermore, the discovered features provide opportunities for other companies to draw conclusions or learn. Because a properly set up and used model can illuminate the existing problems and improper routines (if any), can explore the roots of deficiencies, and can highlight the new challenges connected to the factors/elements of the purchasing work.

6. FEATURES OF SUPPLIER MANAGEMENT AND ITS MECHANISMS – INSIGHTS INTO HUNGARIAN PRACTICE. HOW TO ENHANCE THE EFFECTIVENESS OF PROCUREMENT PROCEDURES

Wittinger, M. M. (2019). Features of supplier management and its mechanisms – insights into Hungarian practice. How to enhance the effectiveness of procurement procedures? Budapest Management Review, 50(11), 37–52.

Abstract

Considering the risk how serious consequences could occur in case of supply problems, the increasing importance of suppliers in supply chains is indisputable; therefore, management of relationships and selection and evaluation of suppliers are seen as crucial strategic issues (Araz & Ozkarahan, 2007). The practice/activity – and theory – how to handle the suppliers is the so-called Supplier Management (SM).

The article presents the findings of research investigating the actual practice of SM in the inquired procurement organizations. The theoretical contribution of the paper is to compare the practice of these particular organisations with the literature in order to state the coincidences with it or the discrepancies between them, in other words, to reveal the status of purchasing work. The managerial implication – on this basis – is to be a compass for practitioners where to find the deficiencies (if any) and how to strengthen the effectiveness of procurement by a better understanding of the problems; also, the paper formulates suggestions for a more efficient SM practice. We argue that the procurement processes in terms of SM have deficiencies which can be originated from its component parts: i) supplier evaluation; ii) cooperation; and iii) IT platforms.

We applied survey research while the answers of the survey were analysed applying comparison to the literature and using Cross-table analysis to reveal the connection among the stated SM factors.

Keywords: Supplier Management, supplier evaluation, supplier selection, cooperation, IT platforms.

6.1. Introduction

In today's turbulent environment, the necessity to sustain and to further enhance the competitive ability of a company is unquestionable (Trkman & McCormack, 2009). Therefore, there is a continuous competition among companies to gather benefits from this race in order to increase competitiveness as much as possible; in Hungary – the same as elsewhere – the companies should choose how to do this: on their own possibilities/assets, in alliances with other companies (as corporations, joint ventures or subsidiaries), or even by becoming a destination of the foreign direct investments in Central and Eastern European region (Lőrincz, 2018).

The work of the procurement organization strongly affects the competitiveness since the purchasing area has the role to manage corporate costs efficiently, to perform these purchases in a cost- and time-effective manner. Also, procurement managers cannot disregard the continuously and rapidly changing environment and the phenomenon that the supply patterns can fall overnight (Kraljic, 1983), therefore the most complex and maybe the most critical part of the purchasing work is the management of supplier relationships (Handfield et al., 2009).

Due to the market changes "*in organizations of the future, world-class operations will require world-class supply management and suppliers*" (Carter, Carter, Monczka, Slaight, & Swan, 2000, p. 22). Therefore, "*without a foundation of effective supply chain organizational relationships, any effort to manage the flow of information or materials across the supply chain is likely to be unsuccessful*" (Croom, Romano, & Giannakis, 2000, p. 73). As a consequence, the role of the purchasing function in the business has significantly increased in importance due to the emphasis on building and maintaining long-term relationships with external partners (Cousins, 2002; Bendixen & Abratt, 2007; Handfield et al., 2009).

Considering the depicted responsibilities of procurement, the paper seeks to compare the actual practice – in terms of SM – of purchasing professionals to the recommended features of literature, in order to confirm the coincidences or to depict the discrepancies; the endeavour of this article is to be a support both for practitioners and for scholars; for practitioners in that sense how to avoid the improper routines or how to follow the suggested behaviours; for scholars to see the actual processes in practice.

To enlist the undertaken tasks, the article is organized as follows: the first chapter is to give a general description about the topic and its importance, while Chapter 2 introduces the concept and the notions of Supplier Management in the literature. In Chapter 3 we depict shortly the characteristics of the survey and the research methodology, then, in Chapter 4 we draw up the research hypotheses, and the fifth chapter depicts the findings of the survey. In Chapter 6 we summarize the research findings and we offer some concluding remarks, while the last one shows insights in terms of theoretical contribution and practical implications, furthermore to the limitation of the research.

6.2. Concept and literature of Supplier Management

Purchasing decisions will affect core activities of the company such as production planning and control, inventory management and logistics (Govindan, Kannan, & Haq, 2010), therefore will have a significant influence on the whole competitiveness of the company.

The main goals of supplier relationship management processes are to reduce purchase/supply risk, to maximize value to customer, to give importance to strategic sourcing, to build long-term strategic relationships between buyers and suppliers and to improve delivery, quality and cost performance of the product (Kraljic, 1983; Ganesan, 1994; Håkansson & Snehota, 1995; Dyer & Singh, 1998; Bensaou, 1999).

To achieve all the above goals, we argue that in terms of Supplier Management – as the essential and main part of the purchasing work – we can distinguish different activities and/or aptness as follows:

1. Supplier selection and evaluation: as the crucial parts of Supplier Management strategies (Lee, Ha, & Kim, 2001; Choi & Kim, 2008) meas the internal activities of purchasing organization to properly handle suppliers;
2. Cooperation: as the other main part of Supplier Management strategies (Bensaou, 1999; Chen, Lin, & Huang, 2006) means the external activity of the organization in connection with suppliers;
3. IT platform: is the aptness of the company in terms of IT systems and applications, on which basis the internal and external processes and workflows take place.

6.2.1. Supplier selection and evaluation

Since suppliers are parts of the supply chain, the relationship between supplier and customer company will have a determinative effect on the whole supply chain, so on the competitiveness of company as well, therefore, the supplier selection problem becomes one of the most crucial issues to implement a successful and effective supply chain system (Chen et al., 2006; Araz & Ozkarahan, 2007; Amindoust, Ahmed, Saghafinia, & Bahreininejad, 2012). Thus, we can treat supplier selection and evaluation as an optimization opportunity of the processes; in this case, this problem-solving (i.e. selection and evaluation of suppliers) requires the formulation of an objective measurement (Huang & Keskar, 2007).

To possess that objective measurement a proper Supplier Management system has to be set up; its role will be to monitor suppliers' performance, to identify strengths and weaknesses of suppliers and to provide relevant information about them to procurement (and to other divisions), to state distinctions in performance among supplies, also to give feedback to suppliers about their performance or even to support suppliers by providing knowledge, skills and experience via various supplier development programs (Araz & Ozkarahan, 2007).

The decisions of supplier selection and evaluation are based on multiple criteria. The number of decision makers, the nature and number of criteria and the degree of uncertainty, all have to be taken into consideration while solving them. Therefore, one of the crucial challenges confronted by procurement managers is the selection and evaluation of suppliers by the usage of a properly configurated method, built on right kinds of attributes/factors/criteria by a system compatible to company's other decision-making platforms (C. T. Chen et al., 2006).

The techniques used in supplier selection vary widely. Researches carried out in this field apply several models which can be grouped (almost all of them) into four main conglomerates: MP (mathematical programming), MA (mathematical analytical), AI (Artificial Intelligence) and other models (e.g. combined methods or industrial/company's specific ones). Even if there is a large body of literature on different methodologies, most of them are basically variations of MA methods (e.g. DEA-Data Envelopment Analysis: Liang, Yang, Cook, & Zhu, 2006; Y. J. Chen, 2011, and AHP-Analytic Hierarchy Process: Bruno, Esposito, Genovese, & Passaro, 2012; Rouyendegh & Erkan, 2012; De Felice, Deldoost, Faizollahi, & Petrillo, 2015, and MCDM-Multi-criteria Decision-Making: Araz & Ozkarahan, 2007; C. T. Chen et al., 2006).

Also, we often find AI methods (e.g. FL-Fuzzy logic: C. T. Chen et al., 2006; Amindoust et al., 2012), hybrid methods or other methods such as SCOR-Supply Chain Operations Reference (Lima-Junior & Carpinetti, 2016) or ISM-Interpretive Structural Modelling (Huang & Keskar, 2007; Faisal, Banwet, & Shankar, 2006).

As described above, in the literature various decision-making techniques are proposed to deal with the process of supplier selection and evaluation. But supplier selection differs significantly from supplier evaluation. The main goal of supplier evaluation is to classify each supplier based on the gaps existing between their real performance and desired one. Also, supplier evaluation includes determination of the evaluation criteria to be used and the weights of each criterion; therefore supplier evaluation seeks to categorize suppliers (along the predefined criteria), while supplier selection aims to define an order of preference among evaluated suppliers (Keskin, Ilhan, & Özkan, 2010; Omurca, 2013); in other words, we can evaluate all suppliers, but it could happen that we will select only a part of them (to conclude a contract or to continue an already started cooperation).

The most of studies and papers found in the literature propose techniques for supplier evaluation which are more appropriate just for ranking suppliers based on comparison among them (e.g. (Olsen & Ellram, 1997; C. T. Chen et al., 2006; Sarkar & Mohapatra, 2006; Araz & Ozkarahan, 2007; A. H. I. Lee, Chang, & Lin, 2009; Park, Shin, Chang, & Park, 2010; Y. J. Chen, 2011; Zeydan, Çolpan, & Çobanoğlu, 2011; Rezaei & Ortt, 2013).

Also, numerous decision models consider only quantity criteria for supplier selection (C. T. Chen et al., 2006). In addition, several researchers have concerns regarding the existing methods: about mathematical rigor of AHP (Dyer, Cho, & Chu, 1998; Dyer & Singh, 1998), while Liang et al. (in spite of application of DEA) consider that "*it cannot be employed directly to measure the performance of supply chain and its members, because of the existence of the intermediate measures connecting the supply chain members"* (Liang et al., 2006, p. 35); also while applying fuzzy system in case of large number of suppliers and criteria "*this method is quite time consuming and the final results of ranking are very close to each other, therefore, the ranking results from this method may not be accurate*" (Amindoust et al., 2012, p. 1665).

However, even scholars emphasize the need of quantitative researches, they do not apply them or overlook the importance of integration with business strategic thinking and apply

them *"without a clear rationale for choosing an appropriate objective function to be optimized"* (Huang & Keskar, 2007, p. 522).

In practice, there are also several ways and methods on how to evaluate the performance and efficiency of suppliers and how to select them. Therefore, the methodologies and the complexity of evaluations/ selections cannot be discussed that easy; or – because of business confidentiality – the indeed applied methods cannot be disclosed at all. Furthermore, the mode of evaluation and its relevant aspects – we mean the aspects and items of a particular model – cannot be generalized, as we could see in this chapter as well. Therefore, there was no purpose to put questions in the survey regarding the applied methodologies for supplier selection. Instead, we inquired respondents about the supplier selection schemes during the bidding phase and their popularity.

In terms of proposed criteria, based on literature their number and types also vary significantly. Several models propose to evaluate/segment suppliers based on the evaluation of factors such as cost/price and delivery issues, product quality and technical aspects (e.g. Olsen & Ellram, 1997; Sarkar & Mohapatra, 2006; Araz & Ozkarahan, 2007; Omurca, 2013; Rezaei & Ortt, 2013b).

Undisputable, cost and quality, furthermore on-time delivery and flexibility are the most dominant factors. In the late 1970s' and early 1980s' literature, there was a heavy emphasis on cost; in the early 1990s, cycle time and delivery aspects emerge, while in the late 1990s, researchers realized the importance of flexibility. Later, environmental and safety issues became the key criteria (Huang & Keskar, 2007; Dobos & Vörösmarty, 2014).

Recently, evaluation of supplier follows methodologies which identify factors such as supplier financial (still prominent criterion) and operational performance, human resource quality and compliance with processes and IT systems, as the main supplier characteristics which affect the likelihood of a supplier-connected disruption or a decrease in its performance; a supplier with a good evaluation in these categories is less likely to underperform in the chain (Trkman & McCormack, 2009). In addition, a significant part of the cited articles groups further the evaluation criteria into two (sometimes one) dimensions of supplier classification/evaluation.

Rezaei & Ortt (2013b) propose a two-dimensional model to evaluate and classify suppliers based on the dimensions of capability and willingness. They consider the dimension of

capability including price, quality, delivery, etc, while the dimension of willingness contains – among others – criteria such as relationship, communication openness, commitment to quality, etc.

Sarkar and Mohapatra (2006) also propose a two-dimensional model in which suppliers are segmented into motivated and de-motivated categories based on evaluating long-term capability and short-term performance. Criteria of the long-term capability are – among others –financial capability, technological capability, quality system, production facilities, management and organization, and reputation; while short-term performance criteria are price, quality, delivery, lead time and attitude.

Olsen and Ellram (1997) propose a two-dimensional model as well: strength (intensity) of a relationship and supplier attractiveness. They argue that strength of relationship depends on economic factors, characteristics of the exchange relationship cooperation and proximity while supplier attractiveness depends on financial, technological and organizational factors, production performance, culture, and strategy.

Omurca (2013) and Araz and Ozkarahan (2007) both propose a uni-dimensional model to group suppliers; Omurca organizes them in clusters based on 11 criteria (such as cost reduction, quality, price, delivery, quality management practices and systems, development capabilities, etc.), while Araz and Ozkarahan propose in their model – based on a set of 10 criteria (such as technology level, quality, cost reduction, delivery, ease of communication, etc.) – to evaluate and classify suppliers according to their ability and performance.

As we can see, apart from the evaluation and selection methods applied, the first step is to state the criteria to be used for evaluation, segmentation, and selection. To have a general view about of the set of criteria, we compared the ones found in the literature to the criteria we used in our survey. Based on the comparison (Figure 43), even if there is a variety of quantitative and qualitative criteria used to evaluate supplier performance, criteria such as financial terms (cost/price/payment), quality and delivery still are the most commonly used. High technological capabilities and long-term partnership, participation in common product development and supplier evaluation belong to the second group of the most commonly used criteria. It is interesting to see cost reduction (as endeavour and action) is not anymore among the most frequently used criteria.

We seek to emphasize again, indifferent from the methods along which the evaluations are made, the first and general step is to identify and select criteria for evaluation – as measurements factors – which will be applied equally to all suppliers.

Figure 43: Frequency of used evaluation criteria

APPEARANCE IN LITERATURE OF THE SET OF EVALUATION CRITERIA SELECTED FOR THIS PARTICULAR SURVEY		Good company reputation	Favourable payment terms	Reasonable price	Low shipping cost	Stability of the supply	Precise delivery	Short delivery time	Flexibility in schedule changes	High technological level	High product/service quality	Favourable connected services	Geographical proximity of the Supplier	Quality management system (e.g. ISO)	Participation in product development	Cost reduction	Finding the right Suppliers	Long-term partnership with Suppliers	Reducing the number of Suppliers	Evaluation of Suppliers	Management of Suppliers' relationship
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Amindoust et al. (2012)	1		■	■		■	■		■	■	■	■	■								■
Araz-Ozkarahan (2007)	2		■				■			■	■			■	■	■				■	
Bensaou (1999)	3		■	■			■			■	■				■			■			■
Chen (2011)	4			■			■		■		■	■				■					■
Chen et al. (2006)	5													■	■			■		■	■
Chin et al. (2006)	6										■				■			■		■	
Day et al. (2010)	7																■		■		■
Dyer et al. (1998)	8		■	■			■			■	■		■		■	■		■			■
García et al. (2013)	9			■			■				■										
Govindan et al. (2010)	10			■			■		■		■					■				■	
Huang-Keskar (2007)	11		■	■		■	■	■	■								■				
Jain et al. (2004)	12						■				■										
Keskin et al. (2010)	13		■										■							■	
Kraljic (1983)	14			■			■				■						■	■			■
Lee et al. (2009)	15		■	■			■			■	■					■		■		■	
Lee-Drake (2010)	16			■			■		■		■										
Liang et al. (2006)	17				■															■	
Luzzini et al. (2012)	18			■			■				■				■	■					
Mohd et al. (2006)	19														■			■			■
Ohdar-Ray (2004)	20			■			■				■	■									
Olsen-Ellram (1997)	21		■	■		■	■		■	■	■				■			■			
Omurca (2013)	22	■	■	■			■		■	■	■	■									
Pagell et al. (2010)	23		■	■			■			■	■							■			
Park et al. (2010)	24	■	■	■		■	■			■	■		■		■			■			■
Prajogo et al. (2012)	25			■			■		■		■					■		■		■	
Rezaei-Ortt (2013)	26			■			■				■					■					
Sarkar-Mohapatra (2006)	27	■	■	■		■	■			■	■	■	■							■	
Shih et al. (2009)	28			■			■		■		■	■									
Toni-Nassimbeni (2001)	29									■					■						
Zeydan et al. (2011)	30						■				■	■								■	
No. of references		3	12	20	1	5	23	1	9	11	23	7	5	2	10	8	3	11	1	10	9

Source: Author's construction

6.2.2. Cooperation

Nowadays there is no mode to avoid supply risks and to enhance competitiveness without an efficient supply chain system. The purchased materials generally form a considerable part of the manufactured products, since "*the typical industrial firm spends more than one half of every sales dollar on purchased products*" (Dyer et al., 1998, p. 57); thus, building stable and long-term relationships between buyers and suppliers is a critical success factor of such a system (C. T. Chen et al., 2006).

Good cooperation among Procurement and Supplier can contribute significantly to produce value. Procurement should purchase goods and services using the most efficient supply chains of suppliers who can provide them the purchased materials not only at the lowest cost, best quality, and highest flexibility but also in a socially and environmentally responsible manner (Seuring & Müller, 2008; Zimmer, Fröhling, & Schultmann, 2016).

Therefore, the cooperation within a given supply chain must start with the identification of supplier relationship types; all the suppliers and their "value" must be measured. Hence, companies need to optimize the classification of suppliers, to apply as effective systems as possible. The company's ability to strategically segment suppliers in such a way as to realize the benefits of the cooperation model secures the key to future competitive advantage in supply chain management (Dyer et al., 1998).

Several supplier- and supplier relationship classifications can be found in the literature; we show a few of them to give an insight into the wealth of cases:

The traditional view of suppliers is to keep them at "arm's-length" and to avoid any form of commitment, to minimize dependence on suppliers and to maximize bargaining power. Formerly this arm's-length model was widely accepted as the most effective way to manage supplier relationships. Later, based on the success of Japanese companies, the partner-type model emerged, and there was a need to consider this new type of cooperation, the partner-type model as well. However, while Japanese-style partnerships have economic benefits, some researches found that these types of relationships are costly to set them up and to maintain that cooperation since they could result in a reduced customer ability to switch away from a less efficient supplier to another one (Dyer et al., 1998).

Kraljic (1983) in the frame of his portfolio matrix categorized the products/goods/services as non-critical, leverage, bottleneck and strategic items. Following this way of thought, we can extend these four item categories even to supplier categories, to broaden items to supply sources, consequently, to measure each supplier on the weight of supplied items.

Das and Teng (2000) group alliances (the cooperation/relationship types) into four major categories as follows: equity joint ventures, minority equity alliances, bilateral contract-based alliances, and unilateral contract-based alliances.

Baker, Gibbons and Murphy (2002) argue that relationships depend on the integration degree (e.g. vertical integration) between companies since it affects parties and determines their behaviour. They distinguish two groups of relationships: transaction integrated (when the downstream party owns the asset) and transaction non-integrated (when the upstream party is an independent contractor, working with its own asset).

Araz and Ozkarahan (2007) suggest selecting and sorting suppliers based on their relations to the customer company as follows: strategic partners (‘‘perfect’’ suppliers), candidates for supplier development programs (‘‘good’’ suppliers), competitive suppliers (‘‘moderate’’ suppliers) and pruning suppliers (‘‘bad’’ suppliers).

Bensaou (1999) applies also four types of relationships: strategic partnership and market exchange, captive supplier and captive buyer. According to him, the level of investment made by either party in every type of relationship correlates significantly with the practices commonly associated with strategic partnerships and notions such as long-term relationship, cooperation, and mutual trust.

Although Cousins is on the opinion that “*partnership relationships do not exist*” (Cousins, 2002, p. 71), it is worth to consider the force of close and strategic cooperation among companies because cooperation delivers superior value (Contractor & Lorange, 2002). Cousins also acknowledged that collaborative relationships (instead of partnership relationships) exist, but these are still competitive because the parties do not trust each other. They will judge the risk on the basis of the particular business case and will decide the appropriate relationship based on the outcome (Cousins, 2002). Ganesan (1994) suggests that a successful long-term relationship between a buyer and supplier is the condition of mutual dependence. At one point all perceptions are the same: companies should think more

strategically about Supplier Management; should avoid both under-designing and over-designing of supplier relationships (Bensaou, 1999).

But a "one-size-fits-all" strategy for supplier relationship management will not be feasible; instead, each supplier should be analysed strategically to have opportunity to determine the extent to which its product contributes to the core competence and competitive advantage of the company (Dyer et al., 1998).

Further concordant opinions in the literature are the power of (strategic) cooperation and of the governance mechanism such as trust, fairness, commitment, and reliability.

The importance of cooperation and building mutual trust still remains utmost in the digitized world, since "*trust … lead to improved satisfaction and performance*" (Nyaga, Whipple, & Lynch, 2010, p. 101). Trust means the dimension to which extent parties of the given relationship perceive one another to be credible and benevolent partner (Ganesan, 1994). Therefore, trust is undoubtedly an important variable in governing the interactional dynamics (Andersen & Kumar, 2006; Gelei & Dobos, 2016).

Literature confirms the idea that one part of a cooperation can use knowledge about another one (as levels of the same organization or in case of supplier-customer relation), to improve its own performance or the mutual performance of the members (Håkansson & Snehota, 1995; Dyer & Singh, 1998; Liang et al., 2006). The supply risks can be managed in an effective manner if all partners of that supply chain share information frequently with each other through a collaborative relationship and the members trust each other (Faisal et al., 2006).

The success of Japanese-style partnerships can be originated from the above phenomenon as well since they apply a close supplier relationship and follow a partner model behavior. They result in superior performance because partner companies i) share more information with each other; ii) invest in dedicated or relation-specific assets which lower costs, improve quality and speed product development; and iii) rely on trust to govern the relationship, a highly efficient governance mechanism that minimizes transaction costs (Dyer & Singh, 1998).

As we can see in the above parts of this chapter, there is no agreement on how to segment the suppliers; but there is a consensus on the importance of suppliers and on the necessity to

classify them for a better cooperation and lower risk level; consequently, the segmentation of supplier relationships and how to name these segmentations are required activities.

Due to the fact that in practice these activities will also vary significantly from company to company, therefore, we did not aim in our survey to classify/catalogue these relationships probably segmented in as many types as companies exist; nor the questionnaire and its questions were built in this sense. But we inquired our respondents about how they handle their partners, and also about the effectiveness of cooperation and its features such as trust, fairness and so on.

6.2.3. IT platform

Given the globalization of markets and sourcing processes, the necessity to focus on core business and the need to exchange information inside and outside companies made IT vital for companies and the entire global economy (Chae, Yen, & Sheu, 2005; Ronchi, Brun, Golini, & Fan, 2010); therefore, information technology becomes one of the key drivers in the formation of cooperation and alliances in supply chains (Contractor & Lorange, 2002). No one, nor the professionals and managers can disregard that the EDP (Electronic Data Processing) is a must for decades in business processes (Kraljic, 1983); especially in such an area as procurement, where everything is data, information consists of figures and databases.

IT platforms as various digitized systems, applications, and tools are to provide relevant information to management to help decision making, including performance evaluation of a given activity (Szukits, 2017). Therefore, several digital solutions are available for procurement as well: transaction on the network, different platforms or cloud solutions, mobile applications, Big Data analysis and so on (Centobelli et al., 2014). Even Artificial Intelligence (AI), which – for instance – would be able to pull out the necessary content from thousands of contracts; in addition, by monitoring economic and/or social background, companies will be able to make forecasts, to predict whether those events could affect the relationship and cooperation with the strategic suppliers. Because all these factors finally will have an impact (positive or negative) on suppliers' performance.

Application of other technological solutions such as EDI (Electronic Data Interchange): capabilities and infrastructure regarding electronic data transfer in the supply chain for effective communication) initiates changes both in organizational architecture and processes (Centobelli et al., 2014), by a necessity to partly/totally reorganize them. But based on these

IT investments, they will launch an undeniable positive effect on the procurement function and processes and as a consequence, e-procurement will allow increased efficiency in the organizational structure as well (Rodríguez-Escobar & González-Benito, 2015; Ronchi et al., 2010). Thus, Procurement should run its activity by digitized workflows (by digitized applications/tools on digitized platforms) to operate procedures at the most effective level, with secured outputs in the most transparent way.

As we can see in the literature, and since several times it happens that there is an urgent need of data (figures which can be obtained or extracted from the digitized systems and applications only), the digitized workflows and processes are must; without them it is not possible to make the purchasing procedures faster and well-monitored, to have reporting possibilities, where the status, lead times and spending can be viewed accurately and instantly.

Considering the importance of the IT platform, in order to have the opportunity to see the status and the degree of digitized systems and solutions applied by the companies, we also put concerning questions in our survey.

6.2.4. General thoughts about the literature

In the literature there is no clear connection between the theory of Supplier Management and its applicability in the practice, especial regarding the procurement area as a segment only of the supply chain. We argue that the presented literature is – generally – too scientific (in their original form) to be applicable/viable in the practice; on the other side, the practice will be much more complex than to discuss it – for instance – on the evaluation criteria basis only.

Furthermore, we did not find in the literature research that process the practice (analyze and show the results), especial in comparison with the theory.

6.3. Research methodology and characteristics of survey

We decided to apply the survey research and as its tool for data collection the survey; we consider the survey to be an appropriate method for the present research since it is a means for gathering information about the characteristics, actions or opinions of people (Pinsonneault & Kraemer, 1993). The survey research has the features which we were looking for: it is used to quantitatively describe specific aspects, several variables can be originated from it, which allow examining the relationships among these variables.

The research was carried out between 2017 Q4 and 2018 Q1-Q2 time interval. The mode of inquiry was an online survey, where the questionnaire was available on Hungarian online platforms of professionals and via direct emails. Some parts of the questionnaire (partial questions) were adapted from International Purchasing Survey (IPS - Rotterdam School of Management, Erasmus University, The Netherlands) and others from Competitiveness Survey of Corvinus University (Competitiveness Research Centre, Institute of Business Economics, Corvinus University of Budapest).

The number of respondents was 57, 80% of them procurement directors or managers. Regarding the corporate structure, the respondents' companies in more than 60% of cases belonged to the manufacturing industry and in more than 70% they were multinational and large companies.

The mode of examination of the answers was on one hand, the comparison of our examination factors (i.e. evaluation criteria) to the literature to see whether there is overlap among them, on the other hand we apply Cross-table Analysis (CTA) – by SPSS – to analyse whether relationships exist among variables (answers and/or criteria) and if so, to reveal the strength of connections.

6.4. Research hypothesis and questions

Despite the increasing importance of SM, our hypothesis is that there are several deficiencies in the procurement processes.

We argue that the factors which improper handling could weaken and jeopardize – or contrarily strengthen – the procurement processes can be originated from the segments of Supplier Management:

i) supplier evaluation and selection: application of improper evaluation criteria and/or tools in practice; ii) cooperation: there are deficiencies in relationships; iii) IT platforms: there are lack of proper IT systems.

Therefore, we aimed to examine – through the questionnaire – the status of procurement practice in terms of the three discussed areas to see whether the features of the literature could be identified in the practice.

Nevertheless, we extended the survey from the simple inquiry about the evaluation criteria, cooperation type with the suppliers and mode of application of the IT systems (i.e. from the theoretically reviewed parts), to a broader pool of questions, putting more (others) of them in connection with the various aspects of practice; following this approach we had the opportunity to interpret widely the professional status of organizations.

We seek answers – among others – of the following questions:

1. **Supplier selection and evaluation:**

   Whether the applied evaluation criteria are in line with the ones recommended by literature?

   How serious accent do the companies put on supplier evaluation?

   What kind of supplier selection schemes do they apply?

It was expected that supplier evaluation and selection are not in line with the literature and the applied criteria still have too much emphasis on financial aspects.

2. **Cooperation:**

How do the companies handle their suppliers?

How effective do they consider the cooperation to be?

Our hypothesis was there are several deficiencies in terms of cooperation, on one hand in the mode of how to handle the suppliers, on the other hand in the effectiveness of cooperation.

3. **IT platform:**

What is the degree of digitized solutions?

Whether the applied IT platforms are in line with the actual requirements?

We supposed that the penetration of digitized applications and systems is too poor and too many processes still are conducted without IT support.

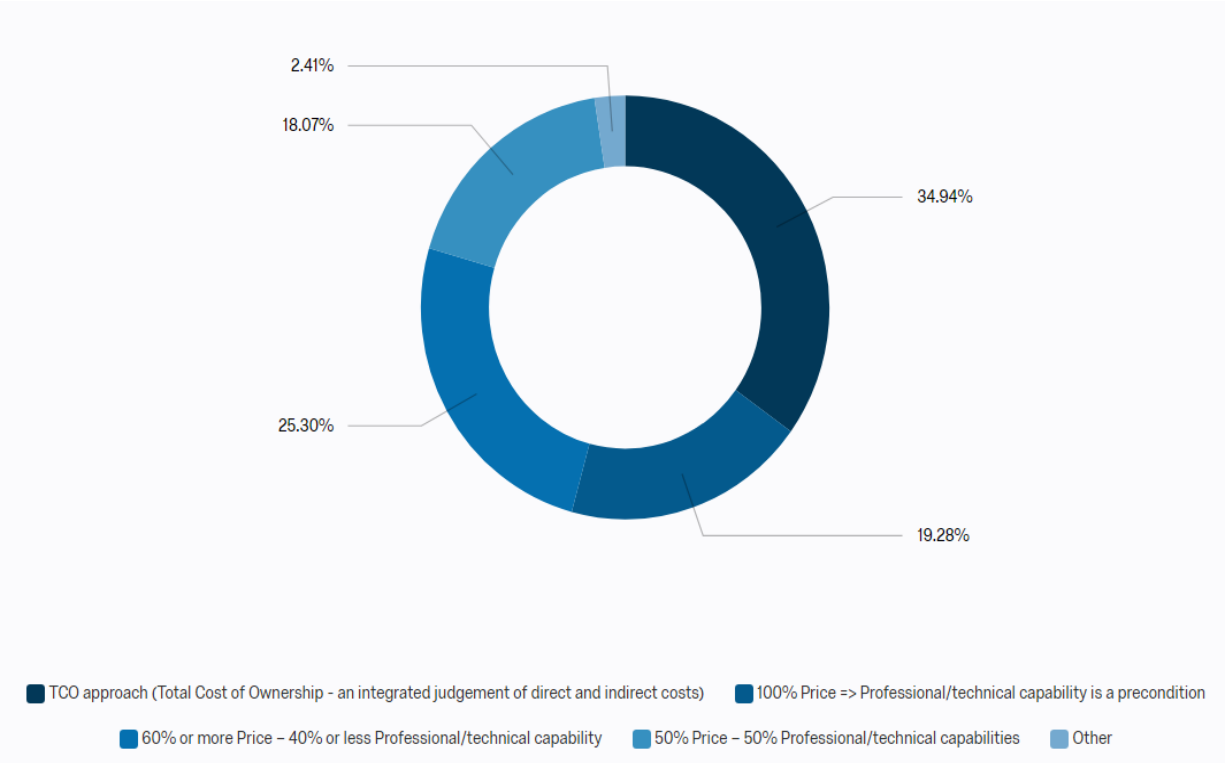
6.5. Findings of research

In this chapter we enlist the findings of research in that manner to follow the stated segments of Supplier Management:

6.5.1. Supplier selection and evaluation

Instead to put questions in the survey regarding the applied methodologies for supplier selection (because it cannot be disclosed and/or generalized at all, as we see in Chapter 2), we inquired, and Figure 44 shows some selection schemes during the bidding phase and their popularity.

Figure 44: Popularity of supplier selection schemes during bidding

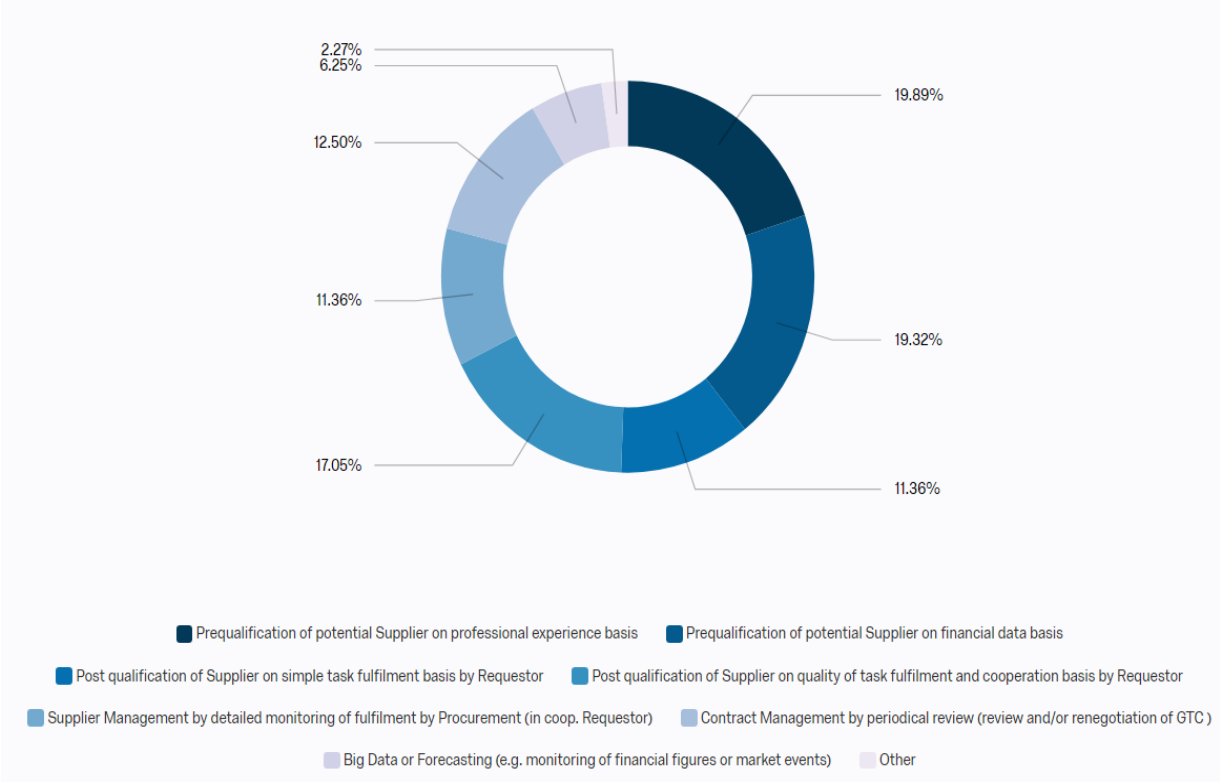


Source: Author's construction

As the results depict, a heavy emphasis still is on the price aspects; nevertheless, fortunately – and as a step towards systems thinking – the TCO (Total Cost of Ownership) is the most popular (34,94%) selection scheme.

Figure 45 describes the results of the survey in connection with the evaluation tools used in practice by the respondents; besides their types, we can see their popularity/frequency in the application. There is a possibility to state some ascending order among the tools based on their complexity from the simplest prequalification to a more complex tool such as Big Data (BD).

Figure 45: Supplier evaluation tools



Source: Author's construction

As we can see there is a quite equal spread of tools among the most popular/used ones, it seems that none of them precede the others significantly.

In Figure 46 we show how important respondents consider evaluation criteria in their Supplier Management practice. Based on respondents' answers criteria with the highest importance level (above 50%) are price, delivery, the stability of supply and high quality. The findings are in line with the frequency/popularity of criteria experienced in the literature and depicted in Chapter 2.

Figure 46: Importance of evaluation criteria in Supplier Management

IMPORTANCE OF EVALUATION CRITERIA IN SUPPLIER MANAGEMENT		Not at all		Slightly important		Neutral		Very important		Completely	
Good company reputation	**1**	3.51%	2	3.51%	2	28.07%	16	54.39%	31	10.53%	6
Favourable payment terms	**2**	5.26%	3	1.75%	1	14.04%	8	49.12%	28	29.82%	17
Reasonable price	**3**	0.00%	0	0.00%	0	5.26%	3	36.84%	21	57.89%	33
Low shipping cost	**4**	0.00%	0	5.26%	3	31.58%	18	38.60%	22	24.56%	14
Stability of the supply	**5**	1.75%	1	0.00%	0	7.02%	4	29.82%	17	61.40%	35
Precise delivery	**6**	0.00%	0	1.75%	1	7.02%	4	29.82%	17	61.40%	35
Short delivery time	**7**	0.00%	0	3.51%	2	24.56%	14	50.88%	29	21.05%	12
Flexibility in schedule changes	**8**	1.75%	1	3.51%	2	15.79%	9	45.61%	26	33.33%	19
High technological level	**9**	0.00%	0	3.51%	2	21.05%	12	47.37%	27	28.07%	16
High product/service quality	**10**	0.00%	0	0.00%	0	7.14%	4	39.29%	22	53.57%	30
Favourable connected services	**11**	7.27%	4	9.09%	5	40.00%	22	32.73%	18	10.91%	6
Geographical proximity of the Supplier	**12**	3.51%	2	15.79%	9	45.61%	26	29.82%	17	5.26%	3
Quality management system (e.g. ISO)	**13**	0.00%	0	5.26%	3	31.58%	18	33.33%	19	29.82%	17
Participation in product development	**14**	10.53%	6	8.77%	5	40.35%	23	35.09%	20	5.26%	3
Cost reduction	**15**	1.75%	1	8.77%	5	10.53%	6	36.84%	21	42.11%	24
Finding the right Suppliers	**16**	0.00%	0	1.79%	1	8.93%	5	42.86%	24	46.43%	26
Long-term partnership with Suppliers	**17**	5.26%	3	3.51%	2	15.79%	9	45.61%	26	29.82%	17
Reducing the number of Suppliers	**18**	8.93%	5	10.71%	6	42.86%	24	35.71%	20	1.79%	1
Evaluation of Suppliers	**19**	5.26%	3	1.75%	1	19.30%	11	47.37%	27	26.32%	15
Management of Suppliers' relationship	**20**	5.36%	3	3.57%	2	23.21%	13	48.21%	27	19.64%	11

Source: Author's construction

Due to the continuously changing environment, respondents evaluated both the importance of stability in supply (61,40%) and the precise delivery (61,40%) at the highest ('completely') level, while the reasonable price is also ranked (still considered) at one of the most important criteria (57,89%). The next one best-ranked criterion is high quality (53,57%).

The short delivery time is considered very important (50,88%), while the geographical proximity of the Supplier is placed to a lower position with a distinctive neutral (45,61%) or slightly important (15,79%) ranking.

The reputation of the company ('good company reputation') is becoming increasingly important (54,39%) which phenomenon also confirms the importance of the relational capital.

Conversely, there is not enough emphasis – despite the relevant literature and expertise – on the common product development in Hungary, since the participation in product development is positioned at neutral (40,35%) or 'Not at all' (10,53%) importance level.

The criterion reduction the number of suppliers seems to be the least important, since it was selected neutral (42,86%), or slightly important (10,71%) or not at all (8,93%). This judgment of this criterion is also in line with the literature.

As we have already had the set of criteria, in addition, we strived to reveal whether there are relevant connections among them, and if so, to see their strength; therefore, Figure 47 is to show the results of the Cross-table analysis on a 5% significance level, where the pairwise relationship-significance is stated on p-value basis.

- There is a "nodule point" which consists of a group of factors – from 4 to 11 – where we can see significant connections; these factors have a quite strong connection to each other, and they are connected (mainly) to supply, delivery and technological level. This phenomenon is in line with the importance of the factors decided by respondents, and also in line with the popularity suggested by literature.
- There are no significant connections among factor 2 (Favourable payment terms) and factor 3 (Reasonable price) and other factors; except for the factor 15 (Cost reduction);
- Factor 1 (Good company reputation) has the biggest number of significant connections to other factors which confirms the emerging importance of this criterion.
- Factor 20 (Management of Suppliers' relationship) has the second rank in the number of significant connections to other factors, such as price, delivery, technological and quality level; this also emphasizes the importance of Supplier Management.
- There are also significant connections among factor 20 (Management of Suppliers' relationship) and other factors (such as Long-term partnership with Suppliers and Evaluation of Suppliers), also related to a conscious Supplier Management.

Figure 47: Strength of connections of evaluation criteria

STRENGTH OF CONNECTIONS: SUPPLIER EVALUATION CRITERIA IN SUPPLIER MANAGEMENT by Chi-Square tests results on a 5% significance level > 0,05 ≤ 0,05 ≤ 0,01		Good company reputation	Favourable payment terms	Reasonable price	Low shipping cost	Stability of the supply	Precise delivery	Short delivery time	Flexibility in schedule changes	High technological level	High product/service quality	Favourable connected services	Geographical proximity of the Supplier	Quality management system (e.g. ISO)	Participation in product development	Cost reduction	Finding the right Suppliers	Long-term partnership with Suppliers	Reducing the number of Suppliers	Evaluation of Suppliers	Management of Suppliers' relationship
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Good company reputation	1		0,000	0,673	0,000	0,000	0,000	0,001	0,000	0,000	0,159	0,003	0,001	0,513	0,005	0,003	0,000	0,000	0,004	0,153	0,000
Favourable payment terms	2	0,000		0,381	0,012	0,956	0,939	0,406	0,459	0,376	0,849	0,338	0,190	0,384	0,343	0,001	0,929	0,140	0,674	0,264	0,014
Reasonable price	3	0,673	0,381		0,091	0,100	0,677	0,025	0,279	0,803	0,121	0,427	0,465	0,176	0,934	0,003	0,650	0,560	0,699	0,592	0,468
Low shipping cost	4	0,000	0,012	0,091		0,000	0,005	0,082	0,000	0,000	0,151	0,005	0,108	0,224	0,002	0,003	0,933	0,150	0,147	0,726	0,004
Stability of the supply	5	0,000	0,956	0,100	0,000		0,000	0,000	0,000	0,000	0,000	0,000	0,775	0,316	0,280	0,695	0,049	0,000	0,002	0,013	0,000
Precise delivery	6	0,000	0,939	0,677	0,005	0,000		0,000	0,000	0,000	0,000	0,000	0,870	0,221	0,206	0,945	0,259	0,000	0,001	0,022	0,000
Short delivery time	7	0,001	0,406	0,025	0,082	0,000	0,000		0,000	0,001	0,179	0,038	0,050	0,295	0,557	0,314	0,088	0,080	0,079	0,854	0,042
Flexibility in schedule changes	8	0,000	0,459	0,279	0,000	0,000	0,000	0,000		0,000	0,000	0,000	0,028	0,632	0,002	0,002	0,244	0,000	0,001	0,325	0,000
High technological level	9	0,000	0,376	0,803	0,000	0,000	0,000	0,001	0,000		0,000	0,074	0,062	0,162	0,001	0,001	0,768	0,000	0,004	0,243	0,000
High product/service quality	10	0,159	0,849	0,121	0,151	0,000	0,000	0,179	0,000	0,000		0,000	0,247	0,007	0,158	0,818	0,366	0,001	0,022	0,003	0,001
Favourable connected services	11	0,003	0,338	0,427	0,005	0,000	0,000	0,038	0,000	0,074	0,000		0,075	0,389	0,100	0,201	0,058	0,000	0,032	0,080	0,011
Geographical proximity of the Supplier	12	0,001	0,190	0,465	0,108	0,775	0,870	0,050	0,028	0,062	0,247	0,075		0,255	0,342	0,003	0,265	0,208	0,578	0,923	0,314
Quality management system (e.g. ISO)	13	0,513	0,384	0,176	0,224	0,316	0,221	0,295	0,632	0,162	0,007	0,389	0,255		0,024	0,124	0,107	0,703	0,628	0,215	0,383
Participation in product development	14	0,005	0,343	0,934	0,002	0,280	0,206	0,557	0,002	0,001	0,158	0,100	0,342	0,024		0,254	0,165	0,011	0,087	0,116	0,000
Cost reduction	15	0,003	0,001	0,003	0,003	0,695	0,945	0,314	0,002	0,001	0,818	0,201	0,003	0,124	0,254		0,196	0,000	0,081	0,299	0,019
Finding the right Suppliers	16	0,000	0,929	0,650	0,933	0,049	0,259	0,088	0,244	0,768	0,366	0,058	0,265	0,107	0,165	0,196		0,000	0,067	0,239	0,020
Long-term partnership with Suppliers	17	0,000	0,140	0,560	0,150	0,000	0,000	0,080	0,000	0,000	0,001	0,000	0,208	0,703	0,011	0,000	0,000		0,020	0,193	0,000
Reducing the number of Suppliers	18	0,004	0,674	0,699	0,147	0,002	0,001	0,079	0,001	0,004	0,022	0,032	0,578	0,628	0,087	0,081	0,067	0,020		0,116	0,001
Evaluation of Suppliers	19	0,153	0,264	0,592	0,726	0,013	0,022	0,854	0,325	0,243	0,003	0,080	0,923	0,215	0,116	0,299	0,239	0,193	0,116		0,003
Management of Suppliers' relationship	20	0,000	0,014	0,468	0,004	0,000	0,000	0,042	0,000	0,000	0,001	0,011	0,314	0,383	0,000	0,019	0,020	0,000	0,001	0,003	

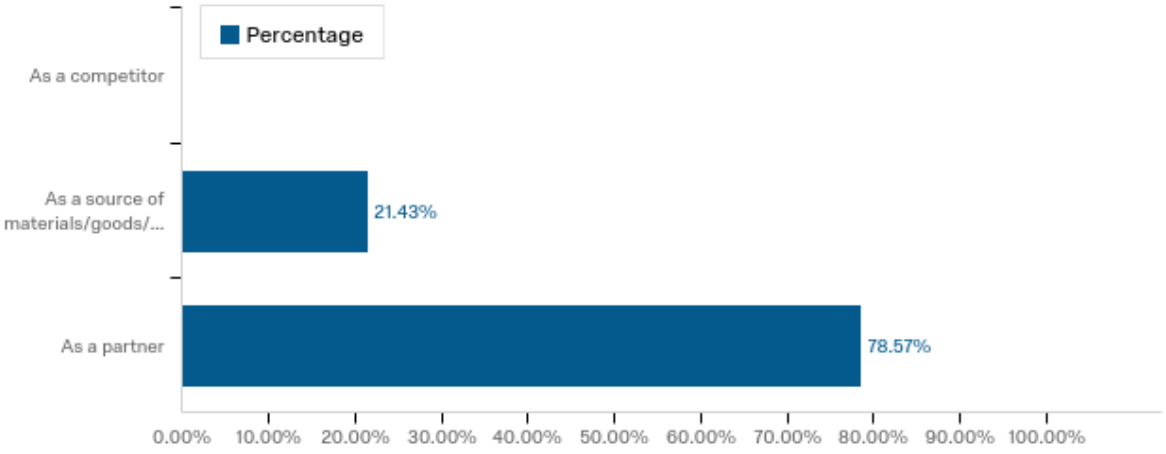
Source: Author's construction

6.5.2. Cooperation

Considering that our intention was to avoid the classification of suppliers in a not uniform manner (by different approaches of companies), thus we applied three simple categories to group them (Figure 48): partners, competitors and sources of materials/goods/services.

To the question "How do you consider and handle your Supplier?" we got answers as follows: no one considers its supplier to be a competitor of the company, while almost 80% of respondents consider and handle their suppliers as partners; a considerable percentage of respondents (more than 20%) still classify their suppliers as a simple material source. The question is – and further research should confirm – whether this category is equal to "arm's-length" category and viewpoint, in order to keep suppliers at that distance where it is possible for the buyer to preserve its independence from any commitment.

Figure 48: Classification of suppliers

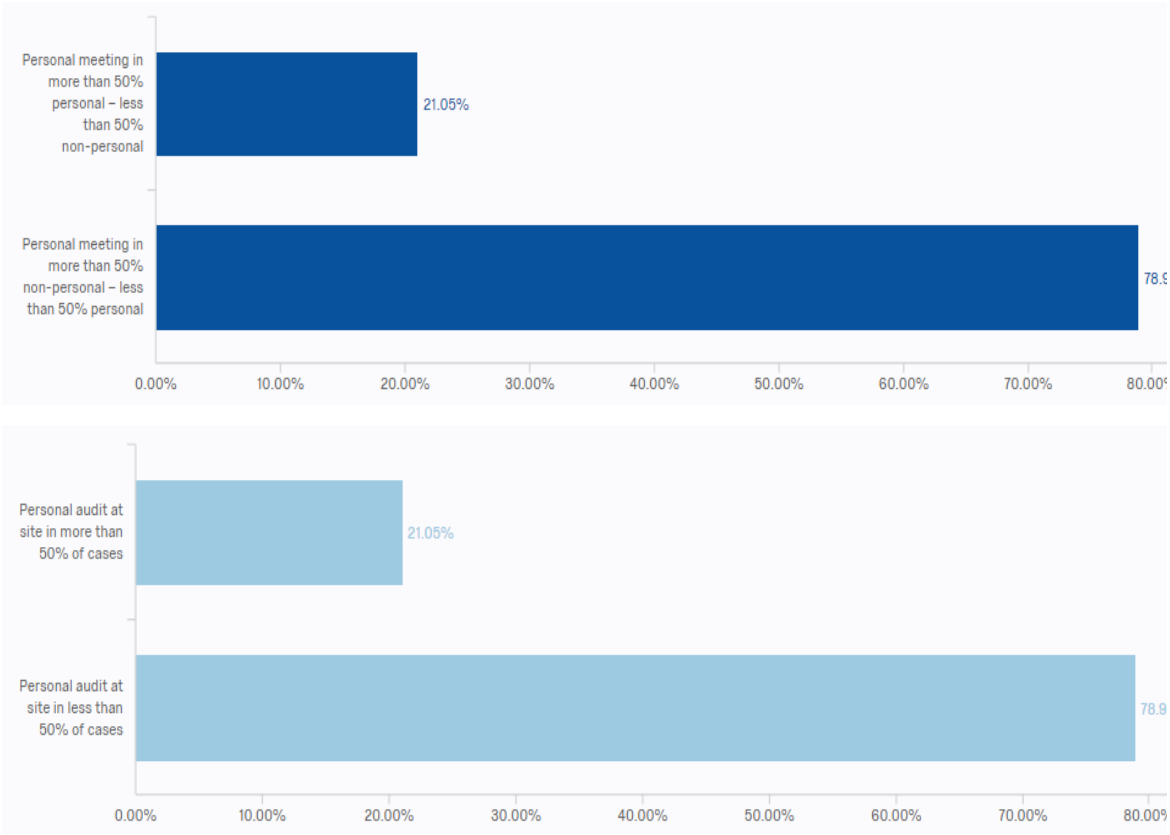


Source: Author's construction

We also analysed the relation between criteria Supplier Management effectiveness (as an existing system) and importance of management of Suppliers' relationship (as an activity), in other words as a part of procurement work. We find a connection between variables because the result of the analysis showed that if the company consider more important the suppliers' relationship management, also the effectiveness of SM will be better. The relationship (on a 5% significance level) between variables was significant (Pearson Chi-Square: 23,621, p-value: 0,023 and Exact sig: 0,024).

Due to IT solutions and according to the professional practice, the proportion of personal contacts decreases day by day. Even though there is an increasing emphasis on digital solutions, these, however, do not always replace personal connections. Also, in practice there is not enough emphasis on on-the-spot audits, although this would be one of the simplest methods for assessing supplier's proper conditions or the possible risks. Since today we must be more conscious in the evaluation and selection of Suppliers, the onsite audit could help more in this sense: as it is said "*go and see for yourself to thoroughly understand the situation*" ("Genchi Genbutsu" i.e. "Go and See" from TPS – Toyota Production System).

Figure 49: Meetings and presence in person at supplier site



Source: Author's construction

Figure 49 shows, on one hand, the percentage of meetings in person between buyer-supplier, while on the other hand the percentage of audits at suppliers' side; both are at the same level and extremely low (21%), however, the personal contacts ensure much smoother cooperation and an increased trust level between parties, it seems that in practice there is not enough accent on these personal connections.

Considering the above findings, there is a crucial need to increase the proportion of the face-to-face meetings in some cases, because it could strengthen the trust and the relational capital between parties better than anything else; one personal meeting could count more than hundreds of impersonal letters (emails).

We also tried to reveal whether there are significant connections between governance mechanisms (GM, such as trust, fairness, reliability, punctuality, and cooperation itself, as requirements on both Supplier and Procurement side) and other criteria, such as effectiveness of Supplier Management, the nature of cooperation (in terms of common goals) and the

supplier segmentation; we tried to see which conditions and to what extent do ensure a good cooperation between Procurement and Suppliers and an effective Supplier Management.

Figure 50 is to show the results of the Cross-table analysis, where the pairwise relationship-significance is also stated on the p-value basis.

Figure 50: Strength of connections of GM factors and other aspects

STRENGTH OF CONNECTIONS: GOVERNANCE MECHANISM FACTORS AND OTHER ASPECTS **by** **Chi-Square tests results** **on a 5% significance level** ≤ 0,05		**PROCUREMENT – Fairness**	**PROCUREMENT – Trust**	**PROCUREMENT – Reliability**	**PROCUREMENT – Punctuality**	**PROCUREMENT – Cooperation**	**SUPPLIER – Fairness**	**SUPPLIER – Trust**	**SUPPLIER – Reliability**	**SUPPLIER – Punctuality**	**SUPPLIER – Cooperation**
		1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**
Effectiveness of SM	**1**	0,139	0,684	0,083	0,250	0,434	0,077	0,948	0,164	0,037	0,056
Cooperation with Suppliers	**2**	0,727	0,040	0,704	0,413	0,321	0,319	0,779	0,454	0,659	0,892
Treatment of Suppliers	**3**	0,122	0,588	0,480	0,792	0,025	0,779	0,315	0,763	0,748	0,363

Source: Author's construction

We find a connection between variables at those pairs where the intersection of variable shows to be significance between criteria on a 5% significance level. There are significant relationships among criteria if:

- effective Supplier Management is accompanied from the supplier side by punctuality and cooperative attitude.
- there will be good cooperation with suppliers if procurement trust suppliers.
- treatment of supplier is appropriate in such a case when a cooperative attitude of procurement exists towards the supplier.

Based on the findings of the survey, the lesson to be drawn is the better cooperative behavior and trust exist between parties of the supply chain (buyers-suppliers), the more effective

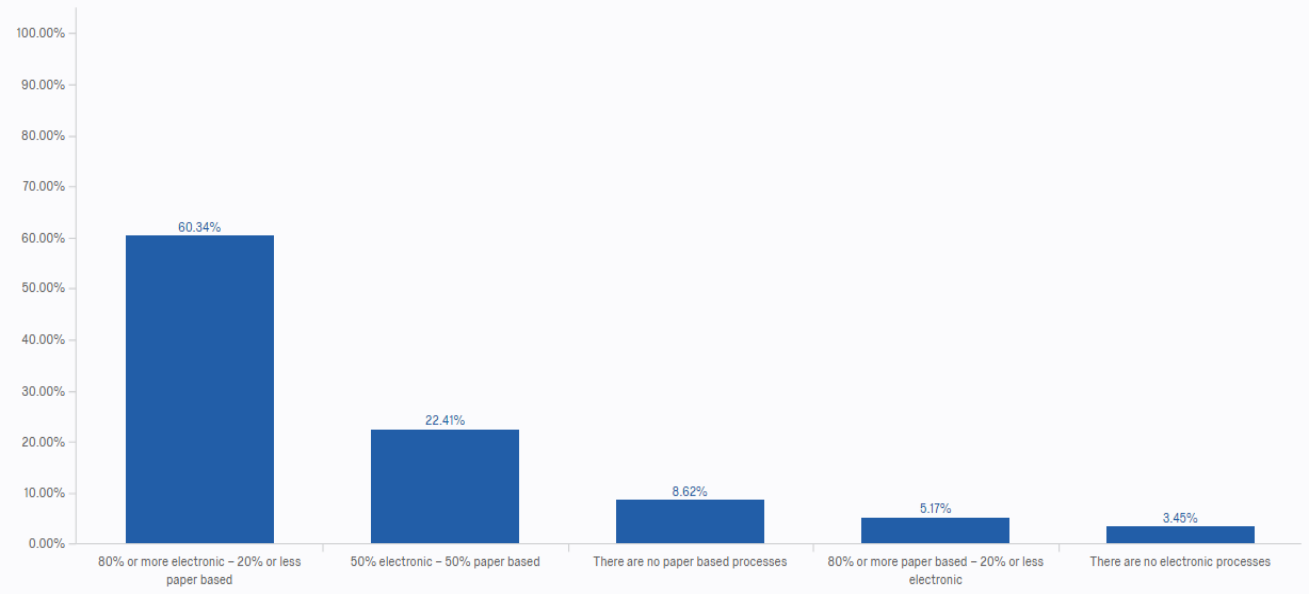
Supplier Management and smoother cooperation will be in that particular relationship, so, the more unlikely risks will be.

6.5.3. IT platform

This chapter is to depict the degree of digitization, more exactly to give information about the penetration (percentage) and type of applied IT systems/solutions/applications.

Figure 51 shows the result of the survey in respect of the degree of digitized workflows: as a positive result, almost 70% of respondents responded that i) there is 80-20% the proportion of electronic-paper-based processes (60,34%) or there are not at all paper-based processes at their company (8,62%).

Figure 51: Proportion of digitized workflows

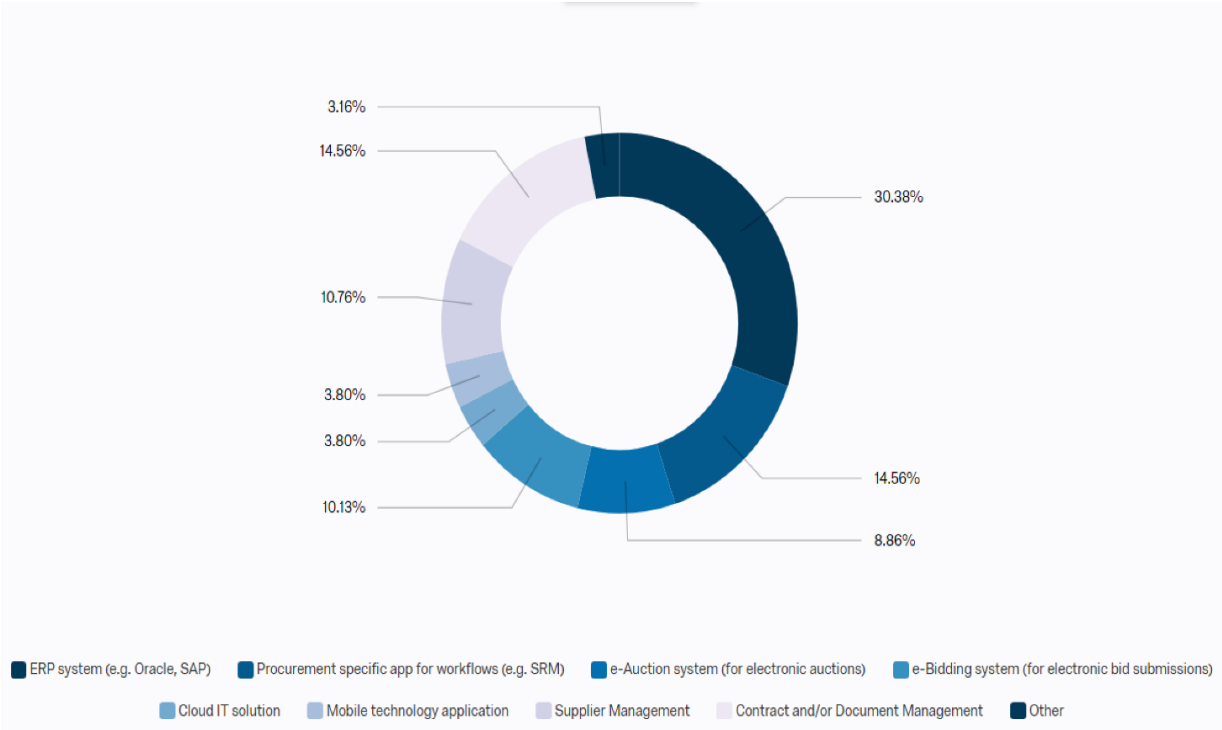


Source: Author's construction

However, more than 30% belongs to workflows which are digitized in the proportion of 50-50% only (22,41%) or the workflows are mostly or totally paper-based (altogether 8,62%).

In Figure 52 we collected the spread and types of the digitized IT-platforms (systems/solutions/ applications) applied which can support the purchasing operations, procedures and workflows.

Figure 52: Digitized IT systems/solutions/applications applied



Source: Author's construction

Most of companies own some digitized IT systems/solutions/applications, however, their proportion is not yet satisfactory enough; especial considering that majority of companies are manufacturer ones, therefore the lack of ERP system – only 30% of them have such a system – is an alarming phenomenon.

6.6. Discussion of findings and concluding remarks

We strive to summarize in this chapter the research findings in comparison to the literature and to our hypothesis and questions.

6.6.1. Supplier selection and evaluation

Considering that in the nowadays global economy and open innovativeness when it is must developing products', services' and suppliers' performance simultaneously, strategic supplier evaluation and selection decisions cannot be based on traditional selection criteria only, such as cost, quality, and delivery (Araz & Ozkarahan, 2007).

In the past, procurement managers focused (mainly) on cost reduction (Kraljic, 1983); recently, they should give importance to stability and continuity of supply, to flexibility and

good relationship between partners, because all of them will ensure competitive advantages to the company; many other criteria should be also considered such as to acquire supplier management practices and skills, to develop long-term supplier relationships, to enhance quality management, to strengthen financial results, to increase technology and innovativeness level and so on (Håkansson & Snehota, 1995; Dyer & Singh, 1998).

There is a consensus on that viewpoint that in order to build durable and supporting relationships the increasing importance of well-established and prudent evaluation models and tools is indisputable. Leaders strongly believe that the above objectives can be achieved through an effective Supplier Management system. Therefore, companies need proper tools to monitor and evaluate supplier's performance, to select key suppliers or develop promising suppliers for strategic partnership, to support suppliers in common engineering activities, even to provide feedback to suppliers about their weaknesses and how to enhance them (Araz & Ozkarahan, 2007).

To have a real opinion about suppliers and their capabilities, the main rule is that all suppliers should be evaluated several times. Generally, in case of a potential supplier (to become a new partner) the prequalification will be a strong requirement to clearly see the strength and weakness of the future partner, so to reduce the supply risk. As minimum requirement (and – for instance – during the bidding procedure and supplier selection), the supplier will be evaluated before to conclude a contract. Also, during the cooperation supplier will (should) be periodically evaluated based on tasks fulfillment.

Those companies which have some quality assurance system (e.g. possess an ISO certification) the supplier evaluation must be done regularly, at least once a year in order to control the supplier's performance, whether it still is in line with the original (first) evaluation and requirements set by assurance system standards and/or with the contract in force.

As we can see in the figures of the survey regarding the evaluation tools, we can state that all the evaluation means (several types of pre- and post-qualifications) are applied by companies.

Also, the evaluation criteria used in practice generally are in line with the literature; the most popular criteria are the stability of the supply and precise delivery, reasonable price and high product/service quality. The hypothesis that the companies apply improper evaluation criteria and/or tools in practice is not confirmed.

In terms of selection schemes, however, there is still a quite big accent on prices as well, but the TCO approach is becoming more popular; the financial aspects (more exactly a part of them) have to be replaced by other evaluation criteria which are in line with the today's requirements.

6.6.2. Cooperation

The literature recommends applying a well-balanced relationship network, where the weight and value of suppliers and of relationships with them are measured based on the real risk of each cooperation. Researchers also suggest managing suppliers in that way to make them committed to the company forming a well-functioning business network, because the network is more effective than a single firm, due to the generation, transfer, and recombination of knowledge at several levels; also the cooperative participants of a supply chain can incorporate in their own strategies the aptitudes, capabilities, and performance of their partners (Dyer & Nobeoka, 2000; Gereffi, Humphrey, & Sturgeon, 2005; Håkansson & Snehota, 1995; Håkansson & Snehota, 2006).

Based on the findings of research the proportion of companies who treat their supplier as partners is almost 80%; nevertheless, the remaining part is too large if companies intend to develop well-established networks. A single exception could be, if the endeavor of them is to keep supplier at "arm's-length" distance; but even in this case such an evaluation of partners ("simple source") cannot be a generalized concept, it could be applied after a prudent segmentation of suppliers.

Good relationships and well-working governance mechanism of these relationships can be best achieved through reliable business cooperation and enhanced by personal meetings to increase the relational capital which exists between buyers and suppliers (Dyer & Singh, 1998; Cousins, Handfield, Lawson, & Petersen, 2006). But as we can see, nowadays there is not anymore enough accent on personal relationships, however, they will result in a smoother bilateral and barrier-free cooperation and will strengthen the relational capital. This will also make more attractive both buyers and suppliers to each other and the projection of such a relationship on cooperation would generate governance mechanisms such as trust, fairness, and commitment (Ganesan, 1994; Baker et al., 2002; Andersen & Kumar, 2006).

Based on results, it seems that the companies have realized the importance of relationships and the function of governance mechanisms, and they consider the cooperation to be effective

enough. Despite this feeling, the phenomenon of rare personal connections confirms that there still are deficiencies in terms of cooperation.

6.6.3. IT platform

The opportunity offered by digital technologies to make deep rationalization in the purchase of goods and materials is becoming indispensable in competition among enterprises, taking into consideration the positive effects in reducing costs and process lead-time of the companies which adopted e-procurement solutions (Centobelli et al., 2014). Digitization and digital solutions can help procurement to achieve an outstanding level of how to handle the enablers (inputs/information): to improve a comprehensive procurement intelligence, to deal with faster procurement processes and solutions, to accelerate the decisions by a better access to information, to boost flexibility in working, and finally to reduce costs. The companies who still use paper-based and labour-intensive processes for procurement freeze a large scale of inefficiencies in their processes (Puschmann & Alt, 2005).

Therefore, within a short time, the proportion of digitized processes and applications – in order to maintain competitiveness – will be acceptable ones at a 100% level only.

As we see, despite the importance of IT platform and apart from the recommendation of literature, the degree of digitization in inquired companies in not yet satisfactory; more than 30% of companies still apply paper-based workflows in more than half of processes.

Also, the proportion of applied systems, especial in case of ERP systems, is alarming, since only 30% of companies own such a system, but the ERP system is one of the crucial supporting means in case of production. In this case, the hypothesis is definitely confirmed, serious deficiencies exist in the IT architecture.

Besides the findings of the research discussed above, in order to emphasize the most important parts of SM, we have some pieces of advice:

1. We recommend increasing the performance of Supplier Management in terms of tools applied for evaluation and selection schemes used.
2. We propose to focus more on inter-organizational cooperation and strategic sourcing to follow an adequate treatment of suppliers – as partners for a continuous and stable supply – furthermore, to ensure proper importance to personal cooperation as well, to enhance further the relational capital and governance mechanisms such as trust.

3. We suggest to introduce and use as many digitized solutions as possible to secure a continuous monitoring and instant reporting.

If procurement conducts a proper Supplier Management which has a key role in risk mitigation and the discussed factors are treated at their proper importance, this approach will assure to the company an effective and rationalized way of operations and will lead to optimized functions and outstanding business results.

6.7. Theoretical contribution and practical implications, limitation of research

This article was written to project attention on the (past) routines and/or on existing ones, and to reveal the deficiencies and/or strengths to have opportunity to align them to the new challenges. The revealed features and the practices of procurement professionals could serve as inspiration for other companies or could shed light on the problems.

The theoretical contribution of the paper is to investigate the relation between Supplier Management theory and practice in Hungary to state whether gaps exist between them. From the managerial implication point of view, the novelty of the article is the endeavour to analyse the applicability of relevant literature in SM practice.

Since the paper shows concrete results of a research and also, formulates suggestions for a more efficient SM practice, the paper seeks to be a guide for practitioners how to strengthen the effectiveness of procurement organizations, where to find the deficiencies. Therefore, we believe it has a considerable contribution to the stream of the relevant researches.

This article depicts aspects and status of – mainly – Hungarian procurement organizations and their Supplier Management. Also, the practices have been studied from the procurement perspective, therefore, the paper does not try to evaluate these issues from the suppliers' point of view. Therefore, the findings cannot be generalized at all.

Furthermore, the result of research – considering the number of respondents (no. of participating companies) cannot be considered representative; that is why it remains an open question whether the answers really reflect the present situation. If not, there is another question whether the quite small sample or a possible euphemism attitude (that maybe was used in the answers) distorted the results in comparison to the existing situation and applied practice, and if so, to what extent?

7. DIGITALIZATION ASPECTS OF PROCUREMENT ORGANIZATIONS IN SUPPLY CHAINS

Wittinger, M. M. (2022). Digitalization aspects of procurement organizations in supply chains, *LOGISTICS TRENDS - and best practices*, *8*(1), 50-56.

Abstract

In today's rapidly changing environment, supply chains, including procurement processes, are becoming increasingly vulnerable to various risks. One effective way to mitigate these risks is by implementing well-designed and efficient procedures that rely on electronic systems, applications, and automated processes. However, despite the growing recognition of the importance of digitalization, significant gaps remain in procurement processes. The penetration of essential applications and systems is still relatively low, leading to many processes being executed without any IT support, often relying on outdated paper-based methods.

The article is written based on data that were extracted using a primary research method, online survey research by questionnaire, during the time interval between Q4 2017 and Q2 2018. The theoretical contribution of the article is the examination of the digitalization aspects of procurement practice through the given research, the presentation of the results, and a review of the relevant literature.

Keywords:

procurement system, procurement workflow, digitalization, e-procurement, IT-platform, BPM, SOA, ERP

7.1. Introduction of concepts related to digitized procurement

In today's rapidly changing environment, supply chains, including procurement processes, are becoming increasingly vulnerable. The exposure of business processes to risks is particularly relevant in emergency situation, such as the current COVID-19 pandemic, when supply chain managers must develop new measures in complex, continuously changing and high-risk supply chains (Ertugrul & Kozma, 2021). In these circumstances, a focus on core business and maintaining competitiveness is essential to increase (or maintain) efficiency,

which can be achieved, inter alia, through the rapid exchange of information within and outside companies and the efficiency of processes. These conditions have made, and continue to make, information technology (IT) solutions and e-procurement vital for companies and the global economy as a whole (Nivetha, 2021; Afolabi, Ibem, Aduwo, Tunji-Olayeni, & Oluwunmi, 2019; Chae, Yen, & Sheu, 2005; Ronchi, Brun, Golini, & Fan, 2010).

The phenomenon called Industry 4.0 is gaining ground primarily through the digitalization of business processes; however, this is not just about the spread of technology but also about a complete paradigm shift in business processes (Tarigan, Siagian, & Jie, 2020; Wittinger, 2019). New manufacturing processes and supply chains, along with new approaches and systems, are emerging; new types of resources are needed, while new jobs are being created or disappearing. Therefore, information technology has become one of the key drivers of supply chain collaboration and business relationships (Contractor & Lorange, 2002).

There are many works in the literature that study in-depth several areas of supply chains and procurement, but these often approach broader purchasing processes rather than discussing sub-processes in detail (e.g., purchase requisition). Therefore, while we also review the concepts on a larger spectrum, we make an effort to identify the systems and processes that characterize procurement work in the age of Industry 4.0, underpinning the concept of e-procurement (Schoenherr, 2018; Afolabi et al., 2019; Nicoletti, 2017).

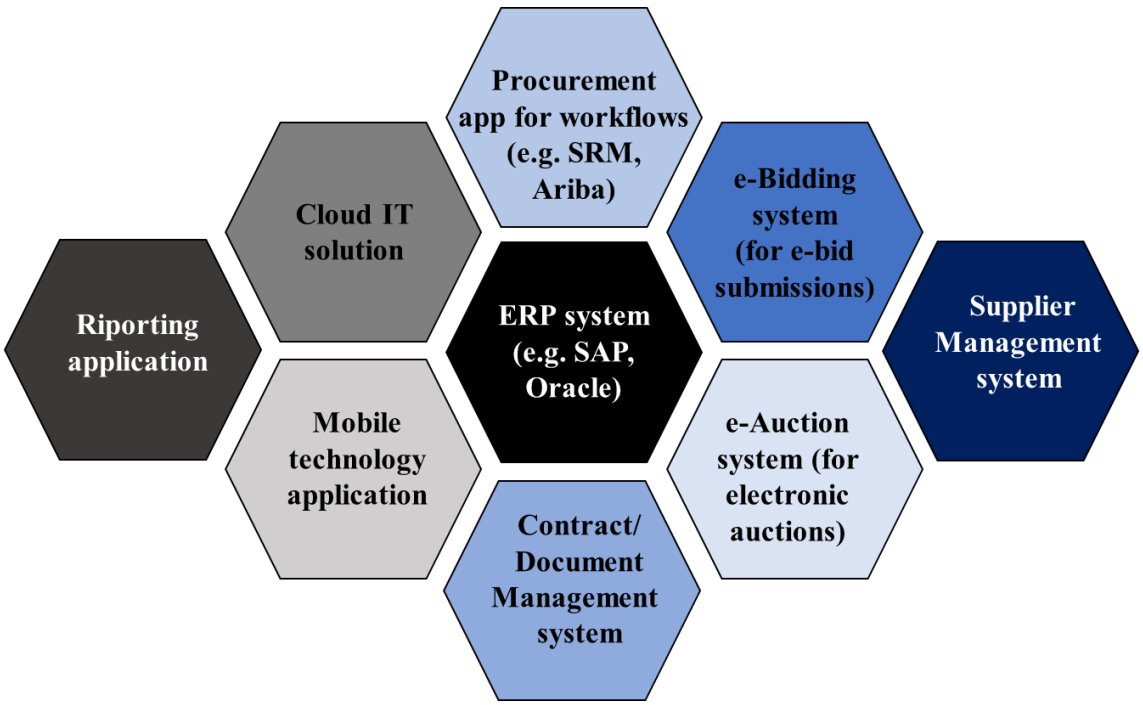
We believe that it is no longer necessary to define information technology and digitalization. However, in order to clarify the exact concepts (without claiming any completeness), the first notion covers the use of computers to store, search, or transmit information and data, while the latter refers to the process by which a physical quantity (data, information) is transcoded to make it processable by a computer. Neither business processes nor procurement can function effectively without IT support, digitized processes, and electronic systems (Johnson & Klassen, 2005; Mishra, Konana, & Barua, 2007).

If we want to talk further about projects that involve the introduction or optimization of digitized systems, applications, and processes, we need to clarify two more concepts. These are the procedures or approaches that summarize our aspirations and provide guidance for action. The two concepts are, on the one hand, Business Process Management (BPM) and, on the other, Service-Oriented Architecture (SOA) (Zairi, 1997; van den Bergh & Viaene,

2012; Trkman, Kovačič, & Popovič, 2011; Nicoletti, 2013; Herrmann, Dalferth, Groß, & Moertl, 2015).

BPM is "*a structured approach to the analysis and continuous improvement of core activities*" (Zairi, M. 1997, p. 64). By core activities, we mean the business processes; a business process is an activity, or a set of activities aimed at achieving an organizational goal, such as managing procurement processes. The use of BPM is typically relevant when we want to automate tasks or workflows, for instance, by introducing new systems (Zairi, M. 1997; van den Bergh & Viaene, 2012). Some of the most common examples of today's business applications (understood here as collective terms) include CRM (Customer Relationship Management – at Sales), SRM (Supplier Relationship Management – at Procurement), Cloud systems, Mobile technology, Supplier Management, Contract and Document Management, e-Bidding (for electronic bidding), e-Auction (for electronic auction), etc. A few examples of purchasing-specific applications are SAP-SRM, Ariba, Coupa, Bravo, and Zycus (Seyedghorban et al., 2020; Handfield et al., 2019).

Figure 53: Digitized platforms and IT solutions: e-systems and applications



For an easier overview, we visualize some examples of digitized platforms and IT solutions (Figure 53) that support procurement operations, procedures and workflows.

Source: Author's construction

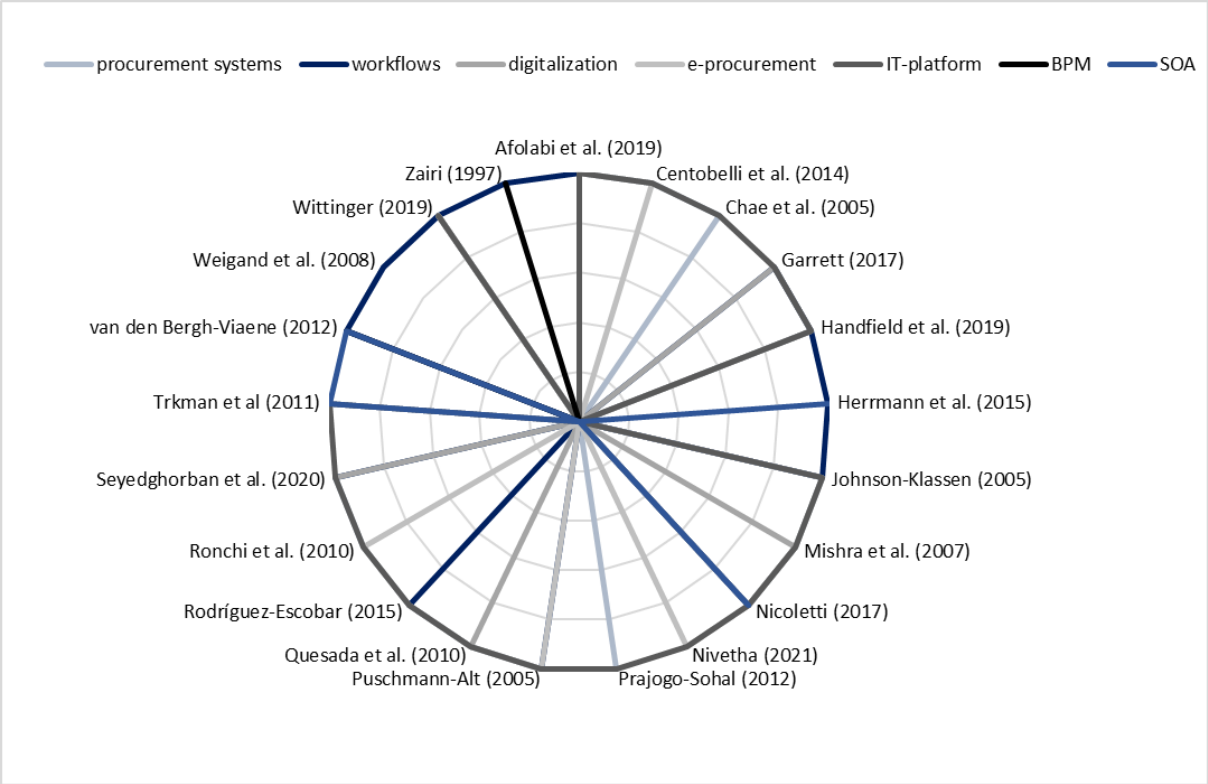
SOA has emerged as an approach to process-oriented design and integration of new applications and aims to align business needs with IT capabilities (van den Bergh & Viaene, 2012; Trkman, Kovačič, & Popovič, 2011). Therefore, if we want to fine-tune business processes, such as procurement procedures or their workflows, we will follow the SOA-compliant process structure and principles. Several studies present the procurement process and its sub-processes from the perspective of SOA (e.g. Herrmann, Dalferth, Groß, & Moertl, 2015; Weigand, Van Den Heuvel, & Hiel, 2008). In connection with procurement, we could mention several workflows; for all of them, the basic requirement would be efficient operation: submission of purchase requisitions, purchase requisition approval, purchase order (PO) creation, fulfilment approval, invoicing workflow, or RfX (Request for Information/Quotation).

In addition to the concepts discussed above, we need to name one more business success condition that companies operating at a high level of digitalization must apply. This condition is essentially the existence and application of ERP (Enterprise Resource Planning), an integrated system that summarizes all the processes and data related to the internal and external operation of a company. ERP allows transactions and information to be organized, retrieved, stored, and continuously monitored. It is also the key system that enables the interconnection and communication among other hardware and software devices (Nicoletti, 2017; Tarigan, Siagian, & Jie, 2020; Schoenherr, 2018).

Although the importance of electronic processes and digitized systems in the business of the 21st century cannot be denied, and the literature also places great emphasis on this (Figure 54), recent research shows that emerging technologies are used in procurement procedures at a low rate (Handfield et al., 2019; Seyedghorban et al., 2020). Without electronic systems and workflows, it is not possible to make procedures faster and more efficient (Tarigan et al., 2020; Follow-up actions and immediate reporting are also not feasible; despite the urgent need for various data (such as the status of a procedure, procured quantities, lead times, total costs, accounts payable, etc.), these can only be extracted from digitized systems and applications. Therefore, procurement must operate on digitized platforms and systems and through electronic workflows to implement procedures at an efficient level, ensuring secure outputs and maximum transparency (Wittinger, 2019; Seyedghorban et al., 2020; Prajogo & Sohal, 2013).

If a company or organization is not yet at the right level of development in terms of digitalization, with electronic systems and automated processes, necessary steps should be taken. At a minimum, digital roadmaps should be developed that include the milestones for the implementation of IT solutions. By utilizing available e-solutions, procurement can move beyond merely responding to events and instead proactively manage them.

Figure 54: Appearance of research notions in the literature



Source: Author's construction

7.2. Research: survey characteristics, methodology and hypotheses

To explore the topic, we chose survey research as the quantitative research method, using a questionnaire as the data collection tool, since it is the primary instrument for gathering quantitative data. Survey research ensures the extraction of quantitative data in a standardized manner, making the data consistent and coherent for analysis. It also provides an opportunity to gather information about people's characteristics, actions, or opinions (Pinsonneault & Kraemer, 1993).

Thus, the data on which the article is based were extracted using a primary research method, specifically an online questionnaire, during the time interval from Q4 2017 to Q2 2018. The provision of answers, along with the synthesis and analysis of quantitative data, was performed using the Qualtrics platform and its applications. The number of respondents was 58, of whom 80% held the position of manager or purchasing director at their respective companies. In terms of corporate structure, more than 70% of the respondents belonged to large and multinational companies, and over 60% of the participating companies were manufacturers.

The questionnaire was available online through professional forums and direct emails as well. Some of the questions (including certain sub-questions) were sourced from the International Purchasing Survey (IPS) conducted by the Rotterdam School of Management, Erasmus University, The Netherlands, and from the Competitiveness Survey developed by the Corvinus University of Budapest, Institute of Business Administration. Other questions were formulated based on the specific research questions and hypotheses.

Despite the growing importance of digitalization, our assumption was that we would find gaps in procurement processes in this area. We argue that there are factors that, if not applied at an appropriate level, could weaken purchasing processes or jeopardize procedures; conversely, if these factors are present, they can strengthen procurement processes. We believe that these factors stem, among other sources, from the realm of digitalization, specifically referring to digital solutions and IT applications such as e-systems and e-workflows.

We aimed to examine, through the questionnaire, the state of procurement practice concerning the field under discussion, specifically investigating whether the best practices suggested in the literature could be identified in practice. We sought answers to the following questions, among others:

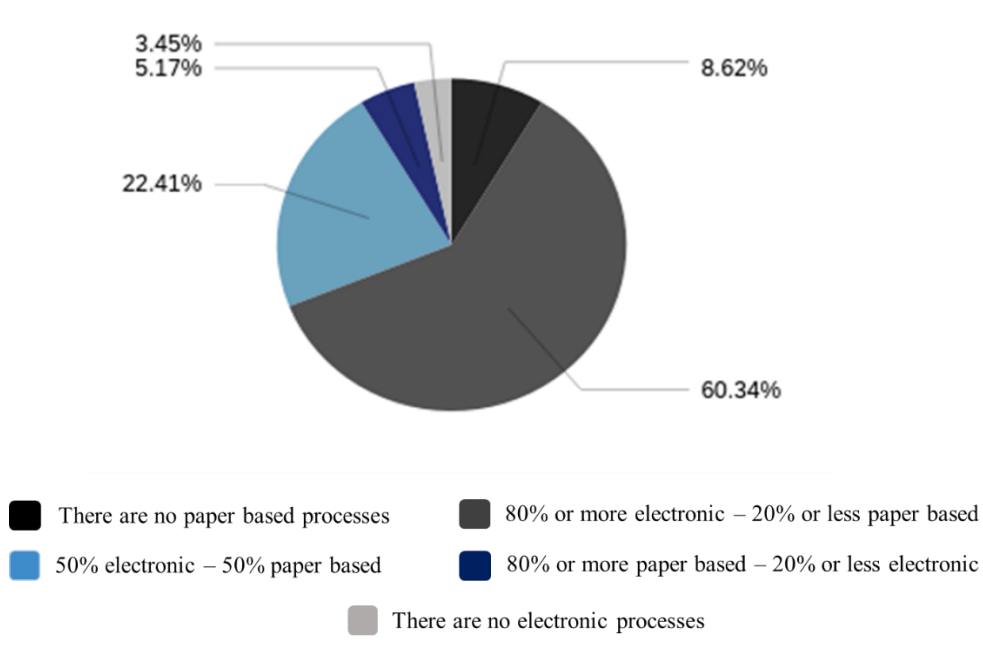
- Do the digital platforms in use meet today's requirements?
- What emphasis do companies place on digitalization?
- What is the ratio of digitized solutions regarding e-systems and e-workflows?

Our assumption was that the penetration of digitized applications and systems is still relatively poor, and that many processes continue to operate on paper (i.e., using paper-based documents) without any IT support.

7.3. Summary of research results, discussion of the factors

This chapter presents the results of the research, the degree of digitalization in the respondent companies, and provides insight into the spread (in percentage) and types of IT solutions and systems/applications used. Based on the responses, we can state that each of the interviewed companies has IT/digital solutions (e-systems such as e-auction, e-bidding, SRM, etc.) or e-applications (such as generation of POs, fulfilment approval, invoice workflow, etc.); this indicates that their awareness and presence align with current expectations. However, the emphasis on digitalization does not meet the level that would be expected of a 21st-century company (especially among manufacturers and large enterprises), as the ratio (Figure 55) of paper-based versus electronic workflows is still not satisfactory.

Figure 55: Ratio between paper-based and electronic workflows



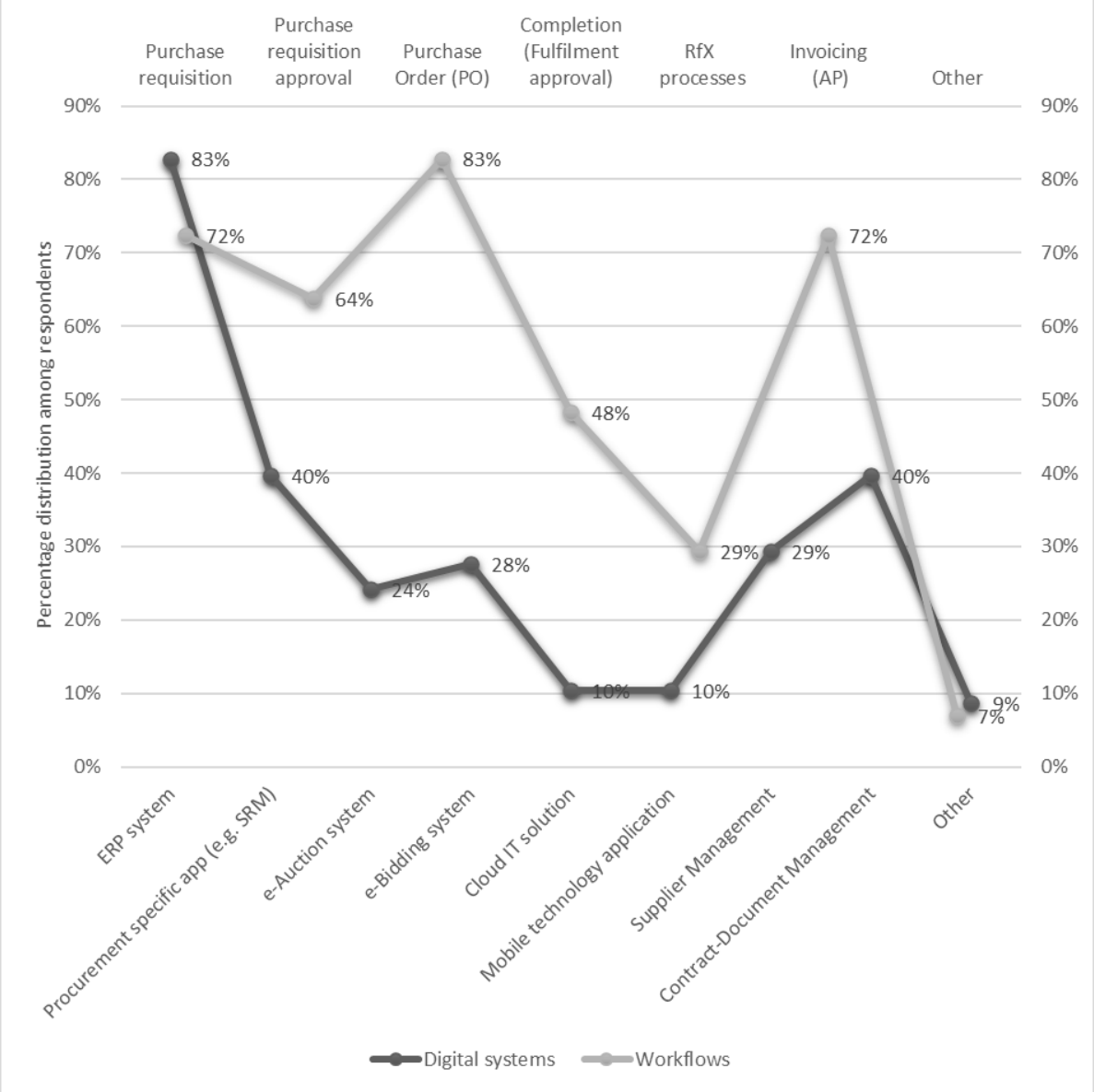
Source: Author's construction

It is concerning that almost 9% of companies lack electronic processes entirely (3.5%) or operate at a digitalization level of less than 20% (5%). Additionally, the ratio of companies using a 50%-50% mix of paper and electronic processes is only 22%, while only 8.6% of

companies have exclusively electronic processes in their procurement operations. However, the digital shift is evident, as in 60% of the surveyed companies, the majority of processes (more than 80%) are already digitized and electronic.

Regarding the systems and workflows (Figure 56), every item received a score in the survey, indicating that they are recognized and in use. However, the frequency of their application varies significantly.

Figure 56: Spread of electronic systems and workflows



Source: Author's construction

Although 83% of the respondents have ERP systems, this value is still far from the expectation that all companies should manage their processes exclusively at the system level to effectively meet the challenges of the present times. Additionally, only 40% possess a specialized application (or special ERP module) required for contract and document management. This discrepancy indicates that for 60% of the companies, the management and storage of contracts and documents are likely performed outside the ERP system, probably in an offline manner or using unreliable and/or non-retrievable methods.

It is interesting to see that procurement-specific applications, such as SRM (Supplier Relationship Management System), are used by 40% of respondents, but Supplier Management is only widespread in 29% of companies, despite being considered a part of SRM. The frequency of e-auction and e-bidding systems is also far below the expected automation level in today's digital world, with the former at 24% and the latter at 25%. This suggests that companies and their managers either do not place much emphasis on resource-efficient digital solutions in this respect or have not yet recognized their importance. The penetration of Cloud IT solutions and Mobile Applications is the worst, with both spreading at only 10%.

In the case of workflows, the most frequent occurrences were the generation of electronic POs (Purchase Orders) at 83% and the invoicing workflow at 72%. This indicates that, on average, 20% of these workflows are still run on a paper basis. Given that most companies create POs within their existing ERP systems (e.g., SAP MM modules), the 83% of PO generation aligns with the 83% usage of ERP systems. In contrast, the 72% invoicing workflow suggests that companies do not manage their AP (Accounts Payable) within their ERP system but through some other method for some unknown reason.

It is also interesting that although purchase requisitions occur at a rate of 72%, their approval is at 64% only. One would expect these interrelated processes to be managed at the same level and in the same way. This discrepancy raises further questions: if there is a high percentage (close to 70% on average) of requisition generation and approval, how can a procurement-specific system like SRM, which supports these processes, be at only a 40% level? Additionally, how does the low level of fulfilment approval (only 48%) correlate with the previously mentioned invoicing workflow level (72%)? These processes should also be

interrelated; it should only be possible to pay an invoice if it is linked to an already approved fulfilment from the accounting perspective, as that approval initiates the invoicing workflow.

RfX (Request for information/quotation), which is related to the procurement procedure and bidding, is at the lowest level (29%). This largely matches the penetration of e-Auctions (24%) and e-Bidding (28%), as these are interconnected systems and processes. Nevertheless, an interesting and open question remains (albeit with small percentage differences): the discrepancy between electronic bidding and auction systems and RfX processes. This discrepancy is notable because the previous systems necessarily operate on the RfX platform through electronic processes/workflows. Furthermore, RfX processes can even be operated on the platform of procurement-specific systems like SRM. In this case, the difference between them is more significant (29% vs. 40%).

If we take another look at the figure of systems and workflows and consider the interactions among elements, it becomes clear that the existence of the deficiencies outlined in the hypothesis (at least in the case of the given companies) is proven. It is, therefore, necessary to re-emphasize the importance of systems and applications that facilitate and accelerate processes in supply chains and procurement.

In summary, there are several digital solutions available for procurement today, such as IT networks, different platforms or cloud solutions, and Big Data Analysis (Garrett, 2017). Digitized systems, platforms, and applications are designed to provide relevant information to managers to facilitate and accelerate decisions, including performance evaluation of a given activity (Szukits, 2017), to increase work flexibility, and ultimately to reduce costs (Garrett, 2017). The opportunity for in-depth examination and streamlining provided by digital technologies (for example, in the procurement of materials and goods) is becoming essential in today's competition; especially considering the positive effects on flexibility, shorter process lead times, and cost reductions in companies that use e-procurement solutions (Centobelli et al., 2014). Companies that still use paper-based and labour-intensive procedures in their procurement freeze large-scale inefficiencies in their processes (Puschmann & Alt, 2005).

Contrarily, if companies use e-procurement processes without fully understanding the external and internal implications and contexts behind these technology models, the energy and money invested in these solutions (to extract relevant information from applications and

integrate them with existing technologies and systems, such as ERP), will not help but endanger processes (Quesada, González, Mueller, & Mueller, 2010). The introduction of new technological solutions induces changes in both organizational architecture and processes (Centobelli et al., 2014), with the need to reorganize them totally or partly. Only in this case, will IT investments have an undeniably positive impact on the procurement function and processes (Rodríguez-Escobar & González-Benito, 2015), thus, e-procurement can increase the efficiency of the organizational structure as well (Ronchi et al., 2010).

7.4. Theoretical contribution and practical implication, limitations of the research

The theoretical contribution of the article is the examination of procurement practice from the point of view of digitalization and the presentation of its results, as well as a short review of the relevant literature of the given topic. The article is written to present the actual practice, the aim is to explore the deficiencies (if any), thus identifying possible weaknesses and opportunities for improvement. By discovering the digitalization status in the companies and assessing their development potential, strategies can be better adapted to the new challenges in a much more targeted way; by reading about the practices of other companies' supply chains (purchasing units) and highlighting certain characteristics or problems, it can inspire other companies.

On the other hand, given that the research presents only the procurement organizations (from many other organizations of the companies operating in Hungary), depicts their practices as well as their digitalization status, the results of the research cannot be considered representative at all. (Also paying attention to the number of respondents.) There are open questions: to what extent did the respondents make precise statements regarding the questions, or could there be – in any proportion – a euphemism in the answers? A further question has remained unanswered: to what extent has the level of digitalization been changed in different companies or in their business and functional organizations in the time spent from the survey? Future research could be scheduled to examine the differences in digitalization levels that may exist at different organizational units within the same company. It would be an interesting area of research to review the level of digitalization in a manufacturing company along its operations axis such as procurement-manufacturing-warehousing-logistics.

CLOSING REMARKS TO THE THESIS

This thesis is built upon the development of a comprehensive purchasing model, which has been validated through assessments of its completeness, correctness, and practical applicability. Additionally, it examines current procurement practices by depicting real-life purchasing procedures, analysing their overall status, and specifically considering features related to IT/digitalization and supplier management. Given the significance of the purchasing processes, the thesis provides a broad perspective on the procurement environment, emphasizing the interconnectedness of the papers and concepts ("***as a whole")*** under investigation.

The results from the research presented in the papers ***"consistently"*** confirmed the hypotheses across all studies:

- **Article A (Validity):** The research, which involved over 130 purchasing professionals, demonstrated the model's validity in terms of correctness, completeness, and applicability. Purchasing leaders affirmed the model's accuracy, comprehensiveness, and balanced nature, recognizing its practical applicability. Additionally, purchasing associates validated the elements and their classifications, confirming the model's completeness by identifying no deficiencies in its arrangement.
- **Article B (Applicability):** The research, which included five case studies of multinational companies, identified both the weaknesses and strengths of current purchasing activities across different organizations, while also confirming the practical applicability of the 4F4D model.
- **Article C (SM) and Article D (Digitalization):** These articles analysed purchasing activities from the perspectives of supplier management and IT/digitalization. The findings highlighted significant deficiencies in current practices related to these areas.

In summary, this collection of articles collectively contributes to a deeper understanding of procurement processes through the lens of the 4F4D model. Each article addresses critical aspects of procurement, from validating the model and exploring supplier management to assessing the impact of digital solutions on procurement efficiency. The insights derived from both qualitative and quantitative analyses provide a comprehensive view of the challenges and opportunities within procurement organizations. The findings underscore the importance of strategic alignment and the need for a robust framework that facilitates effective decision-making in procurement. By identifying key forces and drivers that influence procurement activities, the research not only validates the 4F4D model's applicability but also offers practical implications for organizations aiming to enhance their procurement strategies.

In addition, the study emphasizes that ***"novelty"*** in a conceptual framework can arise not only from introducing new elements but also from offering a fresh perspective and arrangement of existing ones. This concept is analogous to a recipe, where using familiar ingredients in different quantities or combinations can result in something entirely new. Similarly, although the individual factors of the model are established elements that have been studied previously, the innovation lies in their unique combination and structural arrangement within the model. The specific arrangement, classification (as either forces or drivers), and interrelations among these factors enhance the model's comprehensiveness in reflecting real-life procurement procedures. This study underscores that the model's simplicity and transparency significantly improve its practical applicability. Consequently, the thesis strives to maintain a focus on practical significance, as emphasized by Arjan J. van Weele & van Raaij (2014).

Thus, the model can serve as a practical toolkit for diagnosing and addressing common procurement challenges. By applying the 4F4D model, purchasing departments can identify key areas for improvement, such as enhancing IT workflows and fostering better cross-functional integration. Its application can lead to more streamlined operations, improved supplier relationships, and reduced process lead times. Consequently, implementing the model's recommendations can result in a more agile procurement process.

Additionally, the model can be utilized as an effective training tool for purchasing professionals. By providing a structured framework, it helps them understand the intricacies of procurement dynamics and equips them with the necessary skills to navigate and optimize purchasing processes. This holistic approach not only enhances individual competencies but also contributes to the overall strategic alignment of the procurement function within organizations.

The thesis also provides in-depth insights into the actual purchasing practices of large multinational companies through the testing of this holistic model. The depicted examples can assist leaders, professionals, and scholars in drawing conclusions and learning from real-world applications. By adopting the model, purchasing departments can indirectly benefit society by promoting more efficient and sustainable procurement practices. This, in turn, could lead to improved resource allocation, reduced waste, and ultimately, products and services that are better aligned with societal needs and ethical standards.

Ultimately, this thesis (and synthesis of research) emphasizes that continuous improvement in procurement practices is essential for achieving operational efficiency and competitiveness in today's volatile business environment. The model encourages organizations to reflect on their procurement strategies and practices, fostering a culture of continuous improvement. By embracing the principles outlined in the 4F4D model, companies can not only enhance their operational efficiencies but also contribute to broader societal goals, such as environmental sustainability and social responsibility. This alignment between business objectives and societal expectations underscores the model's relevance in today's dynamic procurement landscape.

AUTHOR'S PUBLICATIONS

JOURNAL ARTICLES

Wittinger, M. M., Demeter, K. (2024). Guidance on how to balance the purchasing environment and processes to save resources - A validity examination of a holistic model, *Cogent Business and Management, 11(1), 1-35.*

Wittinger, M. M., Demeter, K., Avornicului, M. (2023). Applicability of a strategic tool for identifying and classifying problems and mitigating risks during the purchase, *Economics & Working Capital*, *8*(1-2), 2-9.

Horváth, D., Wittinger, M. M. (2023). Ipar 4 .0, digitalizáció, illetve új típusú szolgáltatások hatása az üzleti modellre: az üzletimodell-innováció, *LOGISTICS TRENDS - and best practices*, *9*(1), 11-17.

Wittinger, M. M. (2022). Contingency factors of purchasing – a conceptual model to support procurement decisions, *Budapest Management Review*, *53*(5), 43-56.

Wittinger, M. M. (2022). Digitalizációs aspektusok az ellátási láncok beszerzési szervezeteinél, *LOGISTICS TRENDS - and best practices*, *8*(1), 50-56.

Wittinger, M. M. (2019). Features of supplier management and its mechanisms – insights into Hungarian practice. How to enhance the effectiveness of procurement procedures? *Budapest Management Review*, *50*(11), 37–52.

Wittinger, M. M. (2019). A beszerzés stratégiai kérdései az Ipar 4.0 küszöbén, *Logisztikai Híradó*, *28*(4), 39–42.

BOOK CHAPTERS

Wittinger Mária Magdolna (2019). Esettanulmányok: Beszerzés, Logisztika, Vállalatgazdaságtan feladatgyűjtemény, Felsőoktatási tankönyv, Budapest, Budapesti Corvinus Egyetem

INTERNATIONAL CONFERENCES

Maria Magdolna Wittinger (2018). Deviations from optimal supplier relationship management, European Decision Sciences Institute (EDSI), Udine, Italy

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REFERENCES

Acquah, I. S. K., Essel, D., Baah, C., Agyabeng-Mensah, Y., & Afum, E. (2021). Investigating the efficacy of isomorphic pressures on the adoption of green manufacturing practices and its influence on organizational legitimacy and financial performance. *Journal of Manufacturing Technology Management*, *32*(7), 1399–1420. https://doi.org/10.1108/JMTM-10-2020-0404

Afolabi, A., Ibem, E., Aduwo, E., Tunji-Olayeni, P., & Oluwunmi, O. (2019). Critical success factors (CSFs) for e-procurement adoption in the Nigerian construction industry. *Buildings*, *9*(2). https://doi.org/10.3390/buildings9020047

Akın Ateş, M., van Raaij, E. M., & Wynstra, F. (2018). The impact of purchasing strategy-structure (mis)fit on purchasing cost and innovation performance. *Journal of Purchasing and Supply Management*, *24*(1), 68–82. https://doi.org/10.1016/j.pursup.2017.05.002

Amin, I., Zailani, S., & Rahman, M. K. (2021). Predicting employees' engagement in environmental behaviours with supply chain firms. *Management Research Review*, *44*(6), 825–848. https://doi.org/10.1108/MRR-05-2020-0280

Amindoust, A., Ahmed, S., Saghafinia, A., & Bahreininejad, A. (2012). Sustainable supplier selection: A ranking model based on fuzzy inference system. *Applied Soft Computing Journal*, *12*(6), 1668–1677. https://doi.org/10.1016/j.asoc.2012.01.023

Andersen, P. H., & Kumar, R. (2006). Emotions, trust and relationship development in business relationships: A conceptual model for buyer-seller dyads. *Industrial Marketing Management*, *35*(4), 522–535. https://doi.org/10.1016/j.indmarman.2004.10.010

Araujo, L., Gadde, L.-E., & Dubois, A. (2016). Purchasing and supply management and the role of supplier interfaces. *IMP Journal*, *10*(1), 2–24. https://doi.org/10.1108/imp-06-2015-0025

Araz, C., & Ozkarahan, I. (2007). Supplier evaluation and management system for strategic sourcing based on a new multicriteria sorting procedure. *International Journal of Production Economics*, *106*(2), 585–606. https://doi.org/10.1016/j.ijpe.2006.08.008

Ashenbaum, B., & Maltz, A. (2017). Purchasing-logistics integration and supplier performance: An information-processing view. *International Journal of Logistics Management*, *28*(2), 379–397. https://doi.org/10.1108/IJLM-07-2014-0113

Ateş, M. A., Wynstra, F., & van Raaij, E. M. (2015). An exploratory analysis of the relationship between purchase category strategies and supply base structure. *Journal of Purchasing and Supply Management*, *21*(3), 204–219. https://doi.org/10.1016/j.pursup.2015.04.007

Baker, G., Gibbons, R., & Murphy, K. J. (2002). Relational contracts and the theory of the firm. *The Quarterly Journal of Economics*, *117*(1), 39–84.

Bals, L., Laine, J., & Mugurusi, G. (2018). Evolving Purchasing and Supply Organizations: A contingency model for structural alternatives. *Journal of Purchasing and Supply Management*, *24*(1), 41–58. https://doi.org/10.1016/j.pursup.2017.10.001

Barki, H., & Pinsonneault, A. (2005). A model of organizational integration, implementation effort, and performance. *Organization Science*, *16*(2), 165–179. https://doi.org/10.1287/orsc.1050.0118

Baxter, P., & Jack, S. (2015). Qualitative Case Study Methodology: Study Design and Implementation for Novice Researchers. *The Qualitative Report*, *13*(4), 544–559. https://doi.org/10.46743/2160-3715/2008.1573

Bendixen, M., & Abratt, R. (2007). Corporate identity, ethics and reputation in supplier-buyer relationships. *Journal of Business Ethics*, *76*(1), 69–82. https://doi.org/10.1007/s10551-006-9273-4

Bensaou, M. (1999). Portfolios of Buyer-Supplier Relationships. *MIT Sloan Management Review*, *40*(4), 35–44.

Bianchi, E., Bruno, J. M., & Sarabia-Sanchez, F. J. (2019). The impact of perceived CSR on corporate reputation and purchase intention. *European Journal of Management and Business Economics*, *28*(3), 206–221. https://doi.org/10.1108/EJMBE-12-2017-0068

Bianchini, A., Benci, A., Pellegrini, M., & Rossi, J. (2019). Supply chain redesign for lead-time reduction through Kraljic purchasing portfolio and AHP integration. *Benchmarking*, *26*(4), 1194–1209. https://doi.org/10.1108/BIJ-07-2018-0222

Bjerregaard, T., & Jonasson, C. (2014). Organizational responses to contending institutional logics: The moderating effect of group dynamics. *British Journal of Management*, *25*(4), 651–666. https://doi.org/10.1111/1467-8551.12014

Blanchard, D. (2010). *Supply Chain Management Best Practices* (2nd Editio). John Wiley & Sons, Inc., Hoboken, New Jersey.

Brandon-Jones, A., & Knoppen, D. (2018). The role of strategic purchasing in dynamic capability development and deployment: A contingency perspective. *International Journal of Operations and Production Management*, *38*(2), 446–473. https://doi.org/10.1108/IJOPM-10-2015-0656

Bruno, G., Esposito, E., Genovese, A., & Passaro, R. (2012). AHP-based approaches for supplier evaluation: Problems and perspectives. *Journal of Purchasing and Supply Management*, *18*(3), 159–172. https://doi.org/10.1016/j.pursup.2012.05.001

Buzan, T., & Buzan, B. (2006). The Mind Map Book. In *Pearson Education*.

Çankaya, S. Y., & Sezen, B. (2019). Effects of green supply chain management practices on sustainability performance. *Journal of Manufacturing Technology Management*, *30*(1), 98–121. https://doi.org/10.1108/JMTM-03-2018-0099

Carter, P. L., Carter, J. R., Monczka, R. M., Slaight, T. H., & Swan, A. J. (2000). The future of purchasing and supply: A ten-year forecast. *Journal of Supply Chain Management*, *36*(4), 14–26. https://doi.org/10.1111/j.1745-493X.2000.tb00066.x

Caulley, N. D. (2008). Making qualitative research reports less boring: The techniques of writing creative nonfiction. *Qualitative Inquiry*, *14*(3), 424–449. https://doi.org/10.1177/1077800407311961

Centobelli, P., Cerchione, R., Converso, G., & Murin, T. (2014). E-procurement and E-supply Chain: Features and Development of E-collaboration. *IERI Procedia 6*, 8–14. https://doi.org/10.1016/j.ieri.2014.03.003.

Chae, B., Yen, H. J. R., & Sheu, C. (2005). Information technology and supply chain collaboration: Moderating effects of existing relationships between partners. *IEEE Transactions on Engineering Management*, *52*(4), 440–448. https://doi.org/10.1109/TEM.2005.856570

Changalima, I. A., Mchopa, A. D., & Ismail, I. J. (2022). Supplier development and public procurement performance: Does contract management difficulty matter? *Cogent Business and Management*, *9*(1). https://doi.org/10.1080/23311975.2022.2108224

Chen, C. T., Lin, C. T., & Huang, S. F. (2006). A fuzzy approach for supplier evaluation and selection in supply chain management. *International Journal of Production Economics*, *102*(2), 289–301. https://doi.org/10.1016/j.ijpe.2005.03.009

Chen, Y. J. (2011). Structured methodology for supplier selection and evaluation in a supply chain. *Information Sciences*, *181*(9), 1651–1670. https://doi.org/10.1016/j.ins.2010.07.026

Chikán, A. (2023). *Vállalatgazdaságtan* (6th Editio). Akadémiai Kiadó Zrt.

Choi, T. Y., & Kim, Y. (2008). Structural embeddedness and supplier management: A network perspective. *Journal of Supply Chain Management*, *44*(4), 5–13. https://doi.org/10.1111/j.1745-493X.2008.00069.x

Contractor, F. J., & Lorange, P. (2002). The growth of alliances in the knowledge-based economy. *International Business Review*, *11*(4), 485–502. https://doi.org/10.1016/S0969-5931(02)00021-5

Cousins, P. D. (2002). A conceptual model for managing long-term inter-organisational relationships. *European Journal of Purchasing and Supply Management*, *8*(2), 71–82. https://doi.org/10.1016/S0969-7012(01)00006-5

Cousins, P. D., Handfield, R. B., Lawson, B., & Petersen, K. J. (2006). Creating supply chain relational capital: The impact of formal and informal socialization processes. *Journal of Operations Management*, *24*(6), 851–863. https://doi.org/10.1016/j.jom.2005.08.007

Croom, S., Romano, P., & Giannakis, M. (2000). Supply chain management: An analytical framework for critical literature review. *European Journal of Purchasing and Supply Management*, *6*(1), 67–83. https://doi.org/10.1016/S0969-7012(99)00030-1

Das, T. K., & Teng, B.-S. (2000). A Resource-Based Theory. *Journal of Management*, *26*(1), 31–61.

De Boer, L., Harink, J., & Heijboer, G. (2002). A conceptual model for assessing the impact of electronic procurement. *European Journal of Purchasing and Supply Management*,

8(1), 25–33. https://doi.org/10.1016/S0969-7012(01)00015-6

De Felice, F., Deldoost, M. H., Faizollahi, M., & Petrillo, A. (2015). Performance measurement model for the supplier selection based on AHP. *International Journal of Engineering Business Management*, *7*, 1–13. https://doi.org/10.5772/61702

Delaney, J. T., & Huselid, M. A. (1996). The impact of human resource management practices on perceptions of organizational performance. *Academy of Management Journal*, *39*(4), 949–969. https://doi.org/10.2307/256718

Delke, V., Schiele, H., Buchholz, W., & Kelly, S. (2023). Implementing Industry 4.0 technologies: Future roles in purchasing and supply management. *Technological Forecasting and Social Change*, *196*(September), 1–17. https://doi.org/10.1016/j.techfore.2023.122847

Demeter, K., Losonci, D., & Nagy, J. (2021). Road to digital manufacturing – a longitudinal case-based analysis. *Journal of Manufacturing Technology Management*, *32*(3), 820–839. https://doi.org/10.1108/JMTM-06-2019-0226

Den Butter, F. A. C., & Linse, K. A. (2008). Rethinking procurement in the era of globalization. *MIT Sloan Management Review*, *50*(1), 75–80.

Denzin, N. K., & Lincoln, Y. S. (2011). Handbook of Qualitative Research. In *SAGE Publications* (4th ed.). Sage Publications.

Dobos, I., & Vörösmarty, G. (2014). Green supplier selection and evaluation using DEA-type composite indicators. *International Journal of Production Economics*, *157*(1), 273–278. https://doi.org/10.1016/j.ijpe.2014.09.026

Dyer, J. H., Cho, D. S., & Chu, W. (1998). Strategic Supplier Segmentation: the next “best practice” in supply chain management. *California Management Review*, *40*(2), 57–77.

Dyer, J. H., & Nobeoka, K. (2000). Creating and Managing a High-Performance Knowledge-Sharing Network: The Toyota Case. *Strategic Management Journal*, *21*(3), 345–367.

Dyer, J. H., & Singh, H. (1998). The Relational View : Cooperative Strategy and Sources of Interorganizational Competitive Advantage. *Academy of Management Review*, *23*(4), 660–679. https://doi.org/10.2307/259056

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. *Academy of Management Review*, *14*(4), 532–550. https://doi.org/10.5465/amr.1989.4308385

Ellegaard, C., & Koch, C. (2014). A model of functional integration and conflict: The case of purchasing-production in a construction company. *International Journal of Operations and Production Management*, *34*(3), 325–346. https://doi.org/10.1108/IJOPM-03-2012-0108

Erboz, G., & Szegedi, Z. (2020). Review of supply chain integration between 2000 and 2019:Analysis of current status and future trends. *International Journal of Supply Chain Management*, *9*(4), 43–51.

Eriksson, P. E., Volker, L., Kadefors, A., Lingegård, S., Larsson, J., & Rosander, L. (2019). Collaborative procurement strategies for infrastructure projects: A multiple-case study. *Proceedings of Institution of Civil Engineers: Management, Procurement and Law*, *172*(5), 197–205. https://doi.org/10.1680/jmapl.19.00016

Ertugrul, C., & Kozma, T. (2021). A koronavírus hatása a globális ellátási láncokra. *Logisztikai Trendek És Legjobb Gyakorlatok*, *VII*(1), 5–12. https://doi.org/10.21405/logtrend.2021.7.1.3

Faisal, M. N., Banwet, D. K., & Shankar, R. (2006). Supply chain risk mitigation: Modeling the enablers. *Business Process Management Journal*, *12*(4), 535–552. https://doi.org/10.1108/14637150610678113

Fatorachian, H., & Kazemi, H. (2020). Impact of Industry 4.0 on supply chain performance. *Production Planning and Control*, *32*(1), 63–81. https://doi.org/10.1080/09537287.2020.1712487

Ferreira, A. C., Pimenta, M. L., & Wlazlak, P. (2019). Antecedents of cross-functional integration level and their organizational impact. *Journal of Business and Industrial Marketing*, *34*(8), 1706–1723. https://doi.org/10.1108/JBIM-01-2019-0052

Fiedler, F. E. (1978). The Contingency Model and the Dynamics of the Leadership Process. *Advances in Experimental Social Psychology*, *11*(C), 59–112. https://doi.org/10.1016/S0065-2601(08)60005-2

Flick, U. (2009). An Introduction To Qualitative Research. In *SAGE Publications*.

Foerstl, K., Hartmann, E., Wynstra, F., & Moser, R. (2013). Cross-functional integration and functional coordination in purchasing and supply management: Antecedents and effects on purchasing and firm performance. *International Journal of Operations and Production Management*, *33*(6), 689–721. https://doi.org/10.1108/IJOPM-09-2011-0349

Ganesan, S. (1994). Determinants of Long-Term Orientation in Buyer-Seller Relationships. *Journal of Marketing*, *58*(2), 1–19. https://doi.org/10.2307/1252265

Garrett, R. (2017). the Benefits of Digital Transformation. *Supply & Demand Chain Executive*, *18*(2), 22–25. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&AuthType=ip&db=bsu&AN=123453674&site=ehost-live

Gebauer, J., & Shaw, M. J. (2004). Success factors and impacts of mobile business applications: Results from a mobile e-procurement study. *International Journal of Electronic Commerce*, *8*(3), 19–41. https://doi.org/10.1080/10864415.2004.11044304

Gelderman, C. J., & Semeijn, J. (2006). Managing the global supply base through purchasing portfolio management. *Journal of Purchasing and Supply Management*, *12*(4), 209–217. https://doi.org/10.1016/j.pursup.2006.10.002

Gelderman, C. J., Semeijn, J., & Vluggen, R. (2017). Development of sustainability in public sector procurement. *Public Money and Management*, *37*(6), 435–442. https://doi.org/10.1080/09540962.2017.1344027

Gelderman, C. J., & van Weele, A. (2005). Purchasing Portfolio Models : A Critique and Update. *Journal of Supply Chain Management*, *41*(3), 19–28.

Gelei, A., & Dobos, I. (2016). Mutual trustworthiness as a governance mechanism in business relationships - A dyadic data analysis. *Acta Oeconomica*, *66*(4), 661–684. https://doi.org/10.1556/032.2016.66.4.5

Gelei, A., & Jámbor, Z. (2018). Globális vállalatok belső struktúrájának alakítása a beszerzés és a termékfejlesztés kapcsolódó tevékenységeinek tükrében. *Vezetéstudomány / Budapest Management Review*, *XLIX*.(03), 52–63.

George, D., & Malley, P. (2019). IBM SPSS Statistics. In *IBM SPSS Statistics 25 Step by*

Step. Taylor & Francis.

Gereffi, G., Humphrey, J., & Sturgeon, T. (2005). The governance of global value chains. *Review of International Political Economy*, *12*(1), 78–104. https://doi.org/10.1080/09692290500049805

González-Benito, J. (2007). A theory of purchasing's contribution to business performance. *Journal of Operations Management*, *25*(4), 901–917. https://doi.org/10.1016/j.jom.2007.02.001

Goold, M., Campbell, A., & Alexander, M. (1998). Corporate strategy and parenting advantage. *Long Range Planning*, *3*(2), 308–314. https://doi.org/10.1108/eum0000000006590

Govindan, K., Jain, P., Kr. Singh, R., & Mishra, R. (2024). Blockchain technology as a strategic weapon to bring procurement 4.0 truly alive: Literature review and future research agenda. *Transportation Research Part E: Logistics and Transportation Review*, *181*(November 2023), 103352. https://doi.org/10.1016/j.tre.2023.103352

Govindan, K., Kannan, D., & Haq, A. N. (2010). Analyzing supplier development criteria for an automobile industry. *Industrial Management and Data Systems*, *110*(1), 43–62. https://doi.org/10.1108/02635571011008399

Gualandris, J., Golini, R., & Kalchschmidt, M. (2014). Do supply management and global sourcing matter for firm sustainability performance?: An international study. *Supply Chain Management*, *19*(3), 258–274. https://doi.org/10.1108/SCM-11-2013-0430

Håkansson, H., & Snehota, I. (1995). Developing relationships in business networks. In *Routledge*. https://doi.org/10.4324/9780203392638_chapter_7

Håkansson, H., & Snehota, I. (2006). No business is an island: The network concept of business strategy. *Scandinavian Journal of Management*, *22*(3), 256–270. https://doi.org/10.1016/j.scaman.2006.10.005

Hallikas, J., Lintukangas, K., & Kähkönen, A. K. (2020). The effects of sustainability practices on the performance of risk management and purchasing. *Journal of Cleaner Production*, *263*. https://doi.org/10.1016/j.jclepro.2020.121579

Handfield, R. B., Cousins, P. D., Lawson, B., & Petersen, K. J. (2015). How Can Supply

Management Really Improve Performance? A Knowledge-Based Model of Alignment Capabilities. *Journal of Supply Chain Management*, *51*(3), 3–17. https://doi.org/10.1111/jscm.12066

Handfield, R. B., Jeong, S., & Choi, T. (2019). Emerging procurement technology: data analytics and cognitive analytics. *International Journal of Physical Distribution and Logistics Management*, *49*(10), 972–1002. https://doi.org/10.1108/IJPDLM-11-2017-0348

Handfield, R. B., Petersen, K. J., Cousins, P. D., & Lawson, B. (2009). An organizational entrepreneurship model of supply management integration and performance outcomes. *International Journal of Operations and Production Management*, *29*(2), 100–126. https://doi.org/10.1108/01443570910932011

Heikkilä, J., Kaipia, R., & Ojala, M. (2018). Purchasing category management: Providing integration between purchasing and other business functions. *International Journal of Procurement Management*, *11*(5), 533–550. https://doi.org/10.1504/IJPM.2018.094350

Herrmann, M., Dalferth, O., Groß, H., & Moertl, H. (2015). Real-life SOA experiences : Top-Down approach based on an implemented purchase requisition process. *ResearchGate Publication*, (May), 4–8. Retrieved from https://www.researchgate.net/publication/268287070

Hesping, F. H., & Schiele, H. (2015). Purchasing strategy development: A multi-level review. *Journal of Purchasing and Supply Management*, *21*(2), 138–150. https://doi.org/10.1016/j.pursup.2014.12.005

Hesping, F. H., & Schiele, H. (2016). Matching tactical sourcing levers with the Kraljič matrix: Empirical evidence on purchasing portfolios. *International Journal of Production Economics*, *177*, 101–117. https://doi.org/10.1016/j.ijpe.2016.04.011

Hidalgo, C. A. (2021). Economic complexity theory and applications. *Nature Reviews Physics*, *3*(2), 92–113. https://doi.org/10.1038/s42254-020-00275-1

Holloway, I., & Biley, F. C. (2011). Being a qualitative researcher. *Qualitative Health Research*, *21*(7), 968–975. https://doi.org/10.1177/1049732310395607

Holloway, I., & Wheeler, S. (2002). Qualitative Research in Nursing. *Blackwell Publishing*.

https://doi.org/10.4324/9781315539829-7

Huang, S. H., & Keskar, H. (2007). Comprehensive and configurable metrics for supplier selection. *International Journal of Production Economics*, *105*(2), 510–523. https://doi.org/10.1016/j.ijpe.2006.04.020

Huber, B., Sweeney, E., & Smyth, A. (2005). Electronic Purchasing Consortia: a Future Procurement Direction. In A. Ancarani & M. Raffa (Eds.), *Sourcing Decision Management* (pp. 263–282). Rome: Edizioni Scientifiche Italiane.

Johnson, P. F., & Klassen, R. D. (2005). E-procurement. *MIT Sloan Management Review*, *46*(2), 7–10. https://doi.org/10.4324/noe0415394048.ch16

Kakwezi, P., & Nyeko, S. (2019). Effectiveness of the Procurement Function. *International Journal of Social Sciences Management and Entrepreneurship*, *3*(1), 172–182.

Kane, C. G., Palmer, D., Phillips, A. N., Kiron, D., & Buckley, N. (2016a). Aligning the Organization for Its Digital Future. *MIT Sloan Management Review and Deloitte University Press*, *58*(1), 1–27. Retrieved from http://sloanreview.mit.edu/digital2016

Kane, C. G., Palmer, D., Phillips, A. N., Kiron, D., & Buckley, N. (2016b). Preparing for the digital business transformation. *MIT Sloan Management Review*, *58*(1), 1–27.

Kang, M., Hong, P., Bartnik, R., Park, Y., & Ko, C. (2018). Aligning purchasing portfolio management with sourcing negotiation styles. *Management Decision*, *56*(11), 2341–2356. https://doi.org/10.1108/MD-09-2016-0662

Kaplan, R. S., & Norton, D. P. (1992). The Balanced Scorecard - Measures That Drive Performance. *Harvard Business Review*, (1), 71–79. Retrieved from https://umei007-fall10.wikispaces.com/file/view/Kaplan%26Nortonbalanced+scorecard.pdf

Kaplan, R. S., & Norton, D. P. (1993). Putting the Balanced Scorecard to work. *Harvard Business Review*, (4), 2–18.

Kaplan, R. S., & Norton, D. P. (1996). Using the Balanced Scorecard as a Strategic Management System. *Harvard Business Review*, *2*(1), 1–5. Retrieved from https://search.proquest.com/docview/1954386519/fulltextPDF/AD1CA924A36148ADPQ/107?accountid=29104%0Ahttp://www.g20-insights.org/wp-content/uploads/2017/05/Digital_Bridging-the-digital-divide-skills-for-the-new-ageII-

.pdf%0Ahttp://search.proquest.com.proxy

Kaplan, R. S., & Norton, D. P. (2004a). Converting Intangible Assets to Tangible Outcomes. Boston, MA: *Harvard Business School Press*.

Kaplan, R. S., & Norton, D. P. (2004b). Organization Capital: Supporting the Change Agenda That Supports Strategy Execution. *Harvard Business School Publishing*, *6*(1), 1–16. https://doi.org/10.1515/pubhef-2004-2105

Kaplan, R. S., & Norton, D. P. (2006a). Alignment - Using the Balanced Scorecard to create corporate synergies. In *Harvard Business School Press*.

Kaplan, R. S., & Norton, D. P. (2006b). How to implement a new strategy without disrupting your organization. *Harvard Business Review*, *8*(2), 72–87.

Keough, M. (1993). Buying Your Way to the Top. *The McKinsey Quarterly*, *3*, 41–62.

Keskin, G. A., Ilhan, S., & Özkan, C. (2010). The Fuzzy ART algorithm: A categorization method for supplier evaluation and selection. *Expert Systems with Applications*, *37*(2), 1235–1240. https://doi.org/10.1016/j.eswa.2009.06.004

Kırılmaz, O., & Erol, S. (2017). A proactive approach to supply chain risk management: Shifting orders among suppliers to mitigate the supply side risks. *Journal of Purchasing and Supply Management*, *23*(1), 54–65. https://doi.org/10.1016/j.pursup.2016.04.002

Kleindorfer, P. R., Singhal, K., & Wassenhove, L. N. Van. (2005). Sustainable Operations Management. *SSRN Electronic Journal*, *14*(4), 482–492. https://doi.org/10.2139/ssrn.1424488

Kothari, T., Hu, C., & Roehl, W. S. (2005). e-Procurement: An emerging tool for the hotel supply chain management. *International Journal of Hospitality Management*, *24*(3), 369–389. https://doi.org/10.1016/j.ijhm.2004.09.004

Kraljic, P. (1983). Purchasing Must Become Supply Management. *Harvard Business Review*, *61*(5), 109–117.

Lanier, D., Wempe, W. F., & Swink, M. (2019). Supply Chain Power and Real Earnings Management: Stock Market Perceptions, Financial Performance Effects, and Implications for Suppliers. *Journal of Supply Chain Management*, *55*(1), 48–70.

https://doi.org/10.1111/jscm.12186

Larsen-Freeman, D. (2007). On the complementarity of chaos/complexity theory and dynamic systems theory in understanding the second language acquisition process. *Bilingualism: Language and Cognition*, *10*(1), 35–37. https://doi.org/10.1017/S136672890600277X

Lee, A. H. I., Chang, H.-J., & Lin, C.-Y. (2009). An evaluation model of buyer-supplier relationships in high-tech industry - The case of an electronic components manufacturer in Taiwan. *Computers and Industrial Engineering*, *57*(4), 1417–1430. https://doi.org/10.1016/j.cie.2009.07.012

Lee, E. K., Ha, S., & Kim, S. K. (2001). Supplier selection and management system considering relationships in supply chain management. *IEEE Transactions on Engineering Management*, *48*(3), 307–318. https://doi.org/10.1109/17.946529

Li, D., & Nagurney, A. (2015). A general multitiered supply chain network model of quality competition with suppliers. *International Journal of Production Economics*, *170*, 336–356. https://doi.org/10.1016/j.ijpe.2015.09.034

Liang, L., Yang, F., Cook, W. D., & Zhu, J. (2006). DEA models for supply chain efficiency evaluation. *Annals of Operations Research*, *145*(1), 35–49. https://doi.org/10.1007/s10479-006-0026-7

Lima-Junior, F. R., & Carpinetti, L. C. R. (2016). Combining SCOR model and fuzzy TOPSIS for supplier evaluation and management. *International Journal of Production Economics*, *174*, 128–141. https://doi.org/10.1016/j.ijpe.2016.01.023

Lőrincz, N. (2018). Being an investment target in CEE. Country attractiveness and near-shoring. *Vezetéstudomány / Budapest Management Review*, *49*(5), 47–54. https://doi.org/10.14267/veztud.2018.05.05

Maccarthy, B. L., Blome, C., Olhager, J., Srai, J. S., & Zhao, X. (2016). Supply chain evolution – theory, concepts and science. *International Journal of Operations & Production Management*, *36*(12), 1696–1718. https://doi.org/10.1108/IJOPM-02-2016-0080

Maier, A. M., Moultrie, J., & Clarkson, P. J. (2012). Assessing Organizational Capabilities

Reviewing and Guiding the Development of Maturity Grids.pdf. *IEEE Transactions on Engineering Management*, *59*(1), 138–159.

Manson, S. M. (2001). Simplifying complexity: A review of complexity theory. *Geoforum*, *32*(3), 405–414. https://doi.org/10.1016/S0016-7185(00)00035-X

McEvoy, E., & Ferri, D. (2020). The role of the joint procurement agreement during the COVID-19 Pandemic: Assessing Its usefulness and discussing its potential to support a european health union. *European Journal of Risk Regulation*, *11*(4), 851–863. https://doi.org/10.1017/err.2020.91

Meixell, M. J., & Luoma, P. (2015). Stakeholder pressure in sustainable supply chain management: A systematic review. *International Journal of Physical Distribution and Logistics Management*, *45*(1), 69–89. https://doi.org/10.1108/IJPDLM-05-2013-0155

Meschnig, G., & Kaufmann, L. (2015). Consensus on supplier selection objectives in cross-functional sourcing teams: Antecedents and outcomes. *International Journal of Physical Distribution & Logistics Management*, *45*(8), 774–793. https://doi.org/10.1108/IJPDLM-05-2013-0155

Miemczyk, J., Johnsen, T. E., & Macquet, M. (2012). Sustainable purchasing and supply management: A structured literature review of definitions and measures at the dyad, chain and network levels. *Supply Chain Management: An International Journal*, *17*(5), 478–496. https://doi.org/10.1108/13598541211258564

Miemczyk, J., & Luzzini, D. (2019). Achieving triple bottom line sustainability in supply chains: The role of environmental, social and risk assessment practices. *International Journal of Operations and Production Management*, *39*(2), 238–259. https://doi.org/10.1108/IJOPM-06-2017-0334

Mikalef, P., Pateli, A., Batenburg, R. S., & Van De Wetering, R. (2015). Purchasing alignment under multiple contingencies: A configuration theory approach. *Industrial Management and Data Systems*, *115*(4), 625–645. https://doi.org/10.1108/IMDS-10-2014-0298

Miner, J. B. (2005). *Organizational Behavior*. M.E. Sharpe, Inc. All.

Mishra, A. N., Konana, P., & Barua, A. (2007). Antecedents and consequences of Internet

use in procurement: An empirical investigation of U.S. manufacturing firms. *Information Systems Research*, *18*(1), 103–120. https://doi.org/10.1287/isre.1070.0115

Morris, P. W. G., & Jamieson, A. (2005). Moving from corporate strategy to project strategy. *Project Management Journal*, 5–19.

Nagy, J., & Venter, L. (2012). *Az ellátási lánc tudatos folyamat- és kockázatmenedzsmentjének hatás a teljesítményre*.

Nicoletti, B. (2013). Lean six sigma and digitize procurement. *International Journal of Lean Six Sigma*, *4*(2), 184–203. https://doi.org/10.1108/20401461311319356

Nicoletti, B. (2017). Agile procurement. In *Springer International Publishing*. https://doi.org/10.1007/978-3-319-61085-6

Nivetha, P. (2021). E-Purchasing Trends for the Time of Covid-19 Pandemic. *International Journal of Management Research and Social Science*, *8*(2), 96–97. https://doi.org/10.30726/ijmrss/v8.i2.2021.82013

Nyaga, G. N., Whipple, J. M., & Lynch, D. F. (2010). Examining supply chain relationships: Do buyer and supplier perspectives on collaborative relationships differ? *Journal of Operations Management*, *28*(2), 101–114. https://doi.org/10.1016/j.jom.2009.07.005

O'Brien, J. (2024). *Category Management in Purchasing: A Strategic Approach to Maximize Business Profitability* (5th ed.). Kogan Page Limited.

Ogunranti, G. A., Ceryan, O., & Banerjee, A. (2021). Buyer-supplier currency exchange rate flexibility contracts in global supply chains. *European Journal of Operational Research*, *288*(2), 420–435. https://doi.org/10.1016/j.ejor.2020.05.053

Olsen, R. F., & Ellram, L. M. (1997). A portfolio approach to supplier relationships. *Industrial Marketing Management*, *26*(2), 101–113. https://doi.org/10.1016/S0019-8501(96)00089-2

Omurca, S. I. (2013). An intelligent supplier evaluation, selection and development system. *Applied Soft Computing Journal*, *13*(1), 690–697. https://doi.org/10.1016/j.asoc.2012.08.008

Osiro, L., Lima-Junior, F. R., & Carpinetti, L. C. R. (2014). A fuzzy logic approach to

supplier evaluation for development. *International Journal of Production Economics*, *153*, 95–112. https://doi.org/10.1016/j.ijpe.2014.02.009

Oxford English Dictionary (11th Editi). (2004). Oxford University Press.

Padgett, D., Hopkins, C. D., & Williams, Z. (2020). Buyer dependence in B2B relationships: The role of supplier investments, commitment form, and trust. *Journal of Business Research*, *119*(July), 13–24. https://doi.org/10.1016/j.jbusres.2020.07.019

Paranikas, P., Whiteford, G. P., Tevelson, B., & Belz, D. (2015). How to negotiate with powerful suppliers. *Harvard Business Review*, *2015*(July-August), 1–9.

Park, J., Shin, K., Chang, T. W., & Park, J. (2010). An integrative framework for supplier relationship management. *Industrial Management and Data Systems*, *110*(4), 495–515. https://doi.org/10.1108/02635571011038990

Patrucco, Andrea S, Luzzini, D., Moretto, A., & Ronchi, S. (2019). Attraction in buyer - supplier relationships. *Business Process Management Journal*, *25*(2), 347–367. https://doi.org/10.1108/BPMJ-06-2017-0137

Patrucco, Andrea Stefano, Luzzini, D., & Ronchi, S. (2017). Achieving innovation through supplier collaboration: the role of the purchasing interface. *Business Process Management Journal*, *23*(6), 1270–1289. https://doi.org/10.1108/BPMJ-10-2016-0202

Pattanayak, D., & Punyatoya, P. (2020). Effect of supply chain technology internalization and e-procurement on supply chain performance. *Business Process Management Journal*, *26*(6), 1425–1442. https://doi.org/10.1108/BPMJ-04-2019-0150

Patton, M. Q. (2005). Qualitative Research. *Encyclopedia of Statistics in Behavioral Science*, *3*, 1633–1636.

Pemer, F., & Skjølsvik, T. (2016). Purchasing Policy or Purchasing Police? The Influence of Institutional Logics and Power on Responses to Purchasing Formalization. *Journal of Supply Chain Management*, *52*(4), 5–21. https://doi.org/10.1111/jscm.12112

Perdana, A., & Mulyono, N. B. (2021). Purchasing Strategies in the Kraljic Portfolio Matrix – a Case Study in Open Pit Coal Mining. *Indonesian Mining Professionals Journal*, *3*(1), 45–58. https://doi.org/10.36986/impj.v3i1.41

Pinsonneault, A., & Kraemer, K. L. (1993). Survey research methodology in management information systems: An assessment. *Journal of Management Information Systems*, *10*(2), 75–105. https://doi.org/10.1080/07421222.1993.11518001

Pippenger, N. (1978). Complexity theory. *Scientific American*, *238*(6), 114–125. https://doi.org/10.4337/9781788974912.C.77

Poberschnigg, T. F. da S., Pimenta, M. L., & Hilletofth, P. (2020). How can cross-functional integration support the development of resilience capabilities? The case of collaboration in the automotive industry. *Supply Chain Management*, *25*(6), 789–801. https://doi.org/10.1108/SCM-10-2019-0390

Pónusz, M., Gosztonyi, M., Kővágó, G., & Kozma, T. (2020). Reverse Logistics Tasks Tested with Path Models Based on Data of Companies Operating in Hungary. *Acta Universitatis Sapientiae, European and Regional Studies*, *17*(1), 119–139. https://doi.org/10.2478/auseur-2020-0006

Porter, M. E. (1985). Competitive advantage: Creating and sustaining superior performance. In *Free Press New York*. https://doi.org/10.1590/s0034-75901985000200009

Porter, M. E. (2008). The Five Competitive Forces That Shape Strategy. *Harvard Business Review*, *1*, 24–40. Retrieved from www.hbr.org

Prajogo, D., & Sohal, A. (2013). Supply chain professionals: A study of competencies, use of technologies, and future challenges. *International Journal of Operations and Production Management*, *33*(11), 1532–1554. https://doi.org/10.1108/IJOPM-08-2010-0228

Puschmann, T., & Alt, R. (2005). Successful use of e-procurement in supply chains. *Supply Chain Management*, *10*(2), 122–133. https://doi.org/10.1108/13598540510589197

Quesada, G., González, M. E., Mueller, J., & Mueller, R. (2010). Impact of e-procurement on procurement practices and performance. *Benchmarking*, *17*(4), 516–538. https://doi.org/10.1108/14635771011060576

Rana, S. (Ed.). (2022). *Exploring the Latest Trends in Management Literature*. Retrieved from https://books.emeraldinsight.com/page/detail/exploring-the-latest-trends-in-management-literature/?k=9781802623581-

7%0Ahttp://dx.doi.org/10.1016/j.ab.2015.03.024%0Ahttps://doi.org/10.1080/07352689.2018.1441103%0Ahttp://www.chile.bmw-motorrad.cl/sync/showr

Rane, S. B., Narvel, Y. A. M., & Bhandarkar, B. M. (2020). Developing strategies to improve agility in the project procurement management (PPM) process. *Business Process Management Journal*, *26*(1), 257–286. https://doi.org/10.1108/BPMJ-07-2017-0196

Reck, R. F., & Long, B. G. (1988). Purchasing: A Competitive Weapon. *Journal of Purchasing and Materials Management*, *24*(3), 2–8. https://doi.org/10.1111/j.1745-493x.1988.tb00631.x

Rezaei, J., & Fallah Lajimi, H. (2019). Segmenting supplies and suppliers: bringing together the purchasing portfolio matrix and the supplier potential matrix. *International Journal of Logistics Research and Applications*, *22*(4), 419–436. https://doi.org/10.1080/13675567.2018.1535649

Rezaei, J., & Ortt, R. (2013a). Multi-criteria supplier segmentation using a fuzzy preference relations based AHP. *European Journal of Operational Research*, *225*(1), 75–84. https://doi.org/10.1016/j.ejor.2012.09.037

Rezaei, J., & Ortt, R. (2013b). Supplier segmentation using fuzzy logic. *Industrial Marketing Management*, *42*(4), 507–517. https://doi.org/10.1016/j.indmarman.2013.03.003

Riege, A. M. (2003). Validity and reliability tests in case study research: A literature review with "hands-on" applications for each research phase. *Qualitative Market Research: An International Journal*, *6*(2), 75–86. https://doi.org/10.1108/13522750310470055

Rodríguez-Escobar, J. A., & González-Benito, J. (2015). The role of information technology in purchasing function. *Journal of Business and Industrial Marketing*, *30*(5), 498–510. https://doi.org/10.1108/JBIM-06-2012-0106

Ronchi, S., Brun, A., Golini, R., & Fan, X. (2010). What is the value of an IT e-procurement system? *Journal of Purchasing and Supply Management*, *16*, 131–140.

Rouyendegh, B. D., & Erkan, T. E. (2012). Selecting the best supplier using analytic hierarchy process (AHP) method. *African Journal of Business Management*, *6*(4), 1455–1462. https://doi.org/10.5897/ajbm11.2009

Rozemeijer, F. A., van Weele, A., & Weggeman, M. (2003). Creating Corporate Advantage

through Purchasing: Toward a Contingency Model. *Journal of Supply Chain Management*, *39*(4), 4–13.

Rubin, A., & Babbie, E. R. (2011). Research Methods for Social Work. In *Cengage Learning* (7th ed.). Brooks/Cole, Cengage Learning.

Saccani, N., & Perona, M. (2007). Shaping buyer-supplier relationships in manufacturing contexts: Design and test of a contingency model. *Journal of Purchasing and Supply Management*, *13*(1), 26–41. https://doi.org/10.1016/j.pursup.2007.03.003

Sammut-Bonnici, T. (2014). Complexity theory. In C. Sir Cooper (Ed.), *Wiley Encyclopedia of Management*. https://doi.org/10.1136/bmj.39602.443785.47

Sandelowski, M. (2000). Focus on research methods: Combining qualitative and quantitative sampling, data collection, and analysis techniques in mixed-method studies. *Research in Nursing and Health*, *23*(3), 246–255. https://doi.org/10.1002/1098-240x(200006)23:3<246::aid-nur9>3.0.co;2-h

Sarkar, A., & Mohapatra, P. K. J. (2006). Evaluation of supplier capability and performance: A method for supply base reduction. *Journal of Purchasing and Supply Management*, *12*(3), 148–163. https://doi.org/10.1016/j.pursup.2006.08.003

Sárközy, H., Balog, K., & Kumar, S. M. (2022). Accelerating trends in digitization : Fintech ' s progress in hungary and the world in the shadow of the global recession. *Economics & Working Capital*, (1–2).

Schiele, H. (2007). Supply-management maturity, cost savings and purchasing absorptive capacity: Testing the procurement-performance link. *Journal of Purchasing and Supply Management*, *13*(4), 274–293. https://doi.org/10.1016/j.pursup.2007.10.002

Schiele, H. (2019). Purchasing and Supply Management. In H. Zijm, M. Klumpp, A. Regattieri, & S. Heragu (Eds.), *Operations, Logistics and Supply Chain Management* (pp. 45–73). https://doi.org/10.1007/978-3-319-92447-2_4

Schoenherr, T. (2018). The evolution of electronic procurement: Transforming business as usual. *The Evolution of Electronic Procurement: Transforming Business as Usual*, 1–132. https://doi.org/10.1007/978-3-319-93985-8

Schulze, H., Bals, L., & Johnsen, T. E. (2019). Individual competences for sustainable

purchasing and supply management (SPSM): A literature and practice perspective. *International Journal of Physical Distribution and Logistics Management*, *49*(3), 287–304. https://doi.org/10.1108/IJPDLM-01-2018-0036

Seidman, I. (2006). Interviewing as Qualitative Research. In *Teachers College Press* (Vol. 58). Retrieved from https://linkinghub.elsevier.com/retrieve/pii/0022285261903472%0Ahttp://arxiv.org/abs/1011.1669%0Ahttp://dx.doi.org/10.1088/1751-8113/44/8/085201%0Ahttp://www.ncbi.nlm.nih.gov/pubmed/25246403%0Ahttp://www.pubmedcentral.nih.gov/articlerender.fcgi?artid=PMC4

Servajean-Hilst, R., & Calvi, R. (2018). Shades of the innovation-purchasing function-the missing link of open innovation. *International Journal of Innovation Management*, *22*(1). https://doi.org/10.1142/S1363919618500081

Seuring, S., & Müller, M. (2008). From a literature review to a conceptual framework for sustainable supply chain management. *Journal of Cleaner Production*, *16*(15), 1699–1710. https://doi.org/10.1016/j.jclepro.2008.04.020

Seyedghorban, Z., Samson, D., & Tahernejad, H. (2020). Digitalization opportunities for the procurement function: pathways to maturity. *International Journal of Operations and Production Management*, *40*(11), 1685–1693. https://doi.org/10.1108/IJOPM-04-2020-0214

Sjoerdsma, M., & Van Weele, A. (2015). Managing supplier relationships in a new product development context. *Journal of Purchasing and Supply Management*, *21*(3), 192–203. https://doi.org/10.1016/j.pursup.2015.05.002

Somekh, B., & Lewin, C. (2005). Research Methods in the Social Sciences. In *SAGE Publications*. Retrieved from https://www.researchgate.net/publication/215788544_Naturalistic_inquiry

Srai, J. S., & Lorentz, H. (2019). Developing design principles for the digitalisation of purchasing and supply management. *Journal of Purchasing and Supply Management*, *25*(1), 78–98. https://doi.org/10.1016/j.pursup.2018.07.001

Stek, K., & Schiele, H. (2021). How to train supply managers – Necessary and sufficient purchasing skills leading to success. *Journal of Purchasing and Supply Management*,

27(4), 100700. https://doi.org/10.1016/j.pursup.2021.100700

Suchman, M. C. (1995). Managing legitimacy: strategic and institutional approaches. *Academy of Management Review*, *20*(3), 571–610. Retrieved from https://patents.google.com/patent/US20070203521A1/en?q=diabetes&q=cephalic+phase&assignee=neuromodulation%0Ahttp://ir.obihiro.ac.jp/dspace/handle/10322/3933%0Ahttp://amr.aom.org/cgi/doi/10.5465/AMR.1995.9508080331%0Ahttp://www.lib.lsu.edu/apps/onoffcampus

Szukits, Á. (2017). Management control system design – the effect of tools in use on the information provided. *Vezetéstudomány / Budapest Management Review*, *48*(5), 2–13. https://doi.org/10.14267/veztud.2017.05.01

Szulanski, G. (1996). Exploring internal stickiness: Impediments to the transfer of best practice within the firm. *Strategic Management Journal*, *17*(SUPPL. WINTER), 27–43. https://doi.org/10.1002/smj.4250171105

Tarigan, Z. J. H., Siagian, H., & Jie, F. (2020). The role of top management commitment to enhancing the competitive advantage through ERP integration and purchasing strategy. *International Journal of Enterprise Information Systems*, *16*(1), 53–68. https://doi.org/10.4018/IJEIS.2020010103

Tassabehji, R., & Moorhouse, A. (2008). The changing role of procurement: Developing professional effectiveness. *Journal of Purchasing and Supply Management*, *14*(1), 55–68. https://doi.org/10.1016/j.pursup.2008.01.005

Tate, W. L., Ellram, L. M., & Dooley, K. J. (2012). Environmental purchasing and supplier management (EPSM): Theory and practice. *Journal of Purchasing and Supply Management*, *18*(3), 173–188. https://doi.org/10.1016/j.pursup.2012.07.001

Tchokogué, A., Paché, G., Nollet, J., & Stoleru, R. M. (2017). Intra-organizational legitimization strategies used by purchasing managers. *Journal of Purchasing and Supply Management*, *23*(3), 163–175. https://doi.org/10.1016/j.pursup.2017.04.001

Teece, D. J., Pisano, G., & Shuen, A. (2009). Dynamic capabilities and strategic management. *Knowledge and Strategy*, *18*(March), 77–116. https://doi.org/10.1093/0199248540.003.0013

Tilles, S. (1963). How to Evaluate Corporate Strategy. *Harvard Business Review*, *41*(4), 111–121.

Toluwase, O. F. (2017). Fiedler's contingency theory. *Academia: Accelerating the World's Research*.

Tóth, R., Gyurcsik, P., & Karabassov, R. (2020). Corporate capital structure in the context of value-centred corporate leadership. *Economics & Working Capital*, (1–2).

Tripathi, S., & Gupta, M. (2021). A framework for procurement process re-engineering in Industry 4.0. *Business Process Management Journal*, *27*(2), 439–458. https://doi.org/10.1108/BPMJ-07-2020-0321

Trkman, P., Kovačič, A., & Popovič, A. (2011). SOA adoption phases: A case study. *Business and Information Systems Engineering*, *3*(4), 211–220. https://doi.org/10.1007/s12599-011-0168-2

Trkman, P., & McCormack, K. (2009). Supply chain risk in turbulent environments-A conceptual model for managing supply chain network risk. *International Journal of Production Economics*, *119*(2), 247–258. https://doi.org/10.1016/j.ijpe.2009.03.002

Úbeda, R., Alsua, C., & Carrasco, N. (2015). Purchasing models and organizational performance: A study of key strategic tools. *Journal of Business Research*, *68*(2), 177–188. https://doi.org/10.1016/j.jbusres.2014.09.026

van den Bergh, J., & Viaene, S. (2012). Promises from SOA: Reengineering a procurement process at Belgacom Mobile - a case study approach. *Business Process Management Journal*, *18*(5), 815–828. https://doi.org/10.1108/14637151211270171

Van Lith, J., Voordijk, H., Castano, J. M., & Vos, B. (2015). Assessing maturity development of purchasing management in construction. *Benchmarking*, *22*(6), 1033–1057. https://doi.org/10.1108/BIJ-07-2014-0071

van Weele, A. (1984). Purchasing Control : Performance Measurement and Evaluation of Industrial Purchasing Function. *Unpublished Disertation*, (1984). https://doi.org/10.6100/IR126241

van Weele, A., & van Raaij, E. M. (2014). The future of purchasing and supply management research: About relevance and rigor. *Journal of Supply Chain Management*, *50*(1), 56–

72. https://doi.org/10.1111/jscm.12042

Veile, J. W., Schmidt, M., Müller, J. M., & Voigt, K.-I. (2021). Relationship follows technology! How Industry 4.0 reshapes future buyer-supplier relationships. *Journal of Manufacturing Technology Management*, *32*(6), 1245–1266. https://doi.org/10.1108/JMTM-09-2019-0318

Venter, A. C. (2007). A procurement fraud risk management model. *Meditari Accountancy Research*, *15*(2), 77–93. https://doi.org/10.1108/10222529200700012

Versendaal, J., Van Den Akker, M., Xing, X., & De Bevere, B. (2013). Procurement maturity and IT-alignment models: Overview and a case study. *Electronic Markets*, *23*(4), 295–306. https://doi.org/10.1007/s12525-013-0130-x

Vörösmarty, G., & Tátrai, T. (2012). *Beszerzés - Stratégia, folyamatok, információ*. Wolters Kluwer Hungary Kft.

Weigand, H., Van Den Heuvel, W. J., & Hiel, M. (2008). Rule-based service composition and service-oriented business rule management. *CEUR Workshop Proceedings*, *342*, 1–12.

Wittinger, M. M. (2019). Features of supplier management and its mechanisms – insights into Hungarian practice. How to enhance the effectiveness of procurement procedures? *Budapest Management Review*, *50*(11), 37–52.

Wittinger, M. M. (2022). Contingency factors of purchasing – a conceptual model to support procurement decisions. *Budapest Management Review*, *53*(5), 45–58.

Wittinger, M. M., & Demeter, K. (2024). Guidance on how to balance the purchasing environment and processes to save resources - a validity examination of a holistic model model. *Cogent Business & Management*, *11*(1), 1–35. https://doi.org/10.1080/23311975.2024.2374883

Wittinger, M. M., Demeter, K., & Avornicului, M. (2023). Applicability of a Strategic Tool to Reveal and Classify Problems and Mitigate Risks in Purchasing. *Economics & Working Capital*, *8*(1–2), 2–9.

Yin, R. K. (1994). Case studies as a research methodology. In *Case study research: design and methods* (Second Edi). https://doi.org/10.4324/9781315544892-8

Yin, R. K. (2012). Applications of Case Study Research. In *SAGE Publications*.

Youndt, M. A., Snell, S. A., Dean, J. W., & Lepak, D. P. (1996). Human resource management manufacturing strategy. *Academy of Management Journal*, *39*(4), 836–866. Retrieved from 10.2307/256714

Zairi, M. (1997). Business process management : a boundaryless approach to modern competitiveness. *Business Process Management Journal*, *3*(1), 64–80.

Zeydan, M., Çolpan, C., & Çobanoğlu, C. (2011). A combined methodology for supplier selection and performance evaluation. *Expert Systems with Applications*, *38*(3), 2741–2751. https://doi.org/10.1016/j.eswa.2010.08.064

Zimmer, K., Fröhling, M., & Schultmann, F. (2016). Sustainable supplier management - A review of models supporting sustainable supplier selection, monitoring and development. *International Journal of Production Research*, *54*(5), 1412–1442. https://doi.org/10.1080/00207543.2015.1079340

Other refences (in figures only)

Carr, A.S., Kaynak, H., Hartley, J.L., Ross, A. (2008). Supplier dependence: impact on supplier's participation and performance, International Journal of Operations and Production Management, 28(9), 899-916.

Chin, K.S., Yeung, I.K., Pun, K.F. (2006). Development of an assessment system for supplier quality management, International Journal of Quality and Reliability Management, 23 (7), 743-765.

Day, M., Magnan, G.M., Moeller, M.M. (2010). Evaluating the bases of supplier segmentation: A review and taxonomy, Industrial Marketing Management, 39 (4), 625-639.

De Toni, A., Nassimbeni, G. (2001). A method for the evaluation of suppliers' co-design effort, International Journal of Production Economics, 72 (2), 169-180.

García, N., Puente, J., Fernández, I., Priore, P. (2013). Supplier selection model for commodities procurement. Optimised assessment using a fuzzy decision support system, Applied Soft Computing, 13 (4), 1939-1951.

Gold, S., Seuring, S., Beske, P. (2010). Sustainable supply chain management and inter-organizational resources: a lifetime review, Corporate Social Responsibility and Environmental Management 17(4), 230-245.

Håkansson, H. Ford, D. (2002). How should companies interact in business environments, Journal of Business Research, 55, 133-139.

Jain, V., Tiwari, M.K., Chan, F.T.S. (2004). Evaluation of the supplier performance using an evolutionary fuzzy-based approach, Journal of Manufacturing Technology Management, 15 (8), 735-744.

Lee, D.M., Drake, P. (2010). A portfolio model for component purchasing strategy and the case study of two South Korean elevator manufacturers, International Journal of Production Research, 48 (22), 6651-6682.

Luzzini, D., Caniato, F., Ronchi, S., Spina, G. (2012). A transaction costs approach to purchasing portfolio management, International Journal of Operations and Production Management, 32 (9), 1015-1042.

Ohdar, R., Ray, P.K. (2004). Performance measurement and evaluation of suppliers in supply chain: an evolutionary fuzzy-based approach, Journal of Manufacturing Technology Management, 15 (8), 723-734.

Pagell, M., Wu, Z., Wasserman, M.E. (2010). Thinking differently about purchasing portfolios: an assessment of sustainable sourcing, Journal of Supply Chain Management, 46 (1), 57-73.

Shih, K.H., Hung, H.F., Lin, B. (2009). Supplier evaluation model for computer auditing and decision-making analysis, Kybernetes 38 (9), 1439-1460.

LIST OF ABREVIATIONS

List of abbreviations	Meaning
AHP	Analytic Hierarchy Process
AI	Artificial Intelligence
AP	Account Payable
AR	Acquisition Request
B2B	Business to Business
BD	Big Data
BMC	Business Model Canvas
BPM	Business Process Management
BPR	Business Process Reorganisation / Reengineering
BSC	Balanced Scorecard
BU	Business Unit
BUFU	Business Unit and Functional Unit
C2C	Customer to Customer
CA	Cluster Analysis
CAPEX	Capital Expenditure
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CI	Corporate Identity
COO	Chief Operating Officer
COVID 19	Coronavirus disease 2019
CPO	Chief Procurement Officer / Chief Purchasing Officer
CPS	Cyber-Physical System
CRM	Customer Relationship Management
CTA	Cross-tabulation analysis
DC	Dynamic Capabilities
DEA	Data Envelopment Analysis
DN	Delivery Note
EDI	Electronic Data Interchange
EDP	Electronic Data Processing
ERP	Enterprise Resource Planning
EUR	Euro (as currency)
FA	Factor Analysis
FC	Fulfilment Certificate
FL	Fuzzy logic
FTE	Full-Time Equivalent
FU	Functional Unit
GM	Governance Mechanisms
GPS	Global Positioning System
GTC	General Terms and Conditions
H	Half-year
HCA	Hierarchical Cluster Analysis

List of abbreviations	Meaning
HR	Human Resources
HSE	Health, Safety, Environment
I4.0	Industry 4.0
ICT	Information and Communication Technology
IFB	Invitation for Bid
IoS	Internet of Services
IoT	Internet of Things
IP	Internet Protocol
ISM	Interpretive Structural Modelling
ISO	International Standard Organization
ITB	Invitation to Bid
KOM	Kick-off Meeting
KPI	Key Performance (Process) Indicators
KRI	Key Risk Indicator
LAN	Local Area Network
LDA	List of Decision-makers and Authorities
M	Million (of some quantity, currency, etc.)
MA	Mathematical Analytical
MCDM	Multi-criteria Decision-Making
MOM	Minutes of Meeting
MP	Mathematical Programming
MRP	Material Requirement Planning
NA	Not available
NDA	Non-Disclosure Agreement
OD	Organisational Development
OEM	Original Equipment Manufacturer
OM	Operations Management
OPEX	Operating Expenditures
P2P	Procure to Pay
PCA	Principal Component Analysis
PC	Personal Computer
PO	Purchase Order
POS	Point of Sale
PP	Procurement Plan
PR	Purchase Requisition
PSM	Purchasing and Supply Management
Q	Quarter of a year
QR	Quick Response
R&D	Research and Development
R2P	Requisition to Pay
RACI	Responsible-Accountable-Consulted-Informed
RFB	Request for Bid
RFI	Request for Information
RFID	Radio-Frequency Identification

List of abbreviations	Meaning
RFO	Request for Offer
RFP	Request for Proposal / Request for Price
RFQ	Request for Quote / Quotation
RFT	Request for Tender
RFX	Request for any type (x) of procurement element
SCM	Supply Chain Management
SCOR	Supply Chain Operations Reference
SKU	Stock Keeping Unit
SLA	Service Level Agreement
SM	Supplier Management
SME	Small and Medium Enterprise
SOA	Service Oriented Architecture
SPSM	Sustainable Purchasing and Supply Management
SPSS	Statistical Product and Service Solutions by IBM Sciences
SRM	Supplier Relationships Management
SWOT	Strengths, Weaknesses, Opportunities, Threats
T&C	Terms and Conditions
TCO	Total Cost of Ownership
TPS	Toyota Production System
VA	Value Added
WMS	Warehouse Management System

APPENDICES

Appendix A: Interview guidelines of case study research

Connected articles

“Guidance on how to balance the purchasing environment and processes to save resources – A validity examination of a holistic model”

and

“Applicability of a strategic tool to reveal and classify problems and mitigate risks in purchasing”

A. Interviewer's section

Instruction: Put the question "Do you allow recording of the interview?"

- ❖ Introduction of the interviewer and personal motivation.
- ❖ Description of the research goal.
- ❖ Explanation of the reason for and importance of selecting the given company.

B. Interviewee's section

Instruction: Explain the opportunities regarding how data will be processed (based on the interviewee's statement): a) anonymously or b) openly

1. Questions about the interviewee:
    - What is your job position?
    - When did you start in this position?
    - How long have you worked in this position and in the purchasing area overall?
    - Can you provide a brief overview of your previous positions and the companies you worked for?
2. Questions about the company:
    - Can you give an overview of the company's core activity?
    - What are some key figures about the company, such as revenue, number of employees (FTEs), etc.?
3. Questions about the organisational unit and procurement work:
    - What level is the purchasing organisation within the company hierarchy (e.g., 3rd level or higher/lower)?
    - How is the purchasing organisation perceived within the company?
    - Does the company have a procurement strategy and planning process?
    - Could you describe the daily work in terms of IT systems/platforms/applications and regulation within the procurement department?
    - How many purchasing FTEs are there in the organisation and at the group level?
    - How many suppliers and contracts does the company typically manage?
    - What is the annual purchasing budget for the company?

4. Questions about weaknesses and strengths
    - In your opinion, what are the strengths of the purchasing process, and how do they contribute to the overall business processes?
    - Are there any challenges or weaknesses you encounter in your daily work or within the procurement processes?
    - If so, what are the reasons behind these weaknesses? Do you have any suggestions for improving the organization or increasing its effectiveness further?

5. Questions about "forces" factors

   Instruction: Do not disclose the term "forces!"
    - What factors, such as people or organizational units, influence your work?
    - Can you provide practical examples of how these various factors impact, influence, or determine the work and purchasing processes in practice?

6. Questions about "drivers" factors

   Instruction: Do not disclose the term "drivers!"
    - What factors, such as concepts, platforms/systems, workflows, or cooperation with different people, influence your work?
    - Can you provide practical examples of how these various factors impact, influence, or determine the work and purchasing processes in practice?

C. Conceptual model's section

Instruction: Reveal the model and explain the concept.

- ❖ Do you agree that certain elements exert significant influence on work processes? If so, do you recognize the presence of the following: requestor, supplier, internal regulations, and external rules?
- ❖ Do you agree that certain elements serve as key determinants in work processes? If so, do you acknowledge the importance of the following: strategies, cross-functional integration/cooperation, Supplier Management, and IT solutions?
- ❖ Do you have any remarks from the perspective of the conceptual model or any suggestions regarding it? Are there any uncovered topics or missing parts?

- Does it have any influence on your opinion, would you like to add (from the discussed aspects) something to your point of view? In other words, does the model change your point of view on how to regard the purchasing environment?
- What do you think, could the model help the daily work in connection with the purchasing activities, also, does it clarify this particular environment?

D. Administrative tasks

Instruction: Statement regarding data processing to be signed by the interviewee.

CORVINUS UNIVERSITY of BUDAPEST	**Corvinus University of Budapest** **Department of Logistics and Supply Chain Management**

The aim of the research is to examine the Procurement Organisation in the given company, its operating principles, and mechanisms. The Corvinus University of Budapest grants that the data are handled strictly confidentially, stored electronically for 5 (five) years, and used for research purposes only providing anonymity (if required) to the interviewee and company as well. We restrict access to the research material it shall be allowed to the affected researcher only.

STATEMENT OF INTERVIEW

Company's name: ……..……..

Interviewee's name: ……..……..……

Interviewee's position: ……..…….……..

The undersigned certifies that:

The purpose of the research is clear to me, I understand the intent of and my role in this research, and I was able to put my research-related questions.

I give my consent that the interview with me be recorded – including my personal data and company information – as a sound recording for research purposes only.

I declare that the data and information obtained in connection with the research during the interview will be treated confidentially by me.

I declare that the data and information I have provided about the company during the interview can be treated as follows:

☐ **Open**

☐ **Confidential**

Signature:

Dated: ……,,,,,,,,,,….. **…,,,,,,,,,,……..**

Appendix B: Questionnaire of survey research (4F4D Model)

Connected article

“Guidance on how to balance the purchasing environment and processes to save resources – A validity examination of a holistic model”

Corvinus University of Budapest
Department of Logistics and Supply Chain Management

The aim of this survey is to find out a tool that could help identifying factors that can affect the purchasing decisions, reducing the risk of decisions by their identification.

In addition, the research is also part of a doctoral (PhD) thesis,
where the complete anonymity is ensured to the respondents and their employing companies.

You can fill out the questionnaire online (it takes cca. 5 min.) via PC, mobile or tablet:

https: Procurement model

QR code:

NON-DISCLOSURE AND CONFIDENTIALITY STATEMENT

Researcher(s) ensure(s) that data are handled in a strictly confidential way,
used for research purposes only,
providing anonymity of both the respondent and its employer company.
We restrict access to the research material
it shall be allowed to the researcher(s) only.

Thank you very much for your valuable contribution to our research!

Before completing the questionnaire, we would like to establish a uniform interpretation by defining emerging concepts and outlining the research environment. Please carefully review the definitions, as their consistent interpretation is crucial for accurately and professionally completing the questionnaire. Thank you very much!

In our view, every procurement process (procedure) involves constant elements, including certain actors, conditions, and processes, which can be categorised into summary groups as follows:

Internal regulations: the embodiment and implementation of owner's and management's will (directives) through established rules that regulate already existing and functioning processes (such as procurement regulation, investment regulation, financial and accounting regulation, tax and legal regulation, code of ethics, etc).

Requestors: the internal customers of the procurement service (from co-organizations within the company). They initiate the purchase requisition and demand to purchase a product/service.

IT solutions: electronic/digital systems, platforms, applications for internal and external workflows, and procurement procedures (such as corporate workflows, SRM systems, electronic bidding, auction platforms, etc).

Cross-functional integration: cooperation between different co-organizations (business or functional) within the company, such as for procurement procedures or project works.

External rules: the embodiment and implementation of legislation and government will (national or local directives) through external rules (such as the Tax and Accounting Act, Competition Act, environmental protection rules, construction regulations, etc).

Suppliers: representatives/embodiments of the supply market and relevant business segment providing products and services, serving as the source for necessary resources.

Supplier Management: process and/or system for selecting, evaluating, and managing suppliers, including contract management, performance evaluation and monitoring, and encompassing the entire collaboration.

Strategies: governing (overarching) business principles guiding present and future business processes (such as purchasing, investment, tax, acquisition strategies, etc).

RQ1. Considering a procurement procedure from the submission of a request to the conclusion of a contract, and considering the previous definitions, please indicate – according to your opinion – to what extent do these particular elements influence (in any way, either in the sense of workflow/procedure or in the sense of concluding a contract) the procurement processes?

Choose one answer per line, please.

Factors	Not at all	Slightly	Neutral	Very	Completely
Internal regulations (accounting-tax, finance, law, etc.)	☐	☐	☐	☐	☐
Requestors (internal customers)	☐	☐	☐	☐	☐
IT solutions (systems and applications)	☐	☐	☐	☐	☐
Cross-functional integration (cooperation among internal co-departments)	☐	☐	☐	☐	☐
External rules (legislation and rules)	☐	☐	☐	☐	☐
Suppliers (representatives of the market)	☐	☐	☐	☐	☐
Supplier Management (evaluation and selection of suppliers)	☐	☐	☐	☐	☐
Strategies (business principles)	☐	☐	☐	☐	☐

RQ2. If you believe that other element(s) – that are not included in the list – may affect procurement processes, please name them below:

.....……

….....…

.....…

In our view, these certain elements can be defined as "Forces", and others as "Drivers" as follows, respectively:

Forces: These elements, including internal and external entities such as persons, organisations, and rules, have the authority to enforce or determine terms that must be included in a contract. During procurement processes, it is necessary to consult them as they influence or impose - beyond the procurement organisation - the inclusion or exclusion of general or specific conditions in a collaboration; thus, these elements can appear as contractual requirements that must be considered or complied with.

Drivers: These elements play a role in connecting and driving procurement processes. They establish a framework and provide a background for procurement work, facilitating connections between actors and guiding procurement processes. They influence the operation and management of purchasing, as procurement procedures are driven by the workflows according to specific strategies, and they take place with the help of or rest on certain systems and applications.

RQ3. Reconsidering a procurement procedure from the submission of a request to the conclusion of a contract, and again considering the previous definitions, please indicate which of the given elements do you consider to be Force and which one to be Driver?

Choose one answer per line, please.

Factors / Classification	**FORCE** It can enforce contractual terms	**DRIVER** It connects, drives, provides background and guides
Internal regulations (accounting-tax, finance, law, etc.)	☐	☐
Requestors (internal customers)	☐	☐
IT solutions (systems and applications)	☐	☐
Cross-functional integration (cooperation among internal co-departments)	☐	☐
External rules (legislation and rules)	☐	☐
Suppliers (representatives of the market)	☐	☐
Supplier Management (evaluation and selection of suppliers)	☐	☐
Strategies (business principles)	☐	☐

RQ4. How many years of procurement work experience do you have?

☐ less than 1 years

☐ more than 1, less than 3 years

☐ more than 3, less than 5 years

☐ more than 5, less than 10 years

☐ more than 10 years

RQ5. What is the name of the company you work for?

……

Appendix C: Questionnaire of survey research (Supplier Management)

Connected articles

“Features of Supplier Management and its mechanisms – Insights in Hungarian practice. How to enhance the effectiveness of procurement procedures”

and

“Digitalization aspects of the procurement organizations in supply chains”

Corvinus University of Budapest
Department of Logistics and Supply Chain Management

OBJECTIVE OF RESEARCH

The aim of this research is to examine the position of the Procurement Organisation in the given company, and on the one hand to be able to compare it to the benchmark data, on the other hand to have opportunity through the research result to improve its position and to enhance its legitimacy in company's organisation.

To fill in the questionnaire online (it takes cca. 15 min.), you can reach it via mobile or tablet:

https://goo.gl/3dRxDZ ***You can see the questions in Hungarian in italics!***

If you decide to fill in the questionnaire on paper, be so kind to return the scan copy to: mariamagdolna.wittinger@uni-corvinus.hu or the hardcopy to University (E.137).

NON-DISCLOSURE AND CONFIDENTIALITY STATEMENT

Corvinus University of Budapest ensures that data are handled in a strictly confidential way, used for research purposes only and as a basis for further research (if any), providing anonymity of both the respondent and the related company. We restrict access to the research material, it shall be allowed to the affected researchers and their co-workers only.

If, based on this questionnaire, Corvinus University of Budapest decides to continue the research at one of the inquired company, so it becomes subject of relevant research, University shall apply for an authorization/acknowledgement from the owner(s) or executive(s) of company to be involved in the research.

Thank you very much for your valuable contribution to our research!

We ask for your kind support that the questionnaire to be legibly filled in by your open opinion, thank you.

1. What is the name of company you work for?

Mely vállalatnál dolgozik?

……..…….……..…..

2. What is the company's size?

Milyen méretű a vállalat, amelynél dolgozik?

☐ Small and medium-sized (number of FTE < 250 people)
KKV (alkalmazottak száma < 250)

☐ Large, operating only in Hungary (number of FTE ≥ 250 people)
Nagyvállalat, magyarországi működéssel (alkalmazottak száma ≥ 250)

☐ Multinational
Multinacionális

3. What is the industry to which the company belongs?

Mely iparághoz tartozik a vállalata?

☐ Manufacturing/Production
Gyártó/Termelő

☐ Service
Szolgáltató

☐ Both
Mindkettő

4. What is the Procurement Organisation's level in the company?

Melyik szinten helyezkedik el a vállalaton belül a Beszerzés?

CEO: Chief Executing Officer; COO: Chief Operating Officer;
CFO: Chief Financial Officer; CPO: Chief Procurement Officer
directly linked: "=>"

☐ Second (e.g. CEO => CPO)
Második

☐ Third (e.g. CEO => COO => CPO or CEO => CFO => CPO)
Harmadik

☐ Fourth (e.g. CEO => COO => CFO => CPO)
Negyedik

☐ Lower ……***Please, describe below the given structure.***
Alacsonyabb

5. What type of procurement activity is there in your company?

Milyen típusú beszerzési tevékenység zajlik a vállalaton belül?

☐ Centralized procurement (there is only one integrated organization)
Központosított beszerzés (csak egy integrált szervezet van)

☐ Decentralized procurement (there are some organizations with similar tasks)
Decentralizált beszerzés (több olyan szervezet is van, amely hasonló feladatokat végez)

6. Is Procurement Organisation considered as a strategic department (involved in strategic decisions in this sense) in your company?

A Beszerzés stratégiai területnek számít-e (amely ilyen értelemben vesz részt a stratégiai döntésekben) a vállalatánál?

☐ Yes
Igen

☐ No
Nem

☐ I cannot decide it
Nem tudom eldönteni

7. Does Procurement Organisation have any strategic planning (e.g. Procurement Plan) for procurement processes in your company?

Van-e a Beszerzésnek bármilyen stratégiai tervezése a beszerzési folyamatokhoz (pl. Beszerzési terv) a vállalatán belül?

☐ Yes
Igen

☐ No
Nem

☐ I do not know
Nem tudom

8. If Procurement Organisation has strategic planning (e.g. Procurement Plan) how often is it revised?

Ha rendelkezik stratégiai tervezéssel (pl. Beszerzési terv), ezt milyen gyakran vizsgálják felül?

☐ On annual basis, at the planning
Éves szinten, a tervezésnél

☐ On H-basis (half-year)
Féléves szinten

☐ On Q-basis (quarter)
Negyedéves szinten

☐ Continuously (rolling planning)
Folyamatosan (gördülő tervezés)

9. Which digital systems/platforms/solutions/applications do exist in your company to help the procurement processes? Name them please. ***You can choose more than one option.***

Mely digitális rendszerek/platformok/megoldások/alkalmazások léteznek a vállalatnál, hogy segítsék a beszerzési folyamatokat? Nevezze meg őket. ***Több lehetőség közül választhat.***

☐ ERP system (e.g. SAP, Oracle) Name: ....……...…….
Integrált Vállalatirányítási Rendszer

☐ Procurement specific app for workflows (eg SRM) Name: …….....……...…….
Beszerzés specifikus applikáció munkafolyamatokhoz

☐ e-Auction system (for electronic auctions) Name: ……...…….
e-Aukciós rendszer (elektronikus aukciókhoz)

☐ e-Bidding system (for electronic bid submissions)Name: ……...…….
e-Ajánlatadási rendszer (elektronikus ajánlatadáshoz)

☐ Cloud IT solution Name: ……...…….
Felhőrendszer

☐ Mobile technology application Name: ……...…….
Mobil applikáció

☐ Supplier Management Name: ……...…….
Szállító Menedzsment

☐ Contract and/or Document Management Name: ……...…….
Szerződés és/vagy Dokumentum Menedzsment

☐ Other: …… Name: ……...…….
Egyéb

10. Are there electronic workflows for internal/external processes as follows?

You can choose more than one option.

Vannak-e elektronikus munkafolyamatok a belső/külső folyamatokhoz az alábbiak szerint?

Több lehetőség közül választhat.

☐ Purchase requisition (started by internal Requestor, received by Procurement)
Igényfeladás

☐ Purchase requisition approval
Igényengedélyezés

☐ Purchase Order (PO)
Megrendelés készítés

☐ Completion (Performance verification, Fulfilment approval)
Teljesítés igazolás (Teljesítmény ellenőrzés, Teljesítés jóváhagyás)

☐ RfX processes (e.g. for e-Bidding/e-Auction systems)
RfX folyamatok (pl. e-Ajánlatadás, e-Aukció esetén)

☐ Invoicing (Invoice Approval, Accounts Payable - AP)
Számlázás (számla igazolás, számla-kifizetés engedélyezés)

☐ Other: ……
Egyéb

11. How effective do you consider the cooperation between Procurement Organisation and Requestors (internal requestor departments)? ***Choose one.***

Mennyire tartja hatékonynak a Beszerzés és az Igénylő (belső kérelmező) közötti együttműködést? ***Egyet válasszon.***

☐	☐	☐	☐	☐
Not at all *Egyáltalán nem hatékony*	Slightly effective *Kevéssé hatékony*	Neutral *Semleges*	Very effective *Nagyon hatékony*	Completely *Teljes mértékben hatékony*

12. If electronic and paper based processes still exist simultaneously, what is the ratio between them? ***Choose one.***

Ha egyidejűleg léteznek elektronikus és papíralapú folyamatok, akkor milyen az arányuk? ***Egyet válasszon.***

☐ There are no paper based processes
Nincsenek papíralapú folyamatok

☐ 80% or more electronic – 20% or less paper based
80% vagy több elektronikus – 20% vagy kevesebb papíralapú

☐ 50% electronic – 50% paper based
50% elektronikus – 50% papíralapú

☐ 80% or more paper based – 20% or less electronic
80% vagy több papíralapú – 20% vagy kevesebb elektronikus

☐ There are no electronic processes
Nincsenek elektronikus folyamatok

13. How often does Procurement Organisation take part in personal meetings with Requestors to adjust the Procurement Plan and purchase requirements to the Action Plan?

Milyen gyakran vesz részt személyes megbeszélésen a Beszerzés az Igénylővel, hogy a beszerzési tervet és a követelményeket a cselekvési tervhez igazítsa?

☐ Never
Soha

☐ On annual basis, at the planning
Éves szinten, a tervezésnél

☐ On H-basis (half-year)
Féléves szinten

☐ On Q- basis (quarter)
Negyedéves szinten

☐ Monthly
Havonta

☐ More often: ……...…….…….
Sűrűbben

14. How do you think about your cooperation with Requestors? *Choose one.*

Hogyan vélekedik az Igénylővel való együttműködésről? *Egyet válasszon.*

☐	☐	☐	☐	☐
Different interests	No common interest	Neutral	There are common goals	We support each other
Eltérő érdekek	*Nincsenek közös érdekek*	*Semleges*	*Vannak közös érdekek*	*Támogatjuk egymást*

15. How many employees does the Procurement Organisation have? ***Please, give the exact or approximative number of FTE.***

Hány alkalmazottja van a Beszerzésnek? ***Kérjük, adja meg a pontos vagy egy megközelítő számot.***

……..…… FTE

16. What is your position at the Procurement Organisation?

Mi az Ön beosztása a vállalatnál?

☐ Associate (less than 5 years of working experience)
Munkatárs (5 évnél kevesebb szakmai gyakorlattal)

☐ Expert/Specialist (more than 5 years of working experience)
Szakértő (5 évnél több szakmai gyakorlattal)

☐ Category manager/Group leader
Kategória menedzser/Csoportvezető

☐ Manager/Department leader
Vezető/Osztályvezető

☐ Director/General Manager (or equivalent Executive)
Igazgató/Ügyvezető (vagy ennek megfelelő Felsővezető)

17. What is the ratio between personal meetings and non-personal contacts with Suppliers?

Mi a Szállítókkal kapcsolatok személyes és nem személyes találkozók aránya?

☐ More than 50% personal – less than 50% non-personal
Több, mint 50% személyes – kevesebb, mint 50% nem személyes

☐ More than 50% non-personal – less than 50% personal
Több, mint 50% nem személyes – kevesebb, mint 50% személyes

18. How important does your company consider the following factors? *Choose one per line.*

Mennyire tartja vállalata fontosnak a következő tényezőket? *Soronként egyet válasszon.*

Factors *Tényezők*	**Not at all** *Egyáltalán nem fontos*	**Slightly important** *Kevéssé fontos*	**Neutral** *Semleges*	**Very important** *Nagyon fontos*	**Completely** *Teljes mértékben fontos*
Development of digitized procurement activity *A beszerzési tevékenység digitalizált fejlesztése*	☐	☐	☐	☐	☐
Improvement of cross-functional cooperation (among divisions) *A keresztfunkcionális együttműködés javítása (vállalaton belül)*	☐	☐	☐	☐	☐
Training of procurement professionals *A beszerzési szakemberek képzése*	☐	☐	☐	☐	☐
Cost reduction *Költségcsökkentés*	☐	☐	☐	☐	☐
Quality enhancement *Minőség javítása*	☐	☐	☐	☐	☐
Finding the right Suppliers *A megfelelő Szállítók megkeresése*	☐	☐	☐	☐	☐
Establishment of long-term partnership with Suppliers *A Szállítókkal való hosszú távú partnerség kialakítása*	☐	☐	☐	☐	☐
Reducing the number of Suppliers *A Szállítók számának csökkentése*	☐	☐	☐	☐	☐
Evaluation of Suppliers *A Szállítók értékelése*	☐	☐	☐	☐	☐
Management of the relationship with Suppliers *A Szállítókkal való kapcsolat menedzselése*	☐	☐	☐	☐	☐
Development of procurement activity methodology (e.g. market research) *A beszerzési módszertan fejlesztése (pl. Piackutatás)*	☐	☐	☐	☐	☐
Environmental protection *Környezetvédelem*	☐	☐	☐	☐	☐

19. Which tools/methods do you apply during procurement processes in terms of Supplier Management? *You can choose more than one option.*

Milyen eszközöket/módszereket alkalmaz a beszerzési folyamatok során a Szállító Menedzsment szempontjából? *Több lehetőség közül választhat.*

☐ Prequalification of potential Supplier on professional experience basis
A potenciális Szállító szakmai tapasztalat alapú előzetes minősítése

☐ Prequalification of potential Supplier on financial data basis
A potenciális Szállító pénzügyi adatok alapú előzetes minősítése

☐ Post qualification of Supplier on simple task fulfilment basis by Requestor
A Szállító egyszerű feladatmegvalósítás alapú utólagos minősítése az Igénylő által

☐ Post qualification of Supplier on quality of task fulfilment and cooperation basis by Requestor
A Szállító minőségi feladatmegvalósítás és együttműködési alapú utólagos minősítése az Igénylő által

☐ Supplier Management by detailed monitoring of fulfilment by Procurement (in coop. Requestor)
Szállító Menedzsment a feladatvégrehajtásának részletes nyomon követésével a Beszerzés által (az Igénylővel együttműködve)

☐ Contract Management by periodical review (review and/or renegotiation of T&C – Terms and Conditions)
Szerződés Menedzsment időszakos felülvizsgálat által (az Általános Szerződési Feltételek felülvizsgálata és/vagy újra tárgyalása)

☐ Big Data or Forecasting (e.g. monitoring of financial figures or market events) related to Supplier
A Szállítóval kapcsolatos Big Data vagy előrejelzés elemzés (például pénzügyi adatok vagy piaci események nyomon követése)

☐ Other:
……..……
Egyéb

20. What is the ratio of the personal audit at the Supplier's site/plant?

Mi az aránya a személyes ellenőrzéseknek/ terület-bejárásoknak a Szállító telephelyén/üzemében?

☐ In more than 50% of cases
Az esetek több, mint 50%-ban

☐ In less than 50% of cases
Az esetek kevesebb, mint 50%-ban

21. What is the most general Supplier evaluation scheme during procurement bidding processes? ***You can choose more than one option.***

Mely a leggyakoribb Szállítói értékelési módszer a beszerzési folyamatok ajánlattétele során? ***Több lehetőség közül választhat.***

☐ TCO approach (Total Cost of Ownership - an integrated judgement of direct and indirect costs, considering as much conditions as possible)
TCO megközelítés (Teljes költség alapú - a közvetlen és közvetett költségek integrált megítélése, a lehető legtöbb feltétel figyelembevételével)

☐ 100% Price => Professional/technical capability is a precondition
100% Ár => Szakmai/technikai alkalmasság előfeltétel

☐ 60% or more Price – 40% or less Professional/technical capability
60% vagy több Ár - 40% vagy kevesebb Szakmai/technikai képesség

☐ 50% Price – 50% Professional/technical capabilities
50% Ár - 50% Szakmai/technikai képességek

☐ Other:
……..……
Egyéb

22. How important does the Procurement consider the following factors in Suppliers' evaluation? *Choose one per line.*

Mennyire tartja a Beszerzés fontosnak a következő tényezőket a Szállítók értékelésénél? *Soronként egyet válasszon.*

Factors *Tényezők*	**Not at all** *Egyáltalán nem fontos*	**Slightly important** *Kevéssé fontos*	**Neutral** *Semleges*	**Very important** *Nagyon fontos*	**Completely** *Teljes mértékben fontos*
Good company reputation *Jó vállalati hírnév*	☐	☐	☐	☐	☐
Favourable payment terms *Kedvező fizetési feltételek*	☐	☐	☐	☐	☐
Reasonable price *Méltányos ár*	☐	☐	☐	☐	☐
Low shipping cost *Alacsony szállítási költség*	☐	☐	☐	☐	☐
Stability of the supply *Az ellátás stabilitása*	☐	☐	☐	☐	☐
Precise delivery *Pontos szállítás*	☐	☐	☐	☐	☐
Short delivery time *Rövid szállítási határidő*	☐	☐	☐	☐	☐
Flexibility in schedule changes *Rugalmasság az ütemezés módosításában*	☐	☐	☐	☐	☐
High technological level *Magas technológiai színvonal*	☐	☐	☐	☐	☐
High product/service quality *Magas termék/szolgáltatási minőség*	☐	☐	☐	☐	☐
Favourable connected services *Kedvező kapcsolt szolgáltatások*	☐	☐	☐	☐	☐
Geographical proximity of Supplier *A Szállító földrajzi közelsége*	☐	☐	☐	☐	☐
Quality management system (e.g. ISO Certification) *Minőségirányítási rendszer*	☐	☐	☐	☐	☐
Participation in product development *Részvétel a termékfejlesztésben*	☐	☐	☐	☐	☐

23. How do you consider and handle your Supplier? *Choose one.*

Hogyan ítéli meg, illetve kezeli Szállítóját? *Egyet válasszon.*

☐ As a source of materials/goods/services
Mint az anyagok/áruk/szolgáltatások forrását

☐ As a competitor
Versenytársként

☐ As a partner
Partnerként

24. How effective do you consider the Supplier Management at your company? *Choose one.*

Mennyire tartja hatékonynak a Szállító Menedzsmentet a vállalatánál? *Egyet válasszon.*

☐	☐	☐	☐	☐
Not at all *Egyáltalán nem hatékony*	Slightly effective *Kevéssé hatékony*	Neutral *Semleges*	Very effective *Nagyon hatékony*	Completely *Teljes mértékben hatékony*

25. Which conditions and to what extent do you consider necessary for a good cooperation between Procurement and Suppliers? *Choose two (* **Proc.** *and* **Supp.** *) per line.*

Mely feltételek és milyen mértékben tartja szükségesnek a Beszerzés és a Szállítók közötti jó együttműködéshez? *Soronként kettőt (* ***Besz.*** *és* ***Száll.*** *) válasszon.*

Factors *Tényezők*	**Proc.** *Besz.*	**Supp.** *Száll.*	**Proc.** *Besz.*	**Supp.** *Száll.*	**Proc.** *Besz.*	**Supp.** *Száll.*	**Proc.** *Besz.*	**Supp.** *Száll.*	**Proc.** *Besz.*	**Supp.** *Száll.*
	Not at all *Egyáltalán nem fontos*		**Slightly important** *Kevéssé fontos*		**Neutral** *Semleges*		**Very important** *Nagyon fontos*		**Completely** *Teljes mértékben fontos*	
Fairness *Korrektség*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Trust *Bizalom*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Reliability *Megbízhatóság*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Punctuality *Pontosság*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐
Cooperation *Együttműködés*	☐	☐	☐	☐	☐	☐	☐	☐	☐	☐

26. How is the work organized within the Procurement Organization according to the purchasing processes? *Choose one.*

Hogyan vannak kialakítva a beszerzési munkafolyamatok a Beszerzésnél? *Egyet válasszon.*

☐ Based on Purchase categories
Beszerzési kategóriák alapján

☐ Based on Requestor (internal customer)
Igénylő (a belső megrendelő) alapján

☐ Based on Supplier's features (e.g. key Supplier, geographical areas, etc.)
Szállítói jellemző alapján (például kulcs-szállító, földrajzi területek stb.)

☐ Other:

……..……
Egyéb

27. How do you think about your cooperation with Suppliers? *Choose one.*

Hogyan vélekedik a Szállítóval való együttműködésről? ***Egyet válasszon.***

☐	☐	☐	☐	☐
Different interests	No common interest	Neutral	There are common goals	We support each other
Eltérő érdekek	*Nincsenek közös érdekek*	*Semleges*	*Vannak közös érdekek*	*Támogatjuk egymást*

28. What is your opinion about Corporate Identity (CI) as the image/signature of the company? *Choose one.*

Mi a véleménye a Vállalati Identitásról (VI), mint vállalati arculat/aláírás? *Egyet válasszon.*

☐ Corporate Identity of company influences the behaviour of Procurement Organization
A Vállalati Identitás befolyásolja a Beszerzési szervezet magatartását

☐ Corporate Identity of company influences the attitude of Suppliers how to think about Procurement Organization of the given company
A Vállalati Identitás befolyásolja a Szállítók hozzáállását, hogyan vélekednek az adott vállalat Beszerzéséről

☐ There is no connection between Corporate Identity and behaviour/attitude
Nincs kapcsolat a Vállalati Identitás és a viselkedés/hozzáállás között

☐ I cannot decide it
Nem tudom eldönteni