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Differentiating between direct and indirect procurement: roles, skills, and Industry 4.0

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Abstract: The distinction between direct and indirect material procurement is widely understood in practice but only faintly described in research. To manage both, specific purchasing strategies, processes, tools, and skills are needed. With the increasing attention to purchasing competencies and the influence of digitalisation within the purchasing field, this research sheds light on the management of both commodity types, focusing on the difference in skills needed. This research takes an explorative approach by using a world café study with 81 procurement professionals to assess future purchasing skills. Results show that the responsibility for innovation buying is expected to increase for direct purchasers, a wave of internationalisation and the associated need for cultural, communication and flexibility and agility skills is expected for indirect purchasers. This research contributes by structuring previously unstructured phenomena within the human-centric profession by addressing specific purchasing roles and changing skill requirements within the field's current digital transformation.

Keywords: professional roles; skills; indirect and direct material; purchasing and supply management; Industry 4.0; direct and indirect spend; non-production-related costs; indirect expenditure; indirect purchasing; indirect procurement.

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1 Introduction

Today’s procurement professionals are specialists in their tasks and can boost companies’ competitiveness and performance (Barnes and Liao, 2012; Nair et al., 2015). The purchasers’ task-specific specialisation arises from an increasing maturity level in purchasing, where highly mature organisations define specific professional roles and mandates according to business practices (Schiele, 2007). These professional roles, also referred to as profiles or job descriptions, are defined according to the firm’s functional purchasing strategy, business environment, and firm-specific characteristics, including product categories and purchasing portfolios (Knight et al., 2014; Schiele, 2019). Two of the purchasing roles most often used in practice are purchasers of direct and indirect materials (Schiele, 2019). The distinction between direct and indirect procurement is used across manufacturing, oil and gas, and service industries (Hartley and Choi, 2020). Direct material purchasers procure goods necessary for a firm’s final product – for example, the tyres needed to build a car in the automotive industry. On the other hand, purchasers of indirect materials purchase goods needed to ensure the firm’s everyday business unrelated to the final product – for example, office supplies and telecommunication equipment for employees (Chopra and Meindl, 2007; Vos et al., 2016). Practitioners in procurement make this specific distinction between the two very different roles, reflecting the traditional division of two purchasing items (e.g., Heikkilä et al., 2018). Thus, both purchasing categories need to be managed differently (e.g., Carter et al., 2003). For instance, direct material purchasing often focuses on close relationships with a few suppliers to reduce cost, co-develop innovations, and improve long-term performance (Heikkilä et al., 2013; Vos et al., 2016). In contrast, indirect material

purchasing works with many suppliers of routine products, focusing on greater efficiency in the purchasing process (Cox et al., 2005).

It is worth noting that the distinction between direct and indirect materials purchasing is commonplace in practice but seldom researched and discussed in academia (Darom and Plant, 2020; Kim and Shunk, 2004; Niederschweiberer and Kleemann, 2020; Vos et al., 2016). Vos et al. (2016) are a rare exception, being the first to provide empirical evidence on the differences by comparing supplier satisfaction with vendors of indirect and direct materials. A buyer's innovation potential was found to be more relevant for direct suppliers than indirect material suppliers in determining the attractiveness of a customer. Lindgreen et al. (2013) showed that transactional sourcing tactics are typically used for indirect spend, while direct spending requires network purchasing. In practical terms, Darom and Plant (2020) have developed a KPI model for indirect procurement, complaining that they could only identify two previous papers on indirect materials. Classical purchasing textbooks are largely silent on the differences and strategies for sourcing the two commodity types or they address the topic only briefly (Monczka et al., 2015). Further research is needed to close this academic–practitioner gap and to generally shine a light on this neglected feature of purchasing. Future studies that investigate the differences between the material categories will contribute to their better management over time.

To address this significant gap in the knowledge, the procurement field requires further studies to address indirect spend strategies as increasing digitalisation sweeps the field. The business environment of firms is changing in response to the new technologies used in business – starting in the past with the digitalisation of procurement (Lorentz et al., 2021). Currently, the fourth industrial revolution, I4.0, has exercised a significant influence on procurement organisation and practice (Glas and Kleemann, 2016; Kagermann, 2015; Schiele and Torn, 2020). In procurement, large volumes of work, especially repetitive tasks, can be automated (Flehsig et al., 2021; Srari and Lorentz, 2019). Furthermore, technologies such as big data analytics and artificial intelligence benefit the decision-making process in procurement by preparing supplier selections, negotiations, and supply risk management (Ivanov et al., 2019; Schulze-Horn et al., 2020; Wehrle et al., 2021). Thus, a significant impact on procurement roles and skills is to be expected from technologies (Delke et al., 2021b; Santanam and Duarte, 2022). For example, specific skills are required to benefit the direct material purchaser from advanced supply-chain risk analyses and the purchaser of indirect materials from utilising online marketplaces (Ivanov et al., 2019; Santanam and Duarte, 2022). By researching both roles separately, firms may finally benefit from B2B online marketplaces, which have shown considerable promise for more than 25 years (Boulaye et al., 2019; Hawking et al., 2004).

The presented research considers purchasing skills as a point of entry, particularly reflecting the increasing attention to purchasing competencies (Stek and Schiele, 2021). Skill sets are not stable phenomena and change according to changes in the firm's strategy or business environment. Various scholars have addressed purchasing and supply management (PSM) professional skills by developing models to describe the skills needed by procurement professionals (Bals et al., 2019; Giunipero and Percy, 2000; Tassabehji and Moorhouse, 2008). The scientific work of Mulder et al. (2005) addressed the specific link between different job profiles or roles within purchasing and the specific skills needed. Thus, a direct link between the purchasing tasks and skills has been established (Faes et al., 2001). When focusing on firms' characteristics, such as business

strategy, organisational structure, sourced commodity groups, and processes, it is necessary to distinguish between different purchasing roles (Knight et al., 2014; Mulder et al., 2005; Schiele, 2019). If there is a managerial difference between the two types of material, then dissecting the skills purchasers need to manage them would be a clear indication. Against this background, our study explores the current and future skills needed for the most common purchasing roles – the direct and indirect material purchasers. Therefore, this research addresses two research questions:

- 1 What are the main differences between purchasing direct versus indirect materials/services? Is there empirical evidence to show the relevance of the distinction between the types of material?
- 2 Which skills are essential for direct and indirect purchasers in digitally transformed procurement?

A large world café study with 81 global procurement professionals was conducted to differentiate between direct and indirect procurement and the skills needed. A list of 32 future skills was compiled and a systematic voting procedure provided insights into the significant differences between the two purchasing roles. It also yielded insights into the purchasing skills expected to be most relevant in the future for direct and indirect material purchasers.

This paper makes a unique contribution by indicating a clear and significant difference between direct and indirect material purchasers and their skill bases. Findings suggest that procurement research would benefit – and gain practical relevance – by systematically adopting the lens of differentiating between the purchased goods. This research further contributes to the purchasing skills and I4.0 literature by providing evidence for different future expectations. While the role of innovation buying is expected to increase for direct purchasers, a wave of internationalisation (and the associated need for cultural, communication, flexibility, and agility skills) is expected to face indirect purchasers. In broader terms, recognising a significant difference provides the evidence needed to establish a dedicated research stream on indirect procurement management. Furthermore, another future skill, previously little discussed, was identified – ‘inter-generational collaboration’. This may become necessary to navigate a world with an ageing population, in which purchasers’ growing age differences with their interface partners is increasingly evident.

The following section discusses the theoretical background of a changing procurement environment and the skills in purchasing that are necessary in consequence. Then, the world café method is described as a means to acquire empirical insights. The outcome of the methodology employed is presented in the results section, and its importance is discussed from a theoretical and managerial perspective.

2 Theoretical background: the demand for future purchasing skills for specific purchasing roles

2.1 Differentiating direct and indirect material procurement

The importance of indirect materials was identified early on within the field of procurement, where ‘supplies that are necessary for operation of the enterprise’

[Kirkman, (1887), p.26] must be managed adequately. More precisely, in comparison with direct materials, these indirect materials should ‘be guarded with equal intelligence’ [Kirkman, (1887), p.28]. However, only direct procurement has received adequate research attention due to its significant influence on the final manufactured product (Vos et al., 2016). Less attention has been given to the procurement of indirect materials (Kim and Shunk, 2004; Lindgreen et al., 2013). Two different fields are observed by comparing direct and indirect material procurement Table 1. *Direct materials are those that disappear in the final product, while indirect materials/services are necessary to enable the production of the product but do not become part of it* (Cox et al., 2005; Heikkilä et al., 2013). Direct purchases typically include raw materials and services used in production. Purchasing indirect materials includes those purchases needed to ensure the firm’s everyday business and maintain the infrastructure of production/service provision (Chopra and Meindl, 2007; Vos et al., 2016).

In manufacturing firms, indirect materials often represent smaller expenditures (Heikkilä et al., 2013). In contrast, in service firms and public organisations, indirect materials often represent a significant proportion of purchases (Boulaye et al., 2019; Cox et al., 2005). From an accounting perspective, direct materials tend to be variable costs, whereas many indirect materials have the character of fixed costs, such as infrastructure (Carter et al., 2003; Chopra and Meindl, 2007). In the literature, various terms exist for indirect materials – for example, non-production related costs (Kalakota et al., 2001), indirect expenditure (Luzzini et al., 2014), indirect purchasing (Scott et al., 2018), indirect procurement (Gebauer and Segev, 2000), and indirect spend (Cox et al., 2005). While terminology and categorisation may change to some extent depending on the business and supply chain perspective, typical commodity groups of indirect materials include [Cox et al., (2005), p.40]:

- 1 Electrical and mechanical parts and equipment (including materials to support capital projects)
- 2 Electronic parts and equipment (including computers, telecommunications, and peripherals)
- 3 Professional equipment (including laboratory equipment and supplies)
- 4 Industrial supplies (including general maintenance supplies)
- 5 Safety and healthcare equipment, parts, and supplies
- 6 Machine shop supplies (industry machinery, equipment, and tools)
- 7 Office supplies and equipment
- 8 Chemical supplies and equipment
- 9 Vehicle and fleet parts, equipment, and supplies

Furthermore, another commodity group needs to be added to the list as 10 – transport/logistics services, marketing/promotion, legal service/insurance, facility/real estate, and energy. Given this wide range of items, it might be possible to group indirect materials into two types: investment goods such as machines, including their maintenance, and infrastructure goods such as computers, office equipment, fleet, and telecommunications.

Table 1 Differentiating typical direct and indirect procurement

	<i>Direct procurement</i>	<i>Indirect procurement</i>
Definition	Purchasing of direct materials includes those purchases that are necessary for the firms' final product, such as raw materials and components used in the production process	Purchasing indirect materials includes those purchases that are needed to maintain the everyday business of the firm, such as office supplies, telecommunication products, and maintenance and cleaning services
Time perspective	Long term, also entire series	Short term, spot
Number of suppliers	A few suppliers	Many suppliers
Spend characteristics	Homogeneous spend	Heterogeneous spend
Strategic focus	Price reduction and collaboration, relational view	Efficiency and process optimisation, transaction cost perspective
Sourcing strategies	Focus on price reduction	Focus on process efficiency
End-user relevance	Visible	Not visible to end customer
Predictability	High	Low
Value per transaction	High	Low
Order size	Large	Small
Number of transactions	Low	High
Processing cost relative to the value of each transaction	Low	High
Communication with supplier	Frequent	Less frequent
Communication focus	External, e.g., suppliers	Internal, e.g., business units
Buyer–supplier relationship	Close relationship (partnership in some cases)	Loose relationship (transactional)
Outsourcing of procurement activities	Less likely	Likely to outsource to a third party
Kraljic portfolio	Strategic, bottleneck	Routine, leverage
Research attention	Significant research efforts	Less attention on research
Research focus	Cost reduction techniques, buyer–supplier relationships, innovation sourcing, supply risk assessment, transparency	Automatisation, process efficiency

Notes: Table references: Chopra and Meindl (2007), de Boer et al. (2003), Hawking et al. (2004), Kim and Shunk (2004), Nandeesh et al. (2015), Neef (2001), Vos et al. (2016), Cox et al. (2005), Lindgreen et al. (2013), Lorentz et al. (2021), Schiele (2019), Carter et al. (2003), Hartley and Choi (2020), Monczka et al. (2015).

Direct material procurement benefits from plenty of attention due to its significant impact on the firm's expenditure and cost-saving potential (de Boer et al., 2003). As a result, firms strive for high levels of professionalism in direct material purchasing, reaching a higher organisational maturity level. Here, direct materials have a higher purchasing

volume, high demand predictability, and standardised items procured (Vos et al., 2016). The volume per order is usually higher for direct material purchasing, resulting in fewer transactions (Chopra and Meindl, 2007). Moreover, due to the high standardisation of items and the lower number of transactions, a smaller number of core suppliers are involved in direct material procurement (Nandeesh et al., 2015). Due to the sizeable number of standardised items, fewer transactions, and larger purchasing volume, almost all direct material purchases are managed by the procurement organisation (Merkel et al., 2008).

In today's industry, not all resources for indirect materials are administrated solely by purchasing, showing a low level of procurement professionalism and maturity. Low levels of professionalism and efficiency can be observed in indirect procurement due to the high number of non-standardised purchases (Nandeesh et al., 2015). 'Maverick buying' – purchasing goods outside a professionally negotiated contract – is more of a problem in indirect than in direct buying (Kauppi and Van Raaij, 2015; Monczka et al., 2015). Thus, centralising and standardising the procurement of indirect goods and services can facilitate greater control over the spending and higher professionalism, resulting in greater purchasing maturity (Carter et al., 2003; Ellram et al., 2004; Soliman et al., 2005). While scholars previously paid only limited attention to the field of indirect material purchasing, they now explore the usefulness of e-purchasing or e-procurement software and technologies in indirect procurement to save time and cost (Gebauer and Segev, 2001; Kim and Shunk, 2004; Lorentz et al., 2021). It is assumed that using these technologies facilitates price reduction, improved contract compliance, reduced administration costs, enhanced inventory management, improved visibility of customer demand and the supply chain, reduced operating and inventory costs, shortened procurement cycle times, negotiated unit cost reduction, increased accuracy of production capacity, enhanced decision making, and improved market intelligence (Hawking et al., 2004; Santanam and Duarte, 2022). To increase indirect purchasing maturity, various e-purchasing and e-procurement tools are available. Moreover, new technologies will be introduced in purchasing in the course of I4.0 (Caiado et al., 2021; Glas and Kleemann, 2016; Kim and Shunk, 2004). However, to implement these solutions, barriers, such as inadequate technological infrastructure, company culture, security, implementation cost, cooperation with business partners, upper management support, and lack of skilled personnel, have to be overcome (Hawking et al., 2004). The lack of skilled employees, in particular, has not received attention in indirect material procurement (Santanam and Duarte, 2022). Therefore, future procurement professionals in direct and indirect material procurement must be equipped with the knowledge and skills needed to perform their tasks professionally.

2.2 The path from general purchasing skills to professional roles

The work of Giunipero and Percy (2000) summarised the 20th-century skills research findings in purchasing, displaying the scientific reports on longitudinal research of the Centre of Advanced Purchasing Studies in 1993 and 2000 (Giunipero and Percy, 2000; Kolchin and Giunipero, 1993). Subsequently, the work of Tassabehji and Moorhouse (2008) identified and categorised various technical, interpersonal, internal/external enterprise, and strategic business skills. Past research on purchasing skills focused on identifying and categorising skills within purchasing (Eltantawy et al., 2009; Tassabehji and Moorhouse, 2008). Therefore, a list of skills has been pinpointed for the increasingly

strategic role of procurement. Bals et al. (2019) provided insights into the skills that will be needed for purchasing in the future. The later sections of this paper will build on the purchasing skills identified by Bals et al. (2019), addressing changing skill requirements based on the advent of the fourth industrial revolution.

Turning away from a generalist perspective on purchasing skills, the number of publications addressing the link between skills and purchasing tasks has increased within the last two decades. Based on purchasing objectives, Kiratli et al. (2016) focused on the impact of creativity in changing cross-functional teams. Furthermore, Legenvre and Gualandris (2018) concentrated on the critical capabilities for innovation sourcing success. Following on, Schulze and Bals (2020) identified the skills needed to foster sustainability in procurement. Recently, Stek and Schiele (2021) categorised the necessary skills according to seven purchasing objectives. For a detailed overview of past research on purchasing skills, see (Stek and Schiele, 2021). However, previous research has paid scant attention to the combining of skill sets for different roles in procurement. Today's procurement professionals are specialists in their tasks and utilise their skills to boost their firms' competitiveness and performance. Reinecke et al. (2007) showed that the practices of employees and their related people skills have a significant influence on purchasing performance. Thus, scholars see a direct link between employees' skills and their firms' competitiveness (Eltantawy et al., 2009).

A range of different jobs exists within purchasing, relating to the tasks the procurement professional is called on to perform (Knight and Harland, 2005; Mulder et al., 2005; Schiele, 2019). The work of Schiele (2019) offers a categorisation of seven roles:

- 1 operational procurement
- 2 purchaser of direct materials/serial purchaser
- 3 purchaser of indirect materials
- 4 public procurement
- 5 purchasing engineer
- 6 chief purchasing officer (CPO)
- 7 other specialised roles, such as purchasing controller, supply risk manager, and purchasing human resources agent.

The second category focuses on the difference between the purchaser of direct and indirect materials, which are central to this research. However, the distinction in the types of goods sourced has been sparsely researched, and the related purchasing roles are only partly formed. However, the work of Knight et al. (2014) is an exception; it explores the link between purchasing type and purchasing skill, identifying 33 skills related to the responsibility for buying strategic, tactical, and routine products. Following Knight et al. (2014), future professional roles for different commodity types – for example, direct and indirect materials – are still needed. This paper focuses on the specific knowledge and skills, both technical and industrial, that are necessary to generate specific purchasing roles rather than on the more generic, behavioural competencies.

2.3 The fourth industrial revolution as a challenge for purchasing

Procurement is changing rapidly, strongly influenced by the technologies available through the fourth industrial revolution. The fourth industrial revolution –I4.0 – has been described as follows: “*I4.0 is characterised by cyber-physical systems with autonomous machine-to-machine communication*” [Schiele and Torn, (2020), p.512]. Furthermore, scholars have identified various technologies shifting the industry environment towards a new paradigm. These emerging technologies include blockchain technology, 3D printing, cyber-physical systems, digital twins, big data analytics, and artificial intelligence (Kouhizadeh et al., 2021; Schiele et al., 2021; Schiele and Torn, 2020).

Emerging technologies are likely to impact procurement (Schiele and Torn, 2020). For instance, for direct materials within production processes, cyber-physical systems connect the physical and digital worlds through sensors and actuators (Monostori, 2014). Connecting the physical and digital worlds facilitates demand identification without direct human intervention. Furthermore, artificial-intelligence-based algorithms support the planning and forecasting of demand, especially for production-related goods (Bohanec et al., 2017; Dubey et al., 2020). Thus, operational planning decisions are reduced, and demand forecasting accuracy is improved by relying on big data analytics (Bohanec et al., 2017). New technologies also support the identification and selection of suppliers using sophisticated text mining, data analysis, and interactive communication bots (Schiele and Torn, 2020). This reduces the effort in identifying suppliers and increases the number of addressed suppliers by using artificial intelligence to improve processes such as preparing quotation requests by analysing previous quotations (Allal-Chérif et al., 2021). Furthermore, well-coded algorithms take over a significant part of the offer pre-selection process, leaving procurement professionals with the more strategic role of preparing rather than executing the process (Lorentz et al., 2021). For negotiations, research has highlighted the potential of artificial intelligence to support negotiation design and execution (Schulze-Horn et al., 2020). For indirect materials, significant cost-saving opportunities are expected, based on online marketplaces, which will support the bidding processes (Santanam and Duarte, 2022).

Furthermore, the operational ordering of parts and products is managed by e-procurement systems that are already widely available today (Kauppi et al., 2013; Walker and Harland, 2008). However, human interaction is often needed (Zunk et al., 2014). Using e-procurement systems supports procurement professionals in managing orders and suppliers, reducing their involvement in operational tasks and facilitating greater involvement in strategic tasks, such as supply chain risk management of direct materials (Ivanov et al., 2019). From a risk-management perspective, new technologies, such as blockchain, enhance the clarity of the process by creating a truly transparent supply chain (Kouhizadeh et al., 2021; Tapscott and Tapscott, 2017). Thus, procurement professionals notice potential delays and interruptions early on, prompting corrective action.

These technological developments significantly affect purchasing practices, creating new challenges and opportunities in the field, and requiring new procurement roles and skills (Delke et al., 2021a; Santanam and Duarte, 2022). Consequently, a purchasing-skills perspective for direct and indirect procurement benefits from focusing on the present and the changing business landscape of the fourth industrial revolution.

3 Design and methodology: the World Café method as an explorative research method to intensify essential future purchasing skills

3.1 *The World Café method as explorative research design*

To test potential differences between direct and indirect procurement based on the respective future-proof skills samples, a research design is used to identify important skills for future purchasing tasks. To this end, the World Café method – an exploratory-quantitative research approach – was employed. The World Café method was developed to enable discussions in small focus groups on selected subjects for large-group interventions (Brown, 2010; Prewitt, 2011; Wibeck et al., 2007). Compared to other qualitative research methods – for example, multiple-case studies or expert interviews – the World Café method provides similar results in a shorter time (Schiele et al., 2022). The relation between the time needed and the output achieved is considered the main benefit of this method. Furthermore, the data obtained are enriched and the bias reduced due to the variation in the group configuration and the discussion among participants (Fouché and Light, 2011). Finally, the iterative process of the World Café method delivers stable and reliable data (Kidd and Parshall, 2000). By conducting a voting procedure at the end, this method promotes unique quantitative insights by which skills are ranked according to their importance in future direct and indirect procurement (Schiele et al., 2022). Furthermore, the paper reports the empirical findings and follows an interpretative approach. As a result, we added six propositions to our research outcome. See Schiele et al. (2022) for details of the World Café method.

Table 2 Case company and sample characteristics

Case company*	Industry	Manufacturing small appliances
	Location	Worldwide, headquartered in Europe
	Number of manufacturing sites	< 50
	Production in Europe	30%
	Products manufactured in-house	60–70%
	Employees	> 30,000
	Revenue	> €5,000 million
	Purchasing volume	> €3,000 million
	Direct spend	≈ 60%
	Indirect spend	≈ 40%
	Number of suppliers	< 5,000
	Number of listed suppliers accounting for 70% of the purchasing volume	≈ 1,000
	Number of listed direct suppliers	≈ 400
	Number of listed indirect suppliers	≈ 700
Sample characteristics	Participants	81 procurement directors
	Direct material purchasers	44
	Indirect material purchasers	37
	Female	24
	Male	57

Note: *The data is based on the annual report of 2018.

The data were collected at a European-based multinational corporation that produces small appliances (see company characteristics in Table 2). The firm is divided into different business units across multiple countries that produce different products and brands. Most of the direct material buying is decentralised. Recently, the company started to centralise indirect material buying, which corresponds to common procurement practices (Carter et al., 2003; Hartley and Choi, 2020; Monczka et al., 2015). A total of 81 procurement professionals from around the world engaged in the research, gathering for the future-oriented workshop at their headquarters. The sample consisted of 44 direct material buyers and 37 indirect material buyers. The participants in the World Café represent a crucial success factor in the execution of this method and in the validity of the results. Based on the size, age, professionalism, and purchasing maturity of the company, the data provided by the sample of participants are assumed to be valid for purchasing-related topics (see Table 2).

3.2 Rigorous setup of the World Café to ensure valuable research outcomes

To ensure the reliability of the methodology used and the data gathered, the setup of the World Café must be professional and rigorous. The World Café was conducted in accordance with the suggestions of Schiele et al. (2022). All steps are summarised in Table 3. In the first step, the participants – 81 procurement professionals – were divided randomly into four groups of roughly equal size. Next, the groups were allocated various tables with individual flipcharts, where each group was invited to discuss a specific question. The flipcharts and discussion rounds created a café-like atmosphere, promoting open discussion in the focus groups (Brown, 2010; Schieffer et al., 2004). In total, four discussion tables with flipcharts were set up with four different topics in four separate rooms; one discussion group addressed the question of ‘Which skills will be needed in purchasing in five years?’.

This discussion table was used as the input for this paper. The other tables addressed questions related to the organisation of communication in five years, the purchasing interface in five years, and the purchasing tools needed in five years.

A moderator hosted each group at their respective tables until the end of the World Café. The moderator was responsible for moderating the discussion, encouraging people to contribute, and documenting the results on the flipchart.

Four discussion rounds were scheduled. The first round was scheduled for 45 minutes, the second for 30 minutes, the third for 20 minutes, and the last for 20 minutes. It was recommended that the first round be the longest since most participants had not taken part in a World Café previously and would likely require additional time to adjust to the operating rules and requirements (Schiele et al., 2022). Furthermore, the amount and variety of novel responses were expected to decrease with every additional round. At the beginning of each round, the moderator explained the question to be addressed and summarised the previous groups’ findings, which were documented as bullet points on the flipchart (Hüttinger et al., 2014; Schieffer et al., 2004). The moderator helped detect overlapping answers and condense them into one concise response. After the given amount of time, the groups were reassembled randomly to ensure different combinations of participants at each discussion table. The next discussion rounds began with the moderator summarising the results that had been previously identified. This process continued until all four discussion rounds were completed. To analyse the results of the World Café in detail, all discussion rounds were voice recorded, which supported the

qualitative findings of this research. Furthermore, a systematic voting procedure was used to extract quantitative data.

Table 3 Professional and rigorous setup of the World Café

<i>Sequence</i>	<i>Activity</i>
1 Preparation	<ul style="list-style-type: none"> • The theoretical foundation of the research question • Selection and invitation of participants • Selection and briefing of the moderators • Selection and preparation of location and setting
2 Introduction	<ul style="list-style-type: none"> • Plenary introduction of the topics to discuss and the process of the World Café
3 Table discussion	<ul style="list-style-type: none"> • Randomly divided and equalised groups for each table (plus one moderator) • Moderators introduce participants to topics, summarise previous findings, facilitate discussion, and write down results while remaining neutral • After each round, participants move between tables and form new randomised groups • Voice recording of all discussion rounds to analyse the outcome
4 Conclusion	<ul style="list-style-type: none"> • Bringing together findings from all tables for a plenary conclusion • Participants assign points to judge the presumed importance of each presented indicator (distinguishing direct and indirect material purchasers)
5 Wrap-up	<ul style="list-style-type: none"> • Findings are consolidated, shared, and sent to participants for review

3.3 Voting procedure used to rank the most relevant future skills

The World Café concluded with a voting procedure. Each participant was asked to put stickers next to the statement (bullet points on the flipcharts) they considered the most relevant. This procedure made it possible to rate the collected responses according to perceived importance (Pulles et al., 2016). Each participant received five stickers per question. To distinguish between the votes of direct and indirect material purchasers, different colours were distributed. The 44 direct material buyers received orange stickers, and the 37 indirect material buyers received yellow stickers. Given there were 81 participants, a total of 410 stickers were distributed to each table. The participants were not restricted in the way they distributed their stickers. Therefore, all five stickers could be given to one answer on the flipchart or split between different answers. Once all stickers had been utilised, the moderators counted the number of stickers each statement received. Afterwards, the results were documented, presented in a plenary session to the participants, and later distributed by mail.

4 Results: the World Café yielded 32 future skills in purchasing and provided a clear distinction between direct and indirect procurement

4.1 Evidencing the difference between direct and indirect material purchasing skills

The objectives of this research are twofold. First, it aims to identify and assess the difference between direct and indirect material purchasing. Second, it seeks to uncover the essential skills for both purchasers in digitally transformed procurement. Addressing the first objective, the theoretical background presented above clearly identifies the difference. It shows that purchasers in direct procurement are responsible for buying materials needed for the final product produced, receiving high managerial attention due to the commodity type's high impact on firm expenditure. Therefore, practices and research on direct material procurement are matured, allowing for the leveraging of the cost-saving potential of this commodity.

To validate the difference between direct and indirect procurement and justify the relevance of the distinction, this research provides empirical evidence utilising a skills perspective. Indeed, it uses the empirical outcome of the large World Café study. Based on the systematic voting procedure, Pearson's chi-squared test for categorical variables is calculated (Fisher, 1922; Pearson, 1900). This statistic follows the simple idea of comparing the observed frequencies in certain categories with the frequency expected in those categories by chance (Field, 2018). The difference between the expected distribution of votes for each skill from direct procurement professionals is compared to the observed votes of indirect purchasers. Moreover, the two-sided Fisher's exact test is used to cope with the relatively small number of votes in each category to identify the significantly different future skills in direct and indirect procurement (Fisher, 1922). Table 4 presents the results of the Pearson chi-square statistics and two-sided Fisher's exact test at a 95% significance level, proving that there is a clear difference between direct and indirect material purchasing.

Figure 1 Display of propositions

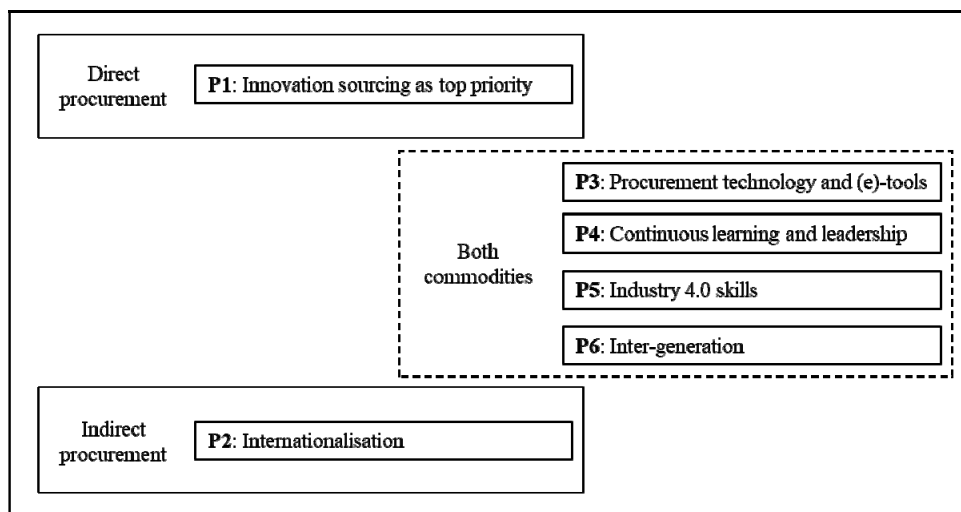


Table 4 The World Café results in essential future skills

<i>Skills</i>	<i>Total (410 votes)</i>	<i>Direct (224 votes)</i>	<i>Indirect (186 votes)</i>	<i>Pearson chi-square</i>	<i>Sig. difference Fischer's exact</i>
Change management	50	20	30	4.920	0.033*
Purchasing technology and (e)-tool skills	29	19	10	1.491	0.250
Co-development (with suppliers)	25	22	3	11.958	0.001*
Human-to-human skills (in teams)	25	15	10	0.309	0.680
Continuous learning	25	13	12	0.075	0.837
Data/information management (big data)	24	13	11	0.002	1.000
'Leadership' community management	23	13	10	0.035	1.000
Cross-cultural awareness	23	4	19	13.636	0.000*
Frustration tolerance (entrepreneurship)	18	12	6	1.100	0.340
Communication skills	18	3	15	10.950	0.001*
Artificial intelligence (basic)	16	9	7	0.018	1.000
Cross-functional management	15	7	8	0.399	0.602
Decision making	14	10	4	1.650	0.276
Flexibility and agility	14	3	11	6.448	0.013*
Supplier relationship management	13	12	1	7.688	0.008*
Supplier development	11	6	5	0.000	1.000
Inter-generation	10	7	3	0.976	0.359
Legal (basic)	9	4	5	0.385	0.737
Curiosity	6	5	1	2.023	0.227
Visioning (perspective)	6	4	2	0.356	0.693
Project management	4	3	1	0.676	0.630
Analytical skills (critical thinking)	4	3	1	0.676	0.630
Task management (priority management)	4	1	3	1.431	0.333
Creativity	4	1	3	1.431	0.333
Product technical awareness (innovation)	3	3	0	2.509	0.255
Stress management	3	3	0	2.509	0.255
Strategic (business) skills	3	3	0	2.509	0.255
Value analysis (product)	3	2	1	0.177	1.000
Automation (basic)	3	2	1	0.177	1.000
Financial skills	3	1	2	0.553	0.593
Self-assurance	2	1	1	0.017	1.000
Customer	0	0	0	NA	NA

Note: *Significance level 95%.

Using the two-sided Fisher's exact test, six skills are found that are significantly different between direct and indirect material procurement on a 95% significance level. These include two skills that relate to direct purchasing – that is to say, 'co-development with supplier' and 'supplier relationship management', and four skills that are significantly more important for indirect material purchasing – namely, 'cross-cultural awareness', 'communication', 'flexibility and agility', and 'change management'. However, two further skills could be considered for direct material procurement due to a relatively high number of votes and a significant difference in votes from participants: 'purchasing technology and (e)-tool skills' and 'decision making'. The next sections address the difference, showing both fields' future development directions concerning increasing digitalisation in procurement, leading to six propositions derived from this work (see Figure 1).

4.2 Essential future skills of direct material purchasers focus on innovation management

Two essential skills should be considered for future direct material purchasing. First, 'co-developing with suppliers', which is considered innovation sourcing by Bals et al. (2019). The importance of this skill stems from the increasing relevance of innovation from the supply base (Hartmann et al., 2012; Spina et al., 2013). For firms, such as the company addressed in this paper, strategic objectives in the consumer market are supported by the capabilities of their suppliers. Here, procurement acts as an intermediary between the company's R&D department and the supplier's product development (Schiele, 2010; von Haartman and Bengtsson, 2015). Hence, procurement is in a prime position to select future business partners and exhibit the skills and information required to evaluate opportunities and develop insights into cost and product life cycles (Hartmann et al., 2012; Homfeldt et al., 2017). 'Supplier management' – also described as 'supplier relationship management' – is another essential skill for future direct material purchasing. Managing the ongoing relationship with a supplier significantly impacts firm performance (Carr and Pearson, 1999). The aim of the discussed company is to reduce the number of direct suppliers and increase collaboration with core suppliers. Maintaining a good relationship with the supplier and aiming for high supplier satisfaction assures the supply of products, allows for the achievement of sustainability aims, grants access to new product developments, and facilitates a route to the supplier's best resources (Schiele, 2012; Schulze et al., 2019). Therefore, from a relational point of view (Dyer and Singh, 1998), purchasers in direct material procurement need the skills to facilitate a relationship with suppliers focused on strategic objectives, such as innovation sourcing. This strategy fits the second external sourcing strategy described by Cox et al. (2005), which suggests increasing leverage by establishing long-term relations. It is in line with the findings of Stek and Schiele (2021), who address the necessary skills to achieve innovation sourcing success. Thus, this outcome provides us with the first proposition of this paper:

Proposition 1: Innovation sourcing skills become a top priority in direct material purchasing.

4.3 Global change management practices influence essential skills for indirect procurement

For future indirect procurement, four essential skills were identified:

- 1 'change management'
- 2 'communication skills'
- 3 'flexibility and agility',
- 4 'cultural awareness'.

Interestingly, all future indirect material purchasing skills belong to the change process of moving from a decentralised to a centralised procurement department, including the internationalisation of the commodity (Hartley and Choi, 2020). However, based on contingency theory, there is no best way to organise a corporation and, therefore, no best way to organise a department or indirect procurement. Rather, the structure is contingent on purchasing maturity, corporate coherence, and fit with the corporate business and purchasing strategy (Rozemeijer et al., 2003). Luzzini et al. (2014) described one example of how to organise indirect material purchasing – IT expenditure. Here, the purchasing responsibility is organised with a high degree of centralisation and a focus on the purchasing process. Indeed, the firm described in this paper intends to centralise the indirect material purchases for all business units to increase item standardisation.

Since the company is organised in multiple business units worldwide, internationalisation of indirect material procurement is required to fulfil internal needs in order to achieve greater transparency, the involvement of fewer suppliers, reduced maverick buying, and less corruption (Carter et al., 2003; Monczka et al., 2015). By centralising indirect material purchases, the company aims to bundle the volume of indirect spending and increase the competition of available suppliers globally, resulting in various cost-cutting opportunities (Hesping and Schiele, 2016). It appears that, in this respect, indirect procurement is following the path of direct procurement from 20 years ago. This approach fits the second and third internal sourcing strategies described by Cox et al. (2005), where the buying role for indirect spend is taken over by a central department, impacting the design and specification of items depending on the item type. Furthermore, the company aims to increase leverage with short-term sourcing strategies, utilising e-auctions for indirect procurement and increasing indirect spend volumes by bundling across business units (Santanam and Duarte, 2022), which fits the first and third external strategies designated by Cox et al. (2005). Lastly, the case company targets increasing process efficiency for indirect purchases by implementing new e-procurement systems, enabling greater efficiency and transparency (Gebauer and Segev, 2000; Hawking et al., 2004; Tatsis et al., 2006). Therefore, indirect procurement is going through a transition. To bring about this transformation, 'change management' skills in indirect material purchasing are needed to lead the process from a local, decentralised procurement organisation to a centralised international organisational structure (Aslam et al., 2018; Tassabehji and Moorhouse, 2008).

Advanced 'communication' skills are necessary for this change process because employees must communicate internationally with multiple business units. In the past, communication in indirect procurement focused on purchasing processes conducted manually by phone, fax, and traditional mail, managing the demand of one single

business unit. In the future, the e-procurement and emerging technologies of I4.0 will significantly influence indirect purchasing practices (Santanam and Duarte, 2022; Schiele and Torn, 2020). Here, communication skills are needed to manage the high internal complexity of the organisation, especially due to the high number of business units involved on an international level. This results in many external stakeholders and an international supply base for indirect materials, where information is currently gathered from different legacy information systems (Foerstl et al., 2018; Hartley and Choi, 2020). Hence, this research's results are in line with the work of Lorentz et al. (2021), supporting the view that a higher degree of formalisation – utilising rules, procedures, and protocols – improves the effectiveness of indirect material purchasing on a global scale.

Moreover, an indirect procurement professional requires a certain level of 'flexibility and agility'. The indirect purchasing tasks can be managed from various locations. Here, indirect material purchasers perform much of their work outside the office, which is an increasing phenomenon in purchasing (Bals et al., 2019; Hartley and Choi, 2020). Moreover, in the restructuring process of indirect material purchasing, professionals require a high level of agility to adapt to the changing working environment. Finally, a new centralised organisational structure for indirect purchasing requires employees to work in a 'cross-cultural' setting because members of the procurement department must work in global teams across business units (Gibson et al., 2019; Martinez and Jarillo, 1991). Likewise, internationalisation of the supply base is expected, which requires the purchaser of indirect materials to possess greater acuity in international management skills. Thus, cultural awareness becomes increasingly important in, for example, negotiating contracts (Giunipero and Handfield, 2004). This aspect of internationalisation and increased cross-cultural work is addressed in the second proposition:

Proposition 2: For indirect purchasing, internationalisation is expected to gain in importance with a respective emphasis on cultural, communication, flexibility, and agility skills.

4.4 Commonly required skills within the transformation process of PSM

The common results – the combined votes of the surveyed purchasers for direct and indirect material with no significant difference – show a clear transformation process in both commodity types. This transformation process is initiated by implementing new technologies, adjusting purchasing objectives, and changing the work environment. Past research has shown that the discipline has evolved into a strategic function, where, for instance, purchasing professionals are engaged with new product development teams and require strategic business skills (Luzzini and Ronchi, 2011; Schiele, 2010; Tassabehji and Moorhouse, 2008). More and more attention has been given over to increasing purchasing maturity (Bals et al., 2018; Schiele, 2007). Therefore, clear procedures that are harmonised across the whole organisation are obligatory. The addressed company serves as one example of how increased similarities, structured by rules, protocols, procedures, and shared legacy information systems, allow for increasing purchasing maturity across the organisation. However, specific capabilities and competencies are highly desirable in purchasing to lead this transformation process.

4.4.1 Required skills for the digital transformation process of procurement

‘Purchasing technology and (e)-tool skills’ are essential ingredients in the digital transformation process of procurement. Increasing attention is given to so-called e-purchasing or e-procurement tools – with both terms often used interchangeably – and greater reliance is placed on information and communication technology in procurement (Giunipero et al., 2012; Zunk et al., 2014). From a process point of view, these technologies are often addressed as e-sourcing, as supplier identification, qualification and selection, and e-transactions addressed as the automation of ‘procure to pay’ (Presutti Jr, 2003). Recently, the functionalities of these systems have increased, whereas the impact of future technologies, moving towards I4.0 in purchasing, continues to receive sparse research attention. Scholars assume a significant impact on the identification and selection of suppliers using, for example, sophisticated text mining, data analysis through artificial intelligence, and interactive communication bots (Schiele and Torn, 2020; Schildt, 2017). Procurement professionals, both present and future, must learn how to use these supportive technologies (Bals et al., 2019). For direct procurement, the value of these technologies can be two-fold, with transactional technologies improving existing business processes, and relational technologies supporting the strategic integration of the supply chain (Johnson et al., 2007). Presutti Jr (2003) addressed the latter using e-design systems to facilitate early supplier involvement. Meanwhile, the case company hopes to improve the planning process with suppliers, using predictive tools to improve forecasts and selecting the most competitive suppliers to innovate and improve quality standards. This planning focus may help to explain why these tools and the respective skills are more often attributed to direct procurement. Here, indirects rely more on spot buying and periodical purchases than on continuous demand in serial production. In indirect procurement, demands will be collected centrally, and online marketplaces will be used to launch a bidding process between suppliers (Santanam and Duarte, 2022).

The last skill that is crucial in purchasing is ‘decision making’. In today’s rapidly changing business environment, the purchaser must make the right decision within a reasonable amount of time. Given purchasing’s strategic position, decisions in purchasing are becoming more complex (Tassabehji and Moorhouse, 2008). Today, the number of digital systems implemented in purchasing are increasing – where the correct choice of system is highly important and where strategic decision-making skills are vital (Giunipero and Percy, 2000; Gottge et al., 2020). Due to the implementation of new systems in purchasing, larger quantities of data, often called big data, are available. Here, purchasers must process large quantities of data to facilitate faster and better decision making (Fatorachian and Kazemi, 2021; Nürk, 2019). The ability to include data analytics, especially supply chain analytics, will be necessary for direct procurement (Wang et al., 2016). For the presented company, direct material procurement selects core suppliers and establishes relationships in a digital supplier–buyer interface to allow mutual benefits for both parties – for example, transparency throughout the supply chain. For this reason, the third proposition is formulated as follows:

Proposition 3: The continuous digitalisation and development towards I4.0 build momentum for skills that use core procurement technology and (e)-tools.

4.4.2 Skills that support the change management process in procurement

Four additional skills have been found that each adds up to more than 5% of the total votes. These skills relate to the change management process in procurement, including ‘continuous learning’, ‘leadership (community management)’, ‘human-to-human skills’ (working in teams), and ‘data and information management’.

Continuous learning is an interpersonal skill that each purchaser needs to develop professionally. The past expectation that individuals would remain in one profession throughout their working life is no longer realistic. A person needs to adapt to changing work environments during a professional career and learn new skills (Bals et al., 2019; Giunipero and Pearcy, 2000). In PSM, these changes include:

- 1 development from an operative into a strategic function
- 2 contextual changes shifting the scope of purchasing
- 3 changing work environments due to new technologies.

To lead the change process, various purchasing professionals need leadership skills. On the one hand, these skills include managing the community through transformation. On the other hand, the process needs to be actively steered, and a high level of problem-solving capabilities is required. Thus, the skills needed to manage the transformation lead to the fourth proposition:

Proposition 4: Continuous learning and leadership skills have grown in importance in purchasing.

The third commonly shared skill in future procurement addresses working within a team setting, especially in cross-functional teams. Here, the need for ‘human-to-human skills’ accelerates in importance. Interestingly, in a working environment that is increasingly supported by digital means, it might well be assumed that less human interaction would be needed, but the opposite is expected for the more complex and higher strategic tasks in purchasing (Bals et al., 2019). Furthermore, various new product development, optimisation, and cost-saving projects are achieved by team efforts rather than individual action (Johnson et al., 2002; Moses and Åhlström, 2008). Teamwork skills must be inculcated in future sourcing teams, and the underlying fundamentals must be understood (Franke and Foerstl, 2020). Fourth, ‘data and information management skills’ are needed in direct and indirect material purchasing, especially with the increasing quantity of data available in the PSM field. On the one hand, the skills include making data available in purchasing and, on the other hand, analysing the data. Thus, professionals need to process, store, secure, and analyse data for future decision making (Oussous et al., 2018).

4.5 Extending the skills framework of Bals et al. (2019) using additional identified skills

During the research process, the work of Bals et al. (2019) was used to categorise and name the skills identified in the World Café. However, five additional future purchasing skills were acknowledged, which were not pinpointed in the interviews held by Bals et al. (2019):

- 1 'artificial intelligence'
- 2 'frustration tolerance'
- 3 'stress management'
- 4 'visioning'
- 5 'inter-generation'.

According to the participants of the World Café, a basic understanding of the concept of 'artificial intelligence' is needed in the prospective procurement department. Understanding artificial intelligence represents a new technical skill for procurement professionals. It is important to understand which inputs or data are needed for artificial intelligence to work and how to use it in purchasing. The quantity of data available, based on e-procurement systems, e-sourcing solutions, and sensor technology, supports data analytics whose application looks promising, though various challenges will need to be overcome (Dai et al., 2020; Roßmann et al., 2018). This leads to the fifth proposition of this research:

Proposition 5: Emerging technology skills, such as big data analytics and artificial intelligence, are important for the future purchaser to move towards I4.0.

Three new interpersonal skills were identified. 'Frustration tolerance' is one. The participants of the World Café assumed that future procurement professionals would need to work in an entrepreneurial manner – for instance, by allowing a certain level of risk taking and frustration tolerance. Second, procurement professionals should possess the skill of managing stressful situations. 'Stress management' skills were not mentioned by Bals et al. (2019) but had been previously referred to by Carr and Smeltzer (2000) and Tatham et al. (2017). The importance of stress management is increasing due to the strategic and influencing roles of purchasing. Having to perform the role of an intermediary between various company functions – for example, between R&D and production to implement externally sourced innovations – unsurprisingly increases the pressure on individual employees. Third, the skill of 'visioning' was identified, supporting a long-range strategic perspective on the business. For instance, in the past, short-term purchasing decisions were made to source specific goods, whereas today's purchasing decisions are taken with a longer-term focus (Cox et al., 2005; Li et al., 2015). Furthermore, procurement professionals must certainly display the ability to see the long-term implications of technological developments.

Finally, 'inter-generational' skills involve working in a cross-generational environment. These days, companies are challenged by high age diversity in the workforce due to an ageing population in which organisations are becoming increasingly diverse demographically (Wagner and Hollenbeck, 2020). Furthermore, rapid technological development presents a challenge to older employees faced with learning the new technologies used in their work environment. Often, younger and older employees have to work together in tough conditions and are not aware of their significantly different ways of working. Though the adoption of new technology may be easier for one, it could be more challenging for the other. Some knowledge of inter-generational workplace cooperation is needed to improve team performance. However, the demographic difference has not yet been addressed in the PSM skills literature, though it has been pinpointed by Franke and Foerstl (2020) in their framework for future

research on PSM teams. This finding raises the sixth proposition based on the explorative research design:

Proposition 6: Inter-generational collaboration is a new skill required by purchasers in an ageing society.

5 Discussion: skill sets for direct and indirect material purchasers are not stable phenomena

5.1 Distinguishing direct and indirect material purchaser skills

First of all, this research responds to the claim that the distinction between direct and indirect material procurement is commonly made in practice but only rarely researched and discussed in academia (Darom and Plant, 2020; Kim and Shunk, 2004; Niederschweiberer and Kleemann, 2020; Vos et al., 2016). The work assesses the difference between direct and indirect material procurement from a competence point of view, which has not been done before. Therefore, the clear relevance of distinguishing both professions in academia has been found, justifying specific work addressing the difference (e.g., Cox et al., 2005; Vos et al., 2016). This research answers the call from Giunipero and Percy (2000) to assess the skills required in different jobs in purchasing. Consequently, this paper demonstrates the impossibility of defining the skill set of an ideal, all-around procurement professional. Rather, the skill set will depend on the tasks undertaken by the procurement professional. Yet, based on the review above, the field of indirect material spending has been rather neglected in research, and efforts need to be made to increase the maturity of research in this field by offering guidance, as has been done by Darom and Plant (2020) and Cox et al. (2005), for example.

Thus, the second contribution addresses the objective of guiding future indirect material purchasing. Based on a World Café study, we have identified specific future skills for direct and indirect procurement, complementing the work of Knight et al. (2014) who explored the connection between purchasing type and purchasing skill. The necessary skills are integrated into purchasing roles, linking purchasing type and purchasing skills based on investigating different skills for different purchasing roles. Therefore, the theoretical contribution answers the call of Schiele (2019) to define specific skills for the seven roles that procurement professionals fulfil. In this work, it has been shown that the scope for direct material procurement is shifting towards the role of innovation buying, and a wave of internationalisation is expected for indirect purchasers. To accomplish the objectives of direct material purchasing, relationship management skills are needed, supporting the long-established claims of Cox et al. (2005) on the need for long-term relationships with direct material suppliers. This research also responds to the quest of Lindgreen et al. (2013) to explore when and why transactional or relational purchasing is applied. Based on the skill focus described above, direct procurement focuses on relational practices to shape buyer–supplier relationships with a long-term focus. However, the internationalisation of indirect procurement and the implementation of new procurement technology increase the number of potential suppliers of indirect materials, which results in a focus on transaction cost. Thus, the results of this research point to the unproven hypothesis of Cox et al. (2005) that indirect material procurement will focus on transaction cost and short-term relations. Moreover, this research shows that

the wave of internationalisation can be expected for indirect procurement (Hartley and Choi, 2020). Here, procurement professionals need to acquire the skills to manage demand in various business units worldwide, resulting in a new international supply base for indirect materials (Carter et al., 2003; Monczka et al., 2015). For that reason, cultural, communication, flexibility, and agility skills are essential. Based on the difference between these two commodity types, this research illustrates how different cost-reduction techniques (e.g., Hespington and Schiele (2016) or purchasing strategies (e.g., Cox et al., 2005) should be implemented.

Third, this research provides a list of common skills needed in future direct and indirect material procurement to push technology implementation in PSM. For that purpose, this work conflates two growing domains of PSM literature, giving increased attention to professional skills and the influence of technological developments within the field, leading to the new industry paradigm of I4.0. These identified skills may also overcome the barrier to implementing future e-purchasing and e-procurement software solutions by helping to resolve the issue of a lack of skilled people (Hawking et al., 2004; Kauppi et al., 2013; Tatsis et al., 2006). Furthermore, this research finds supporting evidence for the proposition of Lorentz et al. (2021) on how digitalisation impacts the field. Results show that increasing internationalisation and technology implementation support each other well – for example, online marketplaces facilitate the inclusion of suppliers worldwide (Santanam and Duarte, 2022). However, internationalisation leads to increasing uncertainty due to the larger number of stakeholders involved across different business units, leading to a high level of internal communication. If the same technologies are implemented throughout the entire organisation, these technologies will decrease the inflow of information from various legacy information systems. However, rules, procedures, and protocols are needed to increase formalisation and purchasing maturity (Lorentz et al., 2021).

Last, based on the work of Bals et al. (2019), five future purchasing skills were identified: ‘artificial intelligence’, ‘frustration tolerance’, ‘visioning’, ‘inter-generation’, and ‘stress management’. Therefore, this paper’s findings contribute to an understanding of the impact of digitalisation and I4.0 on purchasing. The results show that purchasing skills are not stable phenomena that persist over time but are better seen as unstable phenomena that are subject to redefinition over time in response to technological and strategic shifts in purchasing. Special attention must be given to the inter-generational skills in purchasing, which are required in an ageing society. Here, the demographic difference has not yet been addressed in the PSM skills literature, especially for purchasers working in teams.

5.2 Management can benefit from a list of future skills needed for purchasing

The results presented identify a list of essential future skills in purchasing and distinguish between the roles of direct and indirect material procurement professionals. Managers in purchasing, especially managers responsible for the procurement department’s employees and staffing, may use this as a guideline. This research confirms that unique strategies and policies to manage indirect spend are required (Carter et al., 2003). To make sure that the company is well prepared for the future, human resource managers in purchasing should focus on recruiting professionals with essential future skills depending on the purchasing role they are assigned to (Delke et al., 2021; Hartley and Choi, 2020). Furthermore, appropriate educational methods are necessary to train their personnel in

these vital skills (Bals et al., 2019). Educational professionals need to consider current and future procurement professionals with a view to developing appropriate training and educational methods to teach these essential skills (Giunipero and Pearcy, 2000; Pekkanen et al., 2020).

Furthermore, the research results present guidelines on dealing with the challenge to increase purchasing maturity and on implementing appropriate software solutions to resolve the issue of a skills shortfall in direct and indirect material procurement (Andreasen and Gammelgaard, 2018; Schiele, 2007). This research's outcome is especially useful for managers attempting to increase maturity in purchasing based on a skills perspective. Of course, the skills identified have yet to be validated. However, validation using research with a larger population will take time, and managers should respond expeditiously. The results presented above are based on input from practice and should provide useful insights for purchasing managers. Managers from smaller companies can learn from the results obtained and use the guidelines to stimulate future growth efforts.

5.3 The research is limited to an explorative World Café and needs future validation

The research methodology has certain limitations. First, data collection was limited to a single large global corporation. Therefore, the usefulness of the results may be limited for procurement professionals of smaller companies. For instance, the expectation that indirect procurement will internationalise is driven by the unique experience of a global corporation that has already pooled direct material procurement and is now seeking to repeat the same bundling effect for indirects. Nevertheless, the research outcome can be used as a baseline from which to move forward, particularly given the evidence of a significant difference between direct and indirect procurement. Furthermore, groupthink and confirmation bias are involved, based on the data collection process during the World Café study. Therefore, the results have not been validated. To validate and generalise the results, further research efforts will need to draw on a larger and broader target population. Future research could validate the skills identified through the adoption of an extensive survey. Moreover, the World Café method is limited to the use of focus groups and requires a moderator to document the results. The research methods, therefore, constrain the outcome by overseeing individual inputs and confining understanding to the level of the group, giving the moderator a significant role in shaping the outcome. This paper builds a foundation for the further exploration of future skills and purchasing roles. However, it is uncertain how well the procurement professionals who participated can anticipate future purchasing developments, since a low number of skills related to I4.0 in purchasing were identified.

In this research, only four of 32 skills – ‘e-procurement technology’, ‘big data analytics’, ‘artificial intelligence’, and ‘automation’ – relate to a future industry paradigm. Additional research is needed to identify additional I4.0 skills in purchasing. Moreover, future research should focus on the inter-generational skills identified. These skills will likely become necessary to navigate a world with an ageing population, where there are growing age differences between purchasers and their interface partners. Next, the distinction between the skill sets of various purchasing roles is limited to direct and indirect material purchasing. Schiele (2019) suggested seven different roles in purchasing. To make this perspective complete, future skills that are applicable to various

other purchasing roles should be defined by further research, thus increasing purchasing maturity. Furthermore, the available literature on purchasing roles is limited. Future research will need to explore which roles are required in purchasing, especially in the changing procurement environment.

Nevertheless, our research points to the significant difference between direct and indirect purchasing, confirming the suggestion of Knight et al. (2014) that distinct skill sets are needed based on the sourced product category. Future research must emphasise the often-neglected profession of indirect material purchasing, especially because a significant difference exists between direct and indirect procurement, and the field of indirect material procurement is changing in response to the implementation of new technologies and their growing business impact. Past research has shown the importance of strategically managing the direct material group. Now, it is time to pay attention to the indirect spend of organisations to facilitate maturation. In indirect procurement, long-established product portfolios, such as the Kraljic matrix (Kraljic, 1997, 1983) need to be used frequently. Moreover, specific material group strategies must be developed to apply suitable sourcing tactics (Hesping and Schiele, 2016). Consequently, additional research and specific education within the indirect material group are required. Future research would benefit from focusing on how to inculcate the skills identified. Sophisticated educational programs and methods must be pinpointed and developed to train future procurement professionals.

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