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New competences enhancing Procurement's contribution to innovation and sustainability

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ABSTRACT

This research presents the results of a multiple method study exploring the future competence requirements for purchasing and supply management (PSM) professionals in the face of increasing demand for innovative and sustainable product and service solutions. Data collection consisted of four stages: first, a World Café was held to gather experts' insights into PSM skills, which helped to refine a first survey round of eleven open-ended questions. A second survey round then followed, presenting four scenarios based on the results of the initial round. Finally, interviews were conducted to explore the results in detail. The participants in all stages were senior PSM experts from a variety of sectors, including manufacturing and service organisations, as well as academic institutions, consulting firms and non-governmental organisations. The results show that the expected changes in the future business environment mainly concern the application of digital technologies, increasing supply chain flexibility and transparency, sustainability performance and the need to build soft skills to support interpersonal relationships as well as hard skills to support supply chain design.

1. Introduction

As procurement has developed from a tactical, cost-saving function to a more strategic, value-creating function, more skills and competences have come to be required of procurement professionals over the years (Bals et al., 2019; Stek and Schiele, 2021). In addition to strong commercial competences, successful procurement professionals should also possess a wide range of hard and soft skills. Many higher education institutions now have dedicated programs to develop future procurement professionals with a comprehensive set of technical, financial, strategic and functional competences, as well as soft skills such as collaboration and communication.

Today, an added factor in the discipline is the trend of development towards sustainable procurement, which poses new challenges that require different mindsets to those in the past and thus new competences. Furthermore, Wehrle et al. (2022) suggest that digitisation will likely elevate the role procurement innovation plays in new product development (NPD), which again will require new competences. Uniting those trends, a recent study by Gartner highlighted a lack of linkage between supplier innovation and sustainability performance (Gartner, 2022), indicating the potential for a stronger contribution of procurement at this intersection. The climate and biodiversity crises, as well as social and ethical issues, and the resulting new supply chain laws that have been passed or are expected, will impact the future of the business environment and the role of procurement. At the same time, social and technological innovations are changing the traditional way procurement is organised (Constant et al., 2020). For example, the use of machine learning tools has the potential to transform procurement processes. Business schools have a role to play in responding to these trends and providing the future generation of procurement professionals with an appropriate portfolio of competences. Recent research has begun to explore these new competences and has called for more related research (Schulze et al., 2019). In this article, we advocate for a dual focus on sustainable and innovative procurement competences, because truly sustainable procurement – and truly sustainable supply chains (Pagell et al., 2010) – require innovative product and service solutions, as well as innovative ways of sourcing new technologies that are critical to the development of such solutions.

To provide an example, many companies devote significant resources to the ongoing monitoring of suppliers through audits, to ensure that their suppliers do not violate environmental regulations. While such activities are clearly important, they are ultimately driven by the need

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for compliance and risk management (Meqdadi et al., 2020), or in other words, harm reduction. As Montabon et al. (2016) argue, if companies want to achieve harm elimination rather than just harm reduction, their resources would be better spent pursuing radical innovations that can address the major environmental and social crises. To do so, businesses must develop innovations that are not inherently unsustainable, and they must be accommodating of innovations that require new business and operating models. In support of the importance of such innovations, in a study of current and future procurement competences, Bals et al. (2019) found that the most prominent new competency areas relate to digitisation, innovation and sustainability. In a study on the future role of procurement in NPD, Wehrle et al. (2022) suggested that digitisation will strengthen the role of innovation with procurement for NPD, and that this will require new competences.

While contemporary research focuses on the current competences of procurement professionals, we explicitly look to the future. Thus, this research contributes to the literature on procurement competences by exploring the future competences required for procurement to contribute to innovation and sustainability. Our research is novel in its dual focus on future professionals' procurement competences and skills contributing to both sustainability and innovation. Our research is part of the PERISCOPE project, which investigates future procurement competences for innovation and sustainability.[1] Consequently, we seek to address the following research question:

What are the future competence requirements for procurement to contribute effectively to innovation and sustainability?

To provide answers, we present the findings of a multiple method study with four stages of data collection. Our study contributes to the education and training of current and future procurement professionals by supporting education providers to identify the competences that students should acquire when studying procurement at the university level or through internal training within a company, to build future procurement capabilities. In this article, we develop a portfolio of skills and competences for procurement managers, which support both sustainability and innovation developments. We include both traditional skills and competences and others adapted to the new realities of the future. By doing so, we provide insights for practitioners into future procurement skills and competences. Our study seeks to make contributions to research on procurement skills and competences by identifying new – future – requirements for procurement professionals to be able to tackle both innovation and sustainability challenges. In doing this, we advocate for the essential procurement function in efforts to address the ongoing environmental and social crisis by further highlighting these relevant skills and competencies and linking the management of both sustainability and innovation in an intertwined process.

Previous studies on procurement skills and competences provided important insights, such as procurement skills for the 21st century (Tassabehji and Moorhouse, 2008) or to manage specific aspects of procurement such as stakeholder relationships (Kern et al., 2011), supply management (Giunipero et al., 2006) or portfolio management (Knight et al., 2014). Meanwhile, other studies valuably outlined the current competence requirements for procurement roles (Schiele, 2010). Many of these will endure; however, procurement is changing rapidly, particularly with developments related to sustainability and innovation. Accordingly, new holistic procurement skills and competences are needed so the procurement function may contribute to innovation management, sustainability management and the procurement of innovations to enhance sustainability.

[1] The study is a part of the third intellectual output (IO3) of the "PERISCOPE" project. The "PERISCOPE" project aims to prepare students to acquire future sustainable purchasing and supply management (PSM) competences for innovation. The project was funded by the EU, ERASMUS+, KA203 - Strategic Partnerships for Higher Education, Grant number: 2019-1-FR01-KA203-062990.

These holistic procurement competences are not completely new and different from those that have been identified in previous studies on sustainable procurement (Schulze et al., 2019) or procurement for innovation (Stek and Schiele, 2021), but centre on the need to develop creative and innovative solutions to transition towards sustainable supply chains. Therefore, they go beyond merely aiming to reduce harm, expanding the scope of efforts to also seeking innovative solutions that will eliminate harm (Montabon et al., 2016).

2. Literature review

The meaning of skills and competences is widely debated and there is a lack of clarity over related concepts such as knowledge, skills and competences. Debates on competences are often muddled by the interchangeable use of the concepts of competences, capabilities, and skills, as well as distinctions of these as key or core. To prevent such confusion, we define the terms that will be used in this article. In addition, although our use of the concepts of sustainability and innovation is in line with existing definitions, our dual focus on both sustainability and innovation necessitates that we also clarify how we define these concepts. We, therefore, begin this section by briefly explaining the terminology, before we then examine competence frameworks that guided our research.

2.1. Definitions

There are many definitions of sustainability but a common basis is the definition of sustainable development provided by the Brundtland Commission (1987) as '*development that meets the needs of the present without compromising the ability of future generations to meet their own needs*'. The long-term perspective implied by this definition is often further distinguished into environmental, social and economic sustainability, consistent with the triple-bottom-line thinking of people, profit and planet (Purvis et al., 2019. Our use of the concept is, therefore, not limited to environmental sustainability but also includes the other two dimensions: social and economic.

In recent years, there has been much debate about whether the sustainability discourse is sufficiently ambitious to produce the necessary social, environmental, economic and political transformations. Complementary terms such as sufficiency, regeneration, transformation and circularity have recently been adopted more widely. It is beyond this article to enter into this debate, but our use of sustainability encompasses several of these aspects and assumes the need for sustainability to move from 'doing no harm' to 'doing good' (Markman and Krause, 2016). The assumption in our study is that this requires innovation, a concept that we thus couple with sustainability.

The meaning of innovation is multifaceted and, for our purposes, it is important to first distinguish between two types of technological innovation: product and process innovation (Utterback and Abernathy, 1975). From the perspective of procurement innovation, process innovation implies changes in procurement processes, that is, in the way procurement is carried out, whereas product innovation implies a change in the products that are procured. Our interest is primarily in the latter, although procuring innovative products also requires innovative new processes. As innovation is driven by the need to find new solutions to address environmental challenges, the concept of sustainable (and eco or green) innovation has emerged (Melander and Pazirandeh, 2019), with implications for the role of procurement in innovation sourcing (Viale et al., 2022) and the competences required to contribute effectively (Legenvre and Gualandris, 2018).

Skills and competences are often used interchangeably, but competences are generally understood to be broader in scope and refer to the ability to apply knowledge. Competences have also been defined as the combination of knowledge, skills and abilities associated with strong individual job performance (Barnes and Liao, 2012), with skills viewed as talents for managing specific tasks, such as giving a presentation

(Mirabile, 1997; Krumm et al., 2016). Certain competences hinge on the use of technical skills and knowledge (Knight et al., 2014), including both content (know-what) and process knowledge (know-how). In addition, values, attitudes and motivation are suggested to contribute to a person's competences. A distinction can be made between conceptual (cognitive, knowledge and understanding) and operational (functional, psycho-motoric and applied) skills and competences (Delamare-Le Deist and Winterton, 2005, p. 39).

Meanwhile, a common distinction is made between hard and soft skills, with soft skills referring to 'personality traits, goals, motivations, and preferences' (Heckman and Kautz, 2012, p. 451), such as interpersonal skills, and hard skills referring to working with equipment and software. As procurement has evolved over time, this has become a widely used distinction. Due to the exploratory nature of our study, we did not make this distinction in the data-gathering process, but it appears later in the analysis and discussion sections of the article. In general, we use the term competences as the broader concept and skills as the more specific talent for managing specific tasks.

2.2. Procurement competence frameworks

Purchasing and supply management (PSM), or procurement, scholars have examined the skills and competences needed by procurement professionals. These professionals can be described as external boundary spanners, requiring both internal and external relationship management skills. As procurement has matured from a tactical to a strategic function, procurement professionals have come to require an increasingly comprehensive set of skills and competences (Van Weele and Van Raaij, 2014).

Various frameworks have been proposed to capture the broad set of skills and competences of procurement professionals (Flöthmann et al., 2018). Tassabehji and Moorhouse's (2008) multilevel framework has been adopted in several studies (e.g. Bals et al., 2019). It categorises procurement skills into five areas: technical, interpersonal, internal organisational (related to interactions between a company's functions), external organisational (related to the supply chain network) and strategic business. Tassabehji and Moorhouse (2008) also identified new skills buyers need in the 21st century, such as product knowledge, computer science, total quality management and knowledge of government regulations.

These frameworks can be applied in competence analysis and profiling, for example, to inform job descriptions for recruitment purposes. In addition, these frameworks can form the basis for identifying training needs and informing career development (Campion et al., 2011; Knight et al., 2014).Appendix A provides an overview of recent competence classifications, starting with Tassabehji and Moorhouse (2008), which has inspired recent classifications that either focus on general PSM competences or specifically on sustainable PSM, as discussed below.

2.3. Procurement competences that contribute to sustainability

As already described, there has been extensive research into procurement skills and competences, often mixing the two terms. However, research on the specific skills and competences for sustainable procurement is only emerging. Traditional and sustainable procurement differ, but the latter cannot be isolated with a set of distinctive tasks; instead, sustainability must be integrated into all procurement processes (Johnsen et al., 2018). Therefore, the competence requirements for sustainable procurement (SPSM) must not be treated as novel, but instead integrated into existing taxonomies, all of which will support the introduction of innovative approaches to the procurement function.

Despite the growth of research on sustainable procurement, in general, there has been little focus on the skills and competences required to put sustainable procurement into practice. Building on Delamare Le Deist and Winterton's (2005) competence typology, Schulze et al. (2019) proposed a model of sustainable procurement competences with four dimensions.

1. *Cognition-oriented competences:* technical and directly related to the occupational context.
2. *Social-oriented competences:* generic knowledge and understanding related to a conceptual and systematic way of thinking.
3. *Functional-oriented competences:* how to interact with others, including willingness and ability to experience and shape relationships to foster SPSM.
4. *Meta-oriented competences:* facilitate the acquisition and application of the other substantive competences, sometimes positioned at the intersection between attitude and competence.

Schulze et al. (2019) asserted that functional competences are central, but noted a difference between academic research and practitioner views, with the former emphasising social-oriented competences and the latter emphasising cognition-oriented competences.

2.4. Procurement competences contributing to innovation

A recent stream of research focuses on the role of procurement in supporting innovation (Johnsen et al., 2022), and one of the key themes is developing the procurement function to explore external opportunities (Legenvre and Gualandris, 2018). However, this research focuses on organisational level and *not* on the individual-level competences.

Luzzini et al.'s (2015) study on the effects of supplier collaboration on innovation performance acknowledged the contribution of procurement knowledge to innovation performance, though that factor was not specifically analysed. Similarly, various studies have hinted at the need for creative and innovation-oriented mindsets and curiosity-driven behaviours to support procurement's contribution to innovation exploration, but without specific analyses (Schiele et al., 2011; Wehrle et al., 2022; Kähkönen et al., 2017).

Since Tassabehji and Moorhouse (2008), several other researchers have examined the involvement of procurement in innovation from a skills perspective. Innovation sourcing and innovative sourcing approaches have been listed as advanced procurement process skills (Bals et al., 2019). The profile of the innovation purchaser includes a good level of salesmanship, process and project skills and the soft skill 'imagination, creativity, inventiveness and holistic thinking' (Stek and Schiele, 2021, p. 11). However, the studies did not specifically develop the nature of these skills. For instance, the literature emphasises collaboration and trust management as key enablers for innovation sourcing from suppliers (Servajean-Hilst and Mahmoud-Jouini, 2019), but the related procurement skills facilitating collaboration and trust management are not outlined.

2.5. A combined focus on procurement competences contributing innovation and sustainability

Our review of the literature shows a lack of research on the competence requirements for procurement to effectively contribute to both sustainability and innovation. We propose that a holistic view of competences is required that does not consider sustainability and innovation requirements in isolation, but together as a whole. Fig. 1 illustrates this logic. We acknowledge that competences related to sourcing, innovation and sustainability may differ, but our study focuses on certain areas where these competences intersect: first, between sourcing and sustainability competences; second, between sourcing and innovation competences; and third, between all three. The literature review indicates a lack of research on these intersections and, in particular, the central intersection of the three circles, which is the specific contribution of our research.

When we consider natural resource-based perspective (Hart and Dowell, 2011; Hart, 1995), product stewardship requires new green

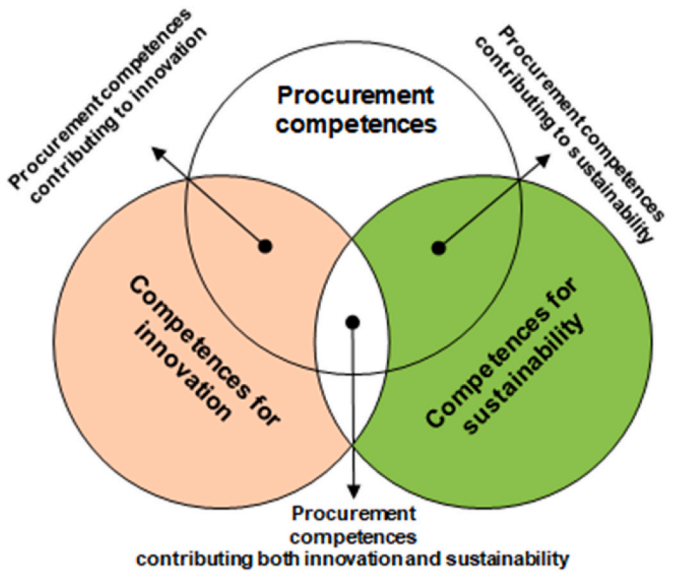

Fig. 1. A holistic view of procurement competences contributing to sustainability and innovation.

product designs that minimise the environmental impacts of product systems. This is in line with the ecologically dominant logic (Montabon et al., 2016, p. 20), which argues that companies 'are more likely to pursue radical innovation to find ways to meet the environmental and social constraints'. Thus, we expect holistic procurement competences to drive the development and implementation of radical sustainable innovations, such as the development of new sustainable sourcing approaches or circular product designs.

3. Methodology

To explore future sustainable and innovative procurement competence requirements, we took a multiple methods research approach centred on an online survey of PSM experts. Multiple methods have been proposed to provide a clear picture by mitigating the shortcomings of individual research methods (Boyer and Swink, 2008). Our study followed two methodologies, with three data-collection techniques. The first methodology was a World Café with direct interaction between experts and the research team. The World Café was part of the overall project this research is embedded in, and it provided insights that helped us focus the question topics for the next stage of data collection. The second methodology was influenced by the Delphi method, in our case, consisting of online surveys (Seuring and Müller, 2008) and face-to-face interviews (Schulze and Bals, 2020). A Delphi study is a qualitative forecasting technique that incorporates subjective judgments from visionary individuals and is particularly useful for exploring future scenarios (Brady, 2015), such as the future competences of procurement professionals. It is a systematic, iterative process to explore a consensus view from a panel of experts (MacCarthy and Atthirawong, 2003). A Delphi study differs from other data-collection methods in the absence of interaction between respondents, which supports the answers to be unbiased. The result of a Delphi study is considered a consensus of expert opinion on a subjective topic (Green and Price, 2000).

There are precedents for Delphi studies in the purchasing and supply chain management discipline, including Ogden et al.'s (2005) and Monczka and Markham's (2007) studies on trends in purchasing and supply management. More recently, Schulze and Bals (2020) conducted a Delphi study to explore future sustainable procurement competences, which inspired our study. However, in the course of our research, we had to adapt the initial plan to rely solely on a Delphi study as the research methodology. In part, this was because we were hampered, as were many other researchers, by the COVID-19 pandemic. Our research project ran from 2020 to 2022, with the two online questionnaires conducted in January and July 2021. This profoundly affected the access to senior experts for interviews and direct, in-depth communication due to inexperience with appropriate tools as well as time constraints on the experts' side as companies struggled to adjust their supply chains to the dynamic challenges at that time. Later in the research process, we revised the approach, as outlined below in detail, due to conflicting results in different stages of our data collection, which required a more personal approach to assess the results in detail. This was made possible by easier access at that time in our research project since managers were more accustomed to using appropriate virtual communication tools and restrictions had been gradually lifted. Hence, our data are based on multiple methods of data collection, while at the core following the idea of obtaining the unbiased opinions of individual experts on future developments around a specific topic and finding an overall consensus among experts.

In total, we conducted four rounds of data collection, starting with the World Café, which helped to develop the Delphi-inspired part of the study. This was followed by two rounds of data collection through online questionnaires – (1) an exploratory online survey of future visions, and (2) a focused survey of envisioned competences based on scenarios – and a final round of 13 face-to-face follow-up interviews to further assess the results (see Fig. 2).

3.1. First stage of data collection: World Café

The first stage of our data collection, a World Café, supported a broad explorative investigation of procurement skills and competences (Schiele et al., 2021). From this, a wide range of topics was narrowed to a manageable scope for the main data collection. The intention was to produce valuable findings, without those being too broad and unspecific, while, at the same time, not restricting participants from expressing their opinions. The World Café event, which took place online in June 2020, was attended by 16 experts from academia and industry. The experts were selected based on their experience with procurement and included, among others, CEOs, lead procurement professionals or consultants with up to 20 years of experience in the area. Three topics were discussed in three parallel discussions: (1) What skills are needed for procurement to contribute to sustainability? (2) What skills are needed for procurement to contribute to innovation and co-development? (3) What prevents companies from being sustainable and innovative at the same time? To avoid misunderstanding, we used the term skills rather than competences in this round of data collection, explaining the reasoning for that choice to the participants. The data gathered in this stage were coded into four themes: (1) knowledge needed, (2) skills needed, (3) attitude needed and (4) organisational support. We identified a wide range of topics, from specific sustainability knowledge over applied skills, such as calculation skills, to seeing the big picture, being curious or engaging with internal and external stakeholders for change. Since we identified topics not solely related to skills and competences, we also included questions not directly related to skills or competences in the next stage of the data collection, which allowed respondents to voice their opinions about, for example, the general future business environment, to contextualise their answers on skills or competences.

3.2. Second stage of data collection: Delphi-inspired questionnaires

The online questionnaires were conducted using the online tool Qualtrics. A small pilot study was conducted with five respondents, three with an academic background and two with a practical background, before sending out the first round of the questionnaire. Based on the pilot study, the questionnaire was adjusted to improve clarity and eliminate ambiguity. For example, changes were made to the introductory text and to improve the usability and question structure.

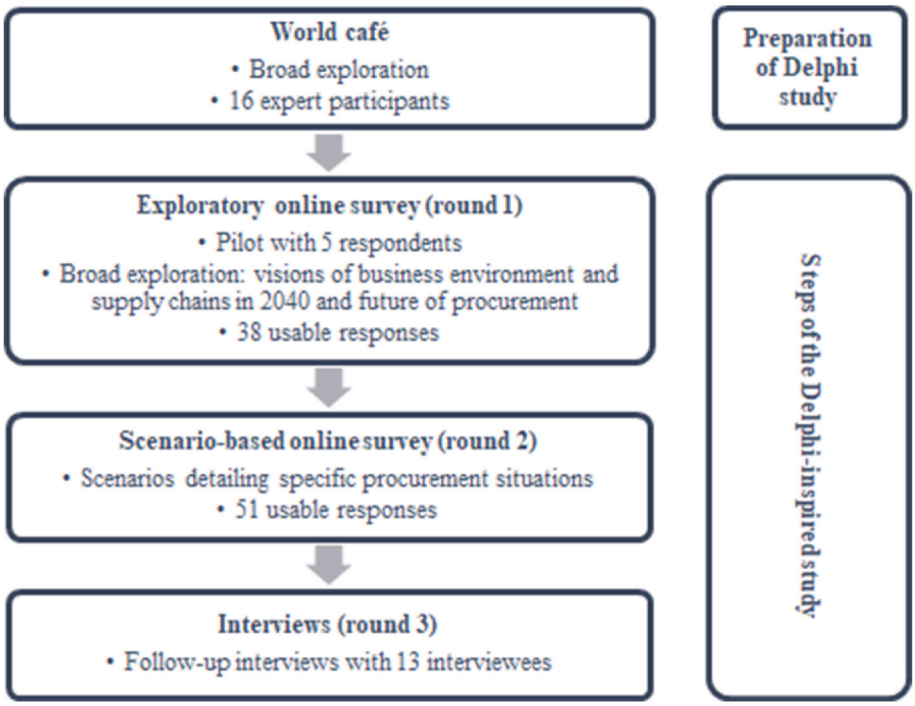

Fig. 2. Data collection process.

The selection of the expert panel is critical to the success of a Delphi study (Melnyk et al., 2009). Here, participants were selected based on their experience and seniority in procurement, innovation or sustainability. On that basis, we targeted senior PSM practitioners, consultants, NGO representatives and academics, all located in the European Union, in line with the objectives of the "PERISCOPE" project. We followed the steps outlined for other, similarly explorative, survey-based Delphi studies, such as Seuring and Müller's (2008) study of sustainable supply chain management.

3.2.1. Online questionnaire round one: exploratory online survey on future business trends

The questionnaire for the first round of the main study consisted of 11 questions, four closed and seven open-ended (see Appendix B). The four closed questions collected background information about the respondents, such as job title and geographic location. The seven open-ended questions allowed respondents to freely share their expertise. These questions were designed to explore their prospective visions of what the future will look like in 2040, starting with a broad picture of business, in general, then focusing on future supply chains, and finally, considering the future of procurement.

Approximately 250 potential participants were initially identified, all senior PSM professionals, including practitioners, consultants, NGOs and academics. We selected them based on seniority (job title and/or years of experience) and location (based in the EU). We sent an invitation to these experts, and 56 participated in the survey. However, 18 of the responses were discarded either because the respondents had moved their focus of work outside the EU and, therefore, outside the scope of our project, or because the responses were incomplete, leaving 38 responses remaining.

A double coding method was chosen to analyse the qualitative data from round one (Church et al., 2019), intended to produce high-quality findings by exploring two interpretations of the patterns and relationships of words and phrases (Church et al., 2019; Voss et al., 2002). Some codes fit within the framework of Tassabehji and Moorhouse (2008) and others were developed from emerging themes.

3.2.2. Online questionnaire round two: scenario-based questionnaire

The second online questionnaire was developed based on the analysis of the results from round one. In the second round, three scenarios were presented to the participants, each prompting them to envision a different procurement situation in the future. Such an approach is commonly applied in survey-based social sciences studies to make abstract situations more concrete for the participants, to enhance the quality of the answers given (Utomo et al., 2022). Additionally, the scenario approach allowed us to gather answers on sustainable and innovation procurement individually as well as in combination. The three scenarios covered sustainable procurement, procurement for the circular economy and procurement's contribution to product innovation for sustainability (see Appendix D).

The first scenario described a sustainability challenge where a fashion supply chain involved forced labour and toxic chemicals. The second scenario, bridging the two others, highlighted the intersection of sustainability and innovation by detailing a scenario centred on the circular economy as an area of sustainability implementation in which great innovation is occurring. The third scenario focused on procurement's ability to support innovation via product development and sourcing of external innovation opportunities. The selection of the circular economy as this innovative field for advancing sustainability was based on the data collected during the first questionnaire round, in which participants mentioned the circular economy as an innovative future trend. The scenarios were developed by the researchers and evaluated by the wider project team.

For each scenario, the experts were presented with a list of 17 skills identified in round one, which they rated on a five-point Likert scale. To support this task, we provided examples of each of the 17 skills that promoted a common understanding of each skill. For example, communication skills were explained with the example: 'Ability to share information effectively with suppliers or internal colleagues'. We chose this approach rather than providing definitions to maximize the readability and applicability of the survey. Lengthy and complex definitions can be detrimental in these regards, whereas the examples allowed participants to easily immerse themselves in the scenario-related situation. The examples were developed and discussed by the entire

PERISCOPE project team.

This questionnaire contained eight closed questions and one open-ended question. The first four questions sought demographic details. Questions 5–7 presented the three scenarios. Question 8 was a closed question that asked participants to select the three generally most important skills from the set of 17 as another way of assessing the importance of these skills. Finally, question 9 allowed participants to make additional comments. It is common practice to insert such an open-ended question at the end of the survey as a post-processing measure, in which participants are asked for information after just completing the survey (Kitchenham and Pfleeger, 2002).

We used the same method to contact participants for the second round of the study as we did for the first round. Due to the anonymity of the data collection, we could not determine which of the participants completed both rounds. We received 101 responses, of which we discarded 50 that were incomplete or again not based in the EU. This left a set of 51 remaining responses.

Since this round consisted mainly of closed questions, analysis was conducted through simple weighted average calculations for each scenario. The weighting was designed as a 1–5 symmetric Likert scale, which quantified the subjective thinking of the respondents in a reliable manner (Joshi et al., 2015). The weighted average was simply calculated by multiplying the weight by the number of responses that mentioned the competence in question. The results were added to the results for the open question seeking additional comments on the overall importance of skills and competences for future procurement professionals. We adjusted the score based on the response to the open question to control our statistical results. The calculation formula is shown in Table 1.

3.3. Third stage of data collection: interviews

Some of the round two results contradicted the round one results as well as established categorisations of procurement skills. For example, while our first-round results indicated that digitalization skills were highly relevant, and Schulze and Bals (2020) highlight related skills, our round two results ranked related skills rather low. Therefore, it was difficult to reach a consensus that respected the different opinions collected across the rounds, especially given the time constraints of the overall project. To better assess and interpret the ranking of skills in round two, adopting an approach similar to Schulze and Bals (2020), we presented our preliminary findings to senior procurement professionals in face-to-face interviews. We organised a series of interviews with 13 participants, using the same selection criteria as in the previous rounds: people working in a company headquartered in Europe, with senior-level experience in procurement. The experts we interviewed had not participated in the first two rounds of the study so they were not influenced by the previous stages or the conflicting results. Particular care was taken to cover different sectors when sampling interviewees, to reflect the diversity of views obtained in the previous rounds (see Table 2).

At the beginning of the interviews, participants were introduced to the previous data-collection process and its challenges. We presented the results of round two and initiated the interviews by asking: 'Looking at the presentation of our results below, what strikes you as interesting, and why?' Respondents were invited to react and comment on the results by giving their points of view. Most interviews were recorded and transcribed. For those that were not, we took notes of the responses. The results were analysed in three ways. First, we noted the initial reaction of the respondent, which indicated their immediate response to the results. Second, we identified consistent responses from a respondent's transcript (or the notes taken in place of a transcript) justifying or invalidating the order of round two skills. Third, the results were discussed among the research team to locate emerging patterns and identify explanations for the previous contradictions, such as the aforementioned

Table 2
Details of the interviewee profiles for round three.

#	Nat.	Position	Sector	Interview date
#1	UK	Procurement Manager	Construction supplies	10/11/2021
#2	NL	Consultant	Education	12/11/2021
#3	PL	Global Purchasing Manager	Automotive	23/11/2021
#4	FR	Global Head of Scientific Procurement	Healthcare products	25/11/2021
#5	DE	Lead Buyer	Food wholesalers	01/12/2021
#6	IT	Purchasing IT Commodity Manager	Aviation	02/12/2021
#7	RO	Category Leader: IT	Automotive	03/12/2021
#8	NL	Purchasing Director	Consumer electronics	03/12/2021
#9	TU/DE	Purchasing Director	Electrical equipment	08/12/2021
#10	NL	Purchasing, Industry 4.0 and Digital Procurement	Healthcare products	09/12/2021
#11	DE	Senior Director of Indirect Procurement	Electrical equipment	13/12/2021
#12	DE	Sustainable Procurement Manager	Electrical equipment	14/12/2021
#13	DK	Purchasing Manager	Healthcare products	14/12/2021

Table 1
Formula for calculating the score for each skill, and presentation of the weight associated with each degree of importance (analysis of round two results).

k	Degree of importance	Weight (w)
1	Extremely Important	5
2	Very Important	4
3	Moderately Important	3
4	Slightly Important	2
5	Not Important	1

The weight 'w' is a symmetric Likert 1–5 scale

$$Scores = \frac{\sum_{k=1}^{5} (n_k . w_k)}{5} + OQ$$

n = number of times the skill was mentioned

w = weight associated with the degree of importance

OQ = Open Question. Reflects the number of people who mentioned this skill when we asked about the most important skills for future procurement professionals (round two)

lower relevance of digital skills.

4. Results

In the following section, the results of the two rounds of online questionnaires and the round of interviews are presented separately and in detail, to provide a clear structure of the research process and the analyses that took place for each round.

4.1. Round one results: exploratory questionnaire

The results of the first round were twofold. First, by analysing the answers to the open-ended questions and clustering them, four major themes emerged from round one.

- 'Digital technologies' such as artificial intelligence and automation (logistics infrastructure, autonomous cars and trucks) are seen as key drivers of evidence-based decision-making in the supplier selection processes or sustainable sourcing decisions.
- 'Supply chain flexibility and transparency' are seen as increasingly important. There are related sustainability challenges, for instance, those concerning general business ethics and poor working conditions. Responding to such supply chain risks, as well as other unforeseen events, will require greater flexibility if businesses are to change their operations.
- 'Sustainability impact' will become an important aspect in many companies' decision-making. This relates to the supply chain flexibility and transparency mentioned above. Respondents also highlighted the importance of reducing or avoiding negative impacts, such as 'avoidance of fuel' as a way to reduce greenhouse gas emissions.
- 'Internal/external business relationships' are seen as a major change for the next 20 years, with respondents often citing cross-functional collaboration, the ability to manage internal relationships with other functions and the ability to collaborate with supply chain stakeholders.

When asked about new key skills and competences that will support the transition to sustainability, respondents first highlighted knowledge of sustainability, which includes knowledge of sustainability practices and awareness of ethical, environmental and human rights impacts, and also indicates a more holistic view of the supply chain. The second most cited competence concerned external/internal enterprise skills, which support supplier relationship management skills, stakeholder engagement skills, change management skills, and collaboration skills.

When asked about the skills needed for procurement to contribute more effectively to the development of innovations, respondents first emphasised the importance of collaboration (leveraging outside competences to enable innovation), customer-centric, and cross-functional integration with sales and marketing. The second most cited capability was a mentality shift (i.e. being open-minded, broadening the scope or thinking outside the box). Based on these results, we identified a list of 17 skills, such as "Negotiation skills", "Critical thinking" or "Curiosity". A complete list, including the brief example of each provided to round two participants, can be found in Appendix C.

4.2. Round two results: scenario-based questionnaire

Our set of 17 skills was then used in the scenario-based questionnaire developed from the themes and concepts that emerged in the first round (see Appendix D). Many respondents selected "Strategic thinking", "Cross-functional teamwork" and "Holistic supply chain thinking" as key skills across the three scenarios (see Table 3 for detailed results). Meanwhile, skills related to "Creativity", "Communication skills" and "Risk management", which seem to be more important when addressing sustainability challenges than innovation and product development.

Creativity is the most notable in terms of higher relevance for procurement in product innovation compared to the other two scenarios. In the case of an innovation-focused scenario, cross-functional Teamwork" is of highest importance, which represents a difference from the other two scenarios. Notably, "Digitalization skills" is of relatively low importance in all scenarios compared to the other skills. This finding contrasts with those of the procurement skills frameworks we identified in the literature review (e.g. Schulze et al., 2019), which indicated the growing importance of such skills and called for "Legal compliance", "Cross-cultural awareness" and "Contract management".

We note that the results for each scenario are very similar, at least for the top five skills. This may support our initial hypothesis that the procurement of the future will require similar skills to support both sustainability and innovation. Respondents did not seem to perceive a strong difference between the situations highlighted in the scenarios. We further explored the small differences between the scenarios by comparing the means and scores for each scenario. In doing so, we found that the perceived importance of the capabilities varied across the scenarios. For example, "Holistic supply chain thinking" is in the top five for each scenario, but the difference between its score and the mean is 21.6 in scenario two compared to only 11 in scenario three. This can be interpreted to indicate the greater relevance of this skill when both innovation and sustainability are concerned. Another interesting example relates to "Risk management skills", which have strong relevance for sustainability-related activities (the gap is 24.6 in scenario one), but less in the other two scenarios (barely any gap). Tables listing

Table 3
Overview of round two results.

Procurement skills for sustainability (scenario 1)	Final score	Procurement skills for both innovation and sustainability (scenario 2)	Final score	Procurement skills for innovation (scenario 3)	Final score
Strategic thinking	79.6	Holistic supply chain thinking	64.8	Cross-functional teamwork	63
Holistic supply chain thinking	78.6	Strategic thinking	63	Strategic thinking	60.8
Cross-functional teamwork	77.6	Cross-functional teamwork	62.6	Holistic supply chain thinking	59.4
Risk management	76.4	Creativity	55.4	Risk management	54.2
Analytical skills	69.6	Risk management	55	External stakeholder relat. mgmt.	52.8
Communication skills	69.4	Leadership skills	54.8	Analytical skills	51
External stakeholder relat. mgmt.	69.2	External stakeholder relat. mgmt.	53.8	Communication skills	51
Negotiation skills	68.8	Analytical skills	53.2	Leadership skills	51
Leadership skills	68	Change management	52.6	Creativity	50.4
Change management	66.4	Communication skills	51.8	Negotiation skills	49.6
Critical thinking	64.2	Critical thinking	50.2	Change management	47.8
Creativity	63.8	Negotiation skills	50	Critical thinking	47
Contract management	61.8	Curiosity	48	Curiosity	46.2
Legal compliance	60.6	Contract management	44.6	Digitalization skills	45.8
Curiosity	59.4	Digitalization skills	43.8	Contract management	43
Cross-cultural awareness	59	Legal compliance	42.6	Legal compliance	41.8
Digitalization skills	54.4	Cross-cultural awareness	41.6	Cross-cultural awareness	39

these gaps between scores are available in Appendix E.

4.3. Round three results: interviews

The round three results indicated that some procurement skills were considered 'must haves' for the next 20 years by almost all respondents, while other skills were perceived very differently among the respondents. The following findings reflect these patterns.

All respondents strongly believe that "Strategic thinking" and a "Holistic view of the supply chain" are the most important skills for the future. Both are seen as critical to driving the contribution of procurement to innovation and sustainability:

> *Strategic thinking is a very broad term, but as I think that transactional and technical procurement will be fully automated, then the strategic skills will become more and more crucial in the profession. It also resonates very much with holistic supply chain thinking, as it represents the skills to embrace the end-to-end supply chain, including innovation and sustainability from the very upstream to the consumers.* – #10, Purchasing Director

Many respondents also consider "Analytical skills" to be important as low-value-added processes such as transactional, administrative and repetitive tasks are systematically being automated and will become less important in the future. This better allows procurement professionals to analyse complex situations and thereby manage those to achieve their goals. Accordingly, analytical skills are becoming central to companies' competitiveness. In line with this, several respondents noted that analytical skills should be high on the agenda because they affect the way procurement adapts to a fast-paced and demanding environment.

> *…you really need human people who can interpret the data and the dashboards, criticise the information prescribed by the systems. Analytical skills are simply mandatory. It is intimately related to risk management skills, because systems will allow us to visualise the risks in our supply chains, like corporate social responsibility (CSR) risks, but people would need analytical skills to figure out actions to take.* – #9, Purchasing Director

Results on the low importance of "Digitalization skills" sparked a lot of discussion. Respondents had different points of view, but highlighted how digitisation of procurement is evolving rapidly, though still in its infancy. Those who ranked digitalization skills among the top three for the future are convinced that these skills are critical to risk management and sustainability:

> *I am very surprised that digitalization is in the bottom six. Does that mean that organisations don't want to make progress on their information systems* agenda*? To me, digital skills are, therefore, critically important.* – #1, Procurement Manager

Others emphasised that digitalization skills are not critical for buyers, as digital transformation and process digitisation are the responsibility of IT functions:

> *I was surprised and happy to see this skill low on the list as it shows that I'm not the only one who thinks it's not a key skill. There are two reasons why this is not a key skill. First, because the responsibility for implementing this digital solution will not be given to purchasing […]. The second reason is that before having digital skills, we must first have a critical and strategic mind that will lead us to think about this digital solution.* – #4, Global Head of Procurement

In summary, respondents often associated the importance of digitalization skills with different digital-related activities, such as the skill to select, configure or use digital tools. Most respondents believe that digital skills are needed in procurement to use digital tools, but less so in selecting and implementing the systems themselves. Several interviewees explained that they do not see coding algorithms using deep learning as part of the future procurement skillset; instead, our findings suggest that future skills and competences must enable experts to analyse and work with outputs of such systems, informed by a holistic understanding of the supply chain.

Three skills were repeatedly highlighted when discussing the contribution of procurement to innovation, three skills are repeatedly highlighted: "Creativity", "Curiosity" and "Critical thinking", and several respondents felt that these should be given high priority:

> *Creativity is the first in that list I can relate to innovation management. Suppliers' innovations are a huge part of our innovations, so we need people who are skilled at having those discussions with our suppliers, and typically not the old procurement negotiation kind of people. I mean, people who can really think out of the box and come with value propositions and creativity.* – #8, Purchasing Director

There seems little debate that those working in procurement must think outside the box and explore new horizons to find new ways to improve efficiency, and several respondents asserted that these skills facilitate the contribution of procurement to sustainability.

The interviewees also highlighted that some skills are becoming less important as a result of digital transformation. The typical example is "Negotiation skills", which are seen as less relevant than skills at using e-auction tools, which are gradually replacing physical negotiations. Several interviewees also voiced the opinion that analytical, critical thinking and digital skills are more important than negotiation since those skills allow the buyer to develop strong arguments, reducing the need for negotiation skills.

> *Negotiation skills should be moved very much down! What we see is that for managing commodities, we can use algorithms and systems for instance to run requests for proposals, check supplier offers, track risks, even negotiate automatically for us. We need many more people thinking in terms of solutions that benefit the whole supply chain, not only people capable of negotiating a good deal for our company. This is like looking at the total cost of benefit across the chain, including managing CSR issues: negotiation has not a role to play here, but more critical thinking.* – #3, Global Purchasing Manager

Similarly, the discussion of hard skills such as "Legal compliance skills" and "Contract management skills" yielded relevant findings. Legal compliance skills are perceived by many of the interviewees as a prerequisite for any position in procurement given the need to navigate CSR regulations and standards. However, a few respondents consider these skills of low importance due to digital transformation:

> *Contract management skills are good to see in that list, but not necessarily high. Indeed, legal compliance [is becoming more important], but the processes are becoming automated and the legal knowledge comes from the system itself, not necessarily from the purchaser.* – #13, Purchasing Manager

Many respondents linked "Risk management skills" to other skills to others, such as digitalization skills, holistic supply chain thinking and legal compliance. They suggested that risk management is closely related to risk knowledge and, therefore, to data availability and compliance, which drives the contribution of procurement to sustainability:

> *Contract management skill is critically important because it is related to exposure to risks and, ultimately, to costs. Ability to write contract clauses is important to secure and protect even the brand image of your firm. Skills in contract management also include ability to understand GDPR compliance, to protect your data, to achieve compliance to CSR and, ultimately, to mitigate risks.* – #7, Lead Buyer: IT.

Finally, most respondents share a view that procurement is often responsible for orchestrating activities between internal and external stakeholders, making "Communication skills", "Leadership skills" and "Relationship management skills" very important. Some even believe that these three skills could be combined to make a single skill in the top

three:

> *Leadership and communication, in the reality of the business, are very important skills, which can even facilitate cross-functional teamwork. This is even truer in purchasing, which is a support function, because we must have these skills to motivate other departments to work with us. That's why I would have put leadership a little higher, [as] communication is part of leadership.* – #4, Purchasing Director

To conclude round three, certain skills are considered critical to facilitate the transition to high-value-added roles in procurement: a holistic view of the supply chain, strategic thinking and analytical skills. These facilitate cross-functional teamwork and relationship-building within supply chains. However, interviewees reported conflicting views in some cases, meaning the consensus was not complete. Nonetheless, the relevant quotes we selected served to explain or challenge the results of round two, as well as put the results of the questionnaire into perspective. Next, we sought to compare the overall findings to those of previous studies on the subject, as will be discussed in detail in the following section.

5. Discussion and implications

Participants in our study predicted that over the next 20 years, supply chain flexibility and transparency, sustainable impact", "digitalization" and "supply chain stakeholder relationships" will drive procurement strategies and impact the skills and competences required. Our research also highlighted relevant emerging skills and competences.

The most unexpected revelation of our study is the observation that even though digitalization is one of the most important trends for future business environments and supply chains, as revealed in our first round, the actual "Digitalization skills" have one of low importance. The idea that digital technologies such as artificial intelligence (AI) will enable more evidence-based decisions in supplier selection or support sustainable procurement decisions is supported by recent studies published in the purchasing discipline (Allal-Chérif et al., 2021). Skills related to digital tools in procurement have previously been reported in the literature as part of functionally oriented competences, mostly required in supplier relationship management (Schulze and Bals, 2020). Our research complements this by distinguishing the skills needed to select or configure digital tools from the skills needed to apply these tools. The former include soft skills such as communication since procurement professionals must express their specific needs for digital tools to providers or, at least in the near future, developers. Meanwhile, the skills associated with the use of digital tools are linked to interpreting the information provided, which requires analytical competences, including critical thinking or a holistic view of the supply chain. We suggest that the skills related to the selection and application of digital tools are enablers for successful procurement contribution to innovation and sustainability, but are not necessarily required by future procurement professionals as a unique skillset.

As a consequence of digital transformation, purchasing must adapt to higher-value tasks, such as those that are more strategic, complex and varied. The skills and competences associated with these higher-value activities are oriented towards cognition (Schulze and Bals, 2019). Our study highlights that future procurement professionals will need to gather a large amount of information to understand a situation and critically examine the different options to manage it sustainably and innovatively. In this scenario, "Analytical skills", "Critical thinking" and "Holistic supply chain thinking" have the greatest importance, regardless of the employee's seniority.

The results of the round three interviews helped put those findings into context. We found that experts value skills that allow them to see the bigger picture of the supply chain and sustainability impacts, along with knowledge of sustainability and related innovations, more highly than technical skills, such as digitalization skills, or detailed product knowledge. While the importance of these factors was not disputed, in line with, for example, Tassabehji and Moorhouse (2008), respondents emphasised the strong need for cognitive skills in an interconnected world where sustainability plays a growing role.

Interestingly, several soft skills are viewed as equally important in promoting the contribution of procurement to sustainability and innovation, or both. "External stakeholder relationship Management", and "Cross-functional teamwork" were noted as critical in our various rounds of data collection. This is in line with the social-oriented skills recently presented as important for procurement professionals (Schulze and Bals, 2022) and reflects the need to orchestrate complex systems, interact with supply chain stakeholders and manage multiple parameters in a fast-paced environment, all while considering innovation and sustainability.

Skills needed for sustainable procurement seem highly related to interpersonal relationships, such as "Negotiation skills" or "Cross-cultural awareness", with "Risk management" and "Legal compliance" also prominent. Meanwhile, "Curiosity" and "Creativity" appear more relevant for procurement contributions to innovation. This indicates that sustainability is a risk and compliance matter, and is less associated with innovation. Participants seemed to differentiate between future and current sustainability challenges, and executives may believe solutions to current sustainability challenges have already been developed and now must be put into practice. However, circularity seems to be perceived as an innovative business opportunity that offers a solution to future sustainability challenges – but when will those arrive? Our findings indicate that addressing sustainability challenges requires a mentality change among procurement professionals that will enable innovative steps to be taken.

Fig. 3 captures the results of our study, highlighting competences that are uniquely related to the procurement contribution to either innovation or sustainability, as well as those required for procurement to contribute effectively to both innovation and sustainability, shown in the central intersection. We refer to the latter as "Holistic procurement competences". These capture the central contribution of our study, as previous studies focused on sustainability (e.g. Schulze et al., 2019) or innovation (Stek and Schiele, 2021) have not focused on the two in tandem. The set of holistic procurement competences is not distinct from those purely related to sustainability or innovation, but distinctive in its holistic focus. These competences support procurement professionals to embrace sustainability challenges by developing creative and innovative solutions to transform financially driven supply chain business models into ones that are sustainability-driven instead. While at least some sustainable procurement thinking is focused on *reducing harm* (Montabon et al., 2016), and legal compliance and risk management competences take centre stage, holistic competences are required to *eliminate harm*.

Holistic competences enable procurement professionals to identify innovation-based opportunities for the sustainability challenges of the future. In this regard, skills such as "Contract management", "Negotiation skills" and even "Digitalization skills" are perceived as support skills for future professionals. Experts also expressed the idea that "Creativity" and "Curiosity" are interdependent and contribute to the mindset shift needed to meet future challenges. In addition, "Leadership skills" are key to bringing in change, with "Communication skills" integral for strong leadership.

Furthermore, for professionals to adapt to issues related to sustainability and innovation, participants foresee the need for internal/external business skills. The former relate to the overall business and cross-functional teamwork (Tassabehji and Moorhouse, 2008). For example, managing internal relationships with marketing and sales accelerates new product development and innovation (Gonzalez-Zapatero et al., 2017). External business skills, meanwhile, relate to the supply chain network and stakeholders, where external relationships must be managed, such as with suppliers (Tassabehji and Moorhouse, 2008). For example, the ability to use supplier relationship management tools improves the visibility to procurement of supplier sustainability practices

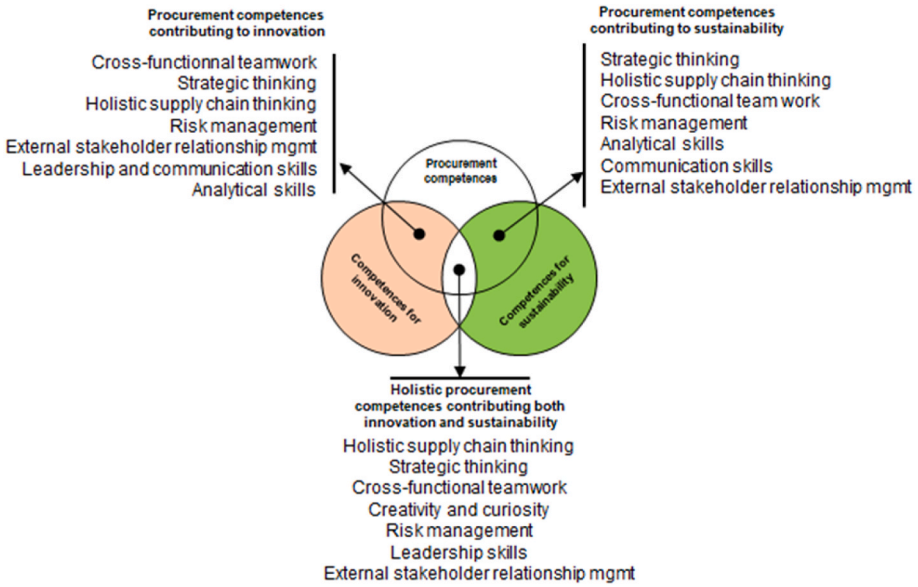

Fig. 3. Procurement competences contributing to sustainability, innovation, and both innovation and sustainability.

(Schulze and Bals, 2020).

However, we see a less clear distinction between internal and external skills than, for example, Giunipero et al. (2006) or Tassabehji and Moorhouse (2008). Participants valued both internal and external stakeholders as important for the procurement contribution to innovation and sustainability. This is in line with previous findings from Tate and Bals (2018), who found both are important for companies to achieve high triple-bottom-line performance. Such findings may indicate a growing understanding of the procurement function as a moderator and facilitator between internal and external stakeholders working on radical developments for sustainability. It may also indicate an evolution over time towards a greater strategic role for the procurement function in companies and an understanding that challenges such as the climate crisis cannot be solved by individual companies, let alone departments.

6. Conclusion

This article has provided insights into future procurement skills and competences that will enable procurement to effectively contribute to the development of solutions to innovation and sustainability challenges. Based on our findings, we propose that the joint focus on both challenges requires holistic procurement competences. These support procurement professionals to address sustainability challenges by developing creative and innovative solutions to transform financially driven supply chain business models into ones that are sustainability-driven, which hinges on a shift in sustainable procurement thinking from simply *reducing harm* to going further and *eliminating harm* (Montabon et al. (2016), potentially even operating in a way that is *net positive*. Given this change in ambition, competences for sustainable procurement related to legal compliance and risk management become less important as change will not arise from, for example, developing supplier codes of conduct or carrying out supplier audits; instead, analytical and critical skills gain importance.

We highlight the potential mismatch between sustainability- and innovation-related skills and competences. The former currently seems more related to compliance and risk management than innovation, leading us to propose that procurement professionals view sustainability-related innovations as a thing of the future, with a mentality shift now needed to reduce that distinction. At the same time, however, we observed differences between the results for individual scenarios. In combination with the analysis of the interviews, we can interpret this as a shift in mindset already taking place. Experts link sustainability and innovation on the premise that no contribution to sustainability comes without a relevant contribution to innovation, which strengthens the argument for holistic procurement competences and calls for related future research.

Our results also show that the expected changes in the future business environment mainly concern the application of digital technologies, increasing supply chain flexibility and transparency, and sustainability impacts. The last point, in particular, is reflected in the development of sustainability knowledge within procurement departments, but perhaps more in the context of risk management than as a future business opportunity. In any case, this knowledge must be integrated across the procurement function to assess the impact of different decisions. Our research shows that to do so requires soft skills such as critical thinking, to reflect on past decisions and future possibilities, along with hard skills such as holistic supply chain thinking, to assess sustainability impacts over the whole supply chain.

Following several studies on procurement skills and competences recently published in the PSM field, this article contributes by improving our understanding of PSM competence frameworks and adding insights into skills that will support innovation and sustainability. This analysis provides a conceptual basis for incorporating such skillsets into future research and development of higher education programs as sustainability and the circular economy gain traction. Since a full consensus could not be reached, even through interviews, we may benefit from more industry-specific research investigating different needs for procurement skills and competences.

Our research also has methodological implications. The use of scenarios in a questionnaire is novel in our discipline, but was welcomed by participants, with one commenting that it was an interesting approach that helped them relate to specific situations. This can offer a way to create relatable scenes in the otherwise impersonal survey situation. However, the number of scenarios or the number of recurring skills to choose from seemed to negatively affect the participants' willingness to complete the questionnaire, as we observed a loss of 20 participants at the beginning of the third scenario. In addition, the wording of scenarios may influence participants' responses, and more evidence from other disciplines, such as social sciences research, may help to further develop such a methodology.

From a management perspective, this study provides organisations with a new framework that is relevant for developing their PSM competences, especially those related to sustainability and innovation. The

findings can be used to design roles, job descriptions, recruitment criteria, competence assessment methods and training (Campion et al., 2011; Krumm et al., 2016). They also provide relevant insights into how procurement will evolve in the future to become an even more strategically involved function that solves complex sustainability-related challenges.

This study has a number of limitations that open up future research opportunities. First, the empirical data from a Delphi study are based on a limited number of experts. The selection of experts in the Delphi method is a limitation that affects the generalisability of the results. Since our study targeted EU-based experts, the results may differ in other regions of the world. In addition, the experts' anonymity created a methodological limitation where we could not assess whether the same experts participated in the first two rounds of the study. Future research should take the results of our study as a starting point to develop a survey or other quantitative approach that is more suitable for generalisation. A final limitation to note here is how procurement skills and competences were not related to a seniority level or company position in this research. However, seniority may be a moderating factor for the skills and competences required for a given position. This perspective should be further explored to improve the applicability of our findings.

Additionally, we suggest that future research investigates the moderating role of the procurement function in facilitating the interaction between internal and external stakeholders, as well as the potential for its absorptive capabilities to be applied to integrate innovations from suppliers into the buyer processes. Lastly, we propose that future research should explore digital skills and competences in PSM; given the recent AI and machine learning developments and their applications in procurement, it seems professionals should prioritise understanding and applying digital tools, as well as critically reflecting on the data generated.

Author statement

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Declaration of competing interest

No conflict of interest.

Data availability

Data will be made available on request.

Appendix A. Recent competence classifications: From general to sustainability-focused

Authors	Competence classifications	
Tassabehji and Moorhouse (2008) *General PSM competences*	Technical skills	Technical knowledge: computing, tool capacity, mathematical skills, blueprint reading, forecasting, e-procurement applications Basic administration skills: TQM, legislation, cost analysis, product knowledge and negotiation, production systems and processes Advanced procurement skills: category management, global sourcing, cost driver
	Interpersonal skills	Oral communication: listening, understanding, passing on information, persuading and influencing Recognise own strengths: creative thinking, analytical skills, investigation, research, problem-solving, stress management, time management Leadership: conflict management, decision-making, organisation, team building, cross-cultural awareness
	Internal enterprise skills	Organisation-wide financial skills Change management and cultural awareness Manage internal customers, sales interface, internal motivation Communicate and sell message/strategy internally, relationship influencing
	External enterprise skills	Cross-functional team working SRM and SCM skills Stakeholder mapping proficiency, supplier evaluation, international buying
	Strategic business skills	Demonstrate ability to add value throughout organisation Manage strategic alliances/partnerships Business skills and risk management
Bals et al. (2019) *General (current and future) PSM competences* *NB: findings on skills not identified by Tassabehji and Moorhouse (2008)*	Technical skills	Automation Big data analytics Innovation sourcing Innovative sourcing approaches
	Interpersonal skills	Curiosity Deal with ambiguity Humility Mobility Openness, open-minded Passion Resilience Self-confidence Self-reflection Self-reliance
	Internal/external enterprise skills	
	Strategic business skills	Critical thinking Holistic supply chain thinking Sustainability
Stek and Schiele (2020) *General PSM competences*	Networking	Capacity to be empathetic; social manners; loyalty; conscientiousness; honesty; comprehension of complexity; building relations/networking; problem-solving; customer-oriented

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Authors	Competence classifications	
	Result orientation	Self-assurance; poise; proactivity; result-orientated action-taking; willingness to take risks; capacity to advise; ability to resolve conflicts; power of persuasion
	Imagination	Creativity; inventiveness; willingness to learn; holistic thinking
	Sellership	Salesperson skills; personality characteristics development (e.g. entrepreneurial); cross-cultural awareness; customer orientation
	Cross-functional cooperation	Cooperating with departments such as marketing management; logistics and storage; research and development; production/operations; quality management
	Forecasting skills	Forecasting of demand; enterprise resource planning; supply chain analysis
	Cost focus	Cost reduction techniques; solicit offers; global sourcing; conduct cost analyses; negotiation; purchasing knowledge
	Contracting skills	Developing specifications for supplies; contract development (design of contracts); contract management; claims management; evaluate offers and supplier selection; CSR; work together with the legal department
	Supplier relationship management	Supplier relationship management; supply risk management; supplier evaluation; supplier development; early supplier involvement; strategic business partnering; sustainability
	Innovation sourcing	Innovation implementation; category strategy development; stakeholder relationship management; pooling planning and demand; supply market analysis
	Analytics	Set key performance indicators (KPIs); performance measurement and follow-up; statistical analyses; big data analyses; portfolio analysis support
	Leadership and personnel management	Roles and job profiles; personnel selection process; employee integration and development plan; employee performance measurement; leadership/managing personnel; training personnel; managing change processes; working together with the department; human resources management
	Organisational insights and governance	Understanding how to add value to the organisation; understanding corporate governance; understanding the position of purchasing in organisation project management skills; team ability skills; optimisation of purchasing processes; process management
	Automation	Procurement IT systems/e-procurement applications
	Technical skills	Technical knowledge of products and production systems; technology planning (knowledge of company's technological requirements); commodity and domain-specific knowledge.
Schulze et al. (2019) *Sustainable PSM competences*	Cognition-oriented competences	Conscientiousness; resourcefulness (creative resource combination); supplier relationship management (holistic view); systems thinking competence
	Social-oriented competences	Communication skills; cross-functional team working; interpersonal savviness; supplier relationship management (communication); stakeholder management (communication); thoughtful towards others
	Functional-oriented competences	Basic individual knowledge of PSM; basic sustainability knowledge; demand management (category strategy, purchasing specifications, supply market research); strategic positioning; contract management; measurement and reporting resourcefulness (application of tools); stakeholder management (application of tools); supplier relationship management (application of tools); sustainability/compliance (development of tools; participation in peer initiatives)
	Meta-oriented competences	Commitment to change; confidence; organisationally savvy; persistence; politically savvy; self-awareness; supplier relationship management (cooperative approach)

Appendix B. Questionnaire used for the exploratory online survey (round 1)

Question #	Question	Question type
1	Which sector are you working in? Please chose on from the dropdown list:	Multiple Choice
2	What is your job title?	Single line text box
3	What is the size of your organisation (number of employees)?	Multiple choice
4	In which country are you based (work)?	Single-line text box
5	What **three** key changes do you imagine will characterise the business environment in 2040?	Three essay text boxes
6	Please name **three** ways in which supply chains will be different in 2040.	Three essay text boxes
7	What do you see as the **three** most important trends and innovations in sustainable procurement?	Three essay text boxes
8	What do you see as new key skills and competences that procurement should develop to enable the transition towards **sustainability**?	Essay text box
9	How does procurement need to change to contribute more effectively to the development of new innovations?	Essay text box
10	What do you see as new key skills and competences that procurement should develop to enable the transition towards **innovation**?	Essay text box
11	Are there any issues we have missed in our questions that are important to understand the need for future procurement skills and competences?	Essay text box

Appendix C. Resulting skills from round 1

Negotiation skills
For example, the ability to negotiate terms and conditions with a supplier.
Communication skills
For example, the ability to share information effectively with suppliers or internal colleagues.
Leadership skills
For example, the ability to lead and influence colleagues to commit to new innovation or sustainability projects.
Creativity
For example, the ability to develop a new process to generate innovative ideas from external sources.
Change management
For example, the ability to manage a project to implement a new supply chain design.

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Teamwork For example, to collaborate effectively in a team to develop new green products.
Strategic thinking For example, to plan how to change an existing supply chain to build a new business model.
Critical thinking For example, to rethink your current practices to create innovative solutions to resolve a problem.
Risk management For example, the ability to make contingency plans.
Curiosity For example, to seek innovative solutions and identify new trends.
Legal compliance For example, to understand legal supply chain frameworks.
Digitalization skills For example, the ability to apply or develop artificial intelligence (AI) or other digital solutions.
Contract management For example, to handle supplier expectations and effective management of intellectual property (IP) contracts to maximize value and avoid problems arising.
External stakeholder relationship management For example, the ability to interact with external stakeholders, such as suppliers, non-governmental organisations (NGOs), or regulatory bodies.
Internal stakeholder relationship management For example, the ability to interact with functions, such as R&D or CSR.
Holistic supply chain thinking For example, the ability to see the big picture to understand and predict different types of relationships between many elements throughout a supply chain.
Cross-culture awareness For example, the ability to identify and mitigate possible cultural differences between supply chain partners from organisational values or socio- cultural backgrounds.

Appendix D. Scenarios used for the scenario based online survey (round 2)

Scenario 1: Sustainable Procurement: "A textile company faces issues in its supply chain where two suppliers of cotton are accused of using forced labour and one leather tannery is reportedly using toxic chemicals without adequate waste management processes. The management wants to find long lasting solutions to these recurring issues by implementing more sustainability practices in the supply chain."
Scenario 2: Procurement innovation for circular economy: "The management of a furniture company has decided to develop a new circular product line. This strategy requires product innovation and creating a new circular supply chain (e.g. recycling, refurbishing or reusing of materials and products) based on new supply chain relationships and processes to ensure the recovery and return of used furniture pieces and bringing these back into the new circular supply chain."
Scenario 3: Procurement impact for product innovation: "The procurement department in an automotive company has been asked by its top management team to collaborate with the R&D department on the development of new product innovations: a completely new autonomous driving technology. The role of procurement will be to support the scouting of new suppliers and possibly startups from outside the automotive industry because no existing automotive suppliers have been found and top management is concerned about leaving the whole process to R&D without procurement's involvement. Procurement's role will be to take charge of the technology scouting process and supplier selection, working in close collaboration with R&D."

APPENDIX E. Round two results and gaps between the mean score and that for each scenario[2]

Procurement skills for sustainability (scenario 1)	Final score	Gap mean–score	Procurement skills for both innovation and sustainability (scenario 2)	Final score	Gap mean–score
Strategic thinking	79.6	12.1	Holistic supply chain thinking	64.8	12.6
Holistic supply chain thinking	78.6	11.1	Strategic thinking	63	10.8
Cross-functional teamwork	77.6	10.1	Cross-functional teamwork	62.6	10.4
Risk management	76.4	8.9	Creativity	55.4	3.2
Analytical skills	69.6	2.1	Risk management	55	2.8
Communication skills	69.4	1.9	Leadership skills	54.8	2.6

(*continued on next page*)

[2] The mean is obtained by simply dividing the sum of all values in the common 'final score' by the number of values. The gap 'mean–score' is the difference between the final score and the mean for each scenario. The scale used to calculate the final score is that of round two (1–5 Likert scale). We used the mean–score gap because the Likert scale data can be analysed based on the central tendency, using the mean, to determine the interval measurement scale (Boone and Boone, 2012). We decided not to apply further data analysis procedures.

(*continued*)

Procurement skills for sustainability (scenario 1)	Final score	Gap mean–score	Procurement skills for both innovation and sustainability (scenario 2)	Final score	Gap mean–score
External stakeholder relat. mgmt.	69.2	1.7	External stakeholder relat. mgmt.	53.8	1.6
Negotiation skills	68.8	1.3	Analytical skills	53.2	1.0
Leadership skills	68	0.5	Change management	52.6	0.4
Change management	66.4	−1.1	Communication skills	51.8	−0.4
Critical thinking	64.2	−3.3	Critical thinking	50.2	−2.0
Creativity	63.8	−3.7	Negotiation skills	50	−2.2
Contract management	61.8	−5.7	Curiosity	48	−4.2
Legal compliance	60.6	−6.9	Contract management	44.6	−7.6
Curiosity	59.4	−8.1	Digitalization skills	43.8	−8.4
Cross-cultural awareness	59	−8.5	Legal compliance	42.6	−9.6
Digitalization skills	54.4	−13.1	Cross-cultural awareness	41.6	−10.6
Mean =	67.5		Mean =	52.2	

Procurement skills for innovation (scenario 3)	Final score	Gap mean–score
Cross-functional teamwork	63	12.8
Strategic thinking	60.8	10.6
Holistic supply chain thinking	59.4	9.2
Risk management	54.2	4.0
External stakeholder relat. mgmt.	52.8	2.6
Communication skills	51	0.8
Leadership skills	51	0.8
Analytical skills	51	0.8
Creativity	50.4	0.2
Negotiation skills	49.6	−0.6
Change management	47.8	−2.4
Critical thinking	47	−3.2
Curiosity	46.2	−4.0
Digitalization skills	45.8	−4.4
Contract management	43	−7.2
Legal compliance	41.8	−8.4
Cross-cultural awareness	39	−11.2
Mean =	50.2	

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