



Procurement Educational Consortium for Innovation-sourcing using Sustainability



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PRECIOUS

Procurement Educational Consortium for Innovation sourcing

Using Sustainability

Intellectual Output 3

Quantitative research by conducting questionnaire-based survey research in the three communities to prepare for an educational design in IO4



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**UNIVERSITY
OF TWENTE.**

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List of Abbreviations

Abbreviation	Meaning
IO	Intellectual Output
PSM	Purchasing and Supply Management
SME	Small and Medium Enterprises
MOOC	Massive Open Online Courses
R&D	Research and Development
RQ	Research Question
SPSM	Sustainable Purchasing Supply Management
SC	Supply Chain

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Abstract

The PRECIUS project addresses the urgent need for sustainable innovation in public procurement, environmental engineering, and SMEs to achieve the broader EU's Green Deal objectives. Motivated by the challenges of climate change and environmental degradation, this research explores essential competencies across three key communities: environmental engineers, public procurement professionals, and SME entrepreneurs. The primary objective of this study is to quantify the competencies required for effective collaboration and co-creation of sustainable innovations, as identified in earlier qualitative phases (IO1 and IO2).

A comprehensive questionnaire-based survey was conducted among professionals in the target communities, yielding a sample of 140 answers from various EU countries. The presented White paper offers valuable insights into the competency frameworks necessary for promoting sustainability. Results indicate significant competency overlaps in areas such as stakeholder management, communication skills, change management, and product optimization. These competencies are pivotal in enhancing performance metrics like innovation, quality, and sustainability across different sectors.

Key findings reveal that traditional competencies, such as stakeholder management and change management, have strong positive correlations with innovative and sustainable outcomes. Similarly, green lever competencies, particularly in product and process optimization, are essential for driving sustainability and compliance within organizations. The analysis also highlights distinct competency gaps and strengths within each community, providing a foundation for targeted educational modules in the following project's phases.

1. Intellectual Output 3: Quantitative research by conducting questionnaire-based survey research in the three communities to prepare for an educational design

Climate change and environmental degradation form an existential threat to Europe and the world. To address these challenges, the Green Deal will transform the EU into a modern, resource-efficient, and competitive economy, ensuring that: (1) no net emissions of greenhouse gases by 2050; (2) economic growth decoupled from resource use, (3) and no person and no place left behind. It is additionally described in the European Committee's vision on "Industry 5.0".

Industry 5.0 provides a vision of a sector that aims beyond efficiency and productivity as the sole goals and reinforces the industry's role and contribution to society. It places human well-being at the centre of the production process. It uses new technologies to provide prosperity beyond jobs and growth while respecting the production limits of the planet. Public organisations are vital in implementing societal goals such as sustainability, and public procurement is an essential policy tool and lever for the sustainability transition.

In the European Union, public procurement by national and local authorities like provinces, municipalities, waterboards, and semi-public institutions (e.g. hospitals or universities) counts for 14 percent of the Gross Domestic Product (GPD), i.e. € 2 trillion every year. The European, national, and local public procurement policy fosters sustainability and resilience and builds innovation capacity. It holds that European, national, and local authorities aim to sustainably stimulate businesses to supply innovative goods and services. However, these firms face difficulties in generating practical, sustainable, innovative concepts. Here environmental engineering is required to develop these concepts to carry out the Green Deal objectives. Environmental engineering can define those sustainable, innovative solutions that need further developed and marketed by innovative suppliers, i.e. privately held firms, primarily small and medium-sized enterprises (SMEs) and adopted by buyers. Thus, entrepreneurial SMEs have a role in transforming the insights from environmental engineering into business activities. In that way, SMEs can serve the needs of public procurement's alignment with the Green Deal objectives.

Project PRECIUS, therefore, focuses on facilitating and stimulating the interaction between three communities:

- (1) environmental engineers as a generator of sustainable innovations;
- (2) public procurement officers of sustainable innovations that increasingly face problems in acquiring sustainable innovations from the market;
- (3) entrepreneurs and sales personnel of privately held firms, i.e. suppliers, mainly SMEs that have difficulties tendering and, particularly, how to sell sustainable solutions to public authorities.

1.1 Introduction

The project PRECIUS focuses on stimulating the interaction between three communities: environmental engineers as a generator of sustainable innovations, public procurement officers in acquiring sustainable innovations from the market, and entrepreneurs and sales personnel of privately held SMEs in selling sustainable solutions to public authorities. Consequently, all three communities are represented in the empirical IO3 work package. The presented white paper reports the results of Intellectual Output 3 (IO3) of the project, including the main findings of the questionnaire survey conducted during the Spring of 2024. The research questions for the survey are chosen to reflect the results of the study in IO1 and IO2. The survey's participants were experts and practitioners in the three communities' fields to discuss the competencies needed in creating, buying, and selling innovative sustainable solutions. The results of IO3 will be used in the design of IO4. This intellectual output provides empirically validated competency frameworks for promoting collaboration and co-creation of the sustainable innovations that are needed by public procurement organisations.

1.2 Background

PRECIUS assumes that effective projects and programs for innovation procurement rely on experts in each of the three communities. However, there are some gaps since environmental engineers, public procurement professionals, and entrepreneurs often do not have sufficient knowledge of the other two communities. There is a lack of understanding of leadership of change. PRECIUS, therefore, offers a modular online course with elements that learners select according to need. The core module will focus on leadership, co-creation/collaboration, change, and change management, especially dealing with resistance in organisations.

The multi-disciplinary partnership is focused on establishing a freely available modular online course trajectory within the (future) mutual online platform ECIU University (<https://www.eciu.org/>). The partners in the project are excelling in educational programs for bachelor and master students and increasingly focusing on the lifelong learning trajectories of professionals. The aim is that the course materials can be applied firstly for training professionals and secondly for academic education.

ECIU University's mission is to facilitate a European-wide ecosystem based upon open and inclusive collaboration connecting societal stakeholders, researchers, and learners to provide European answers to future societal challenges. ECIU University creates a playground for solving multi-disciplinary challenges in entrepreneurial, innovative ways and provides personalised learning and career opportunities for life at the European level, enabled by a novel university model based upon co-creation.

In conclusion of IO1 and IO2, the overlapping competencies required across three communities: public procurement, environmental engineering, and the SME sector were found. These competencies encompass a wide range of skills and qualities essential for individuals working in these fields to succeed and make a meaningful impact. Regarding Sustainable Purchasing Supply Management (SPSM) competencies, several authors proposed a classification according to social, meta, functional, and cognition-oriented competencies

(Schulze & Bals, 2020; Schulze et al., 2019; Schulze et al., 2022). The classification in the framework of IO1 was done based on the model by Le Deist & Winterton (2005).

By recognizing and cultivating necessary competencies, individuals can enhance their professional capabilities and contribute effectively to their respective communities. Moreover, integrating competencies fosters a well-rounded approach to work, enabling individuals to excel in their roles and positively impact the sector. Then, the further quantification of the findings from IO1 and IO2 were aimed at IO3. For this reason, the questionnaire survey was conducted.

1.3 Research objective for IO3

The White Paper of IO3 reflects on the outcomes of the quantitative survey-based study that was performed to verify the qualitative findings based on the qualitative research. The White Paper summarises the outcomes and analysis of the questionnaires that are directed at (1) environmental engineers as inventors of innovative sustainability solutions, (2) public procurement leaders, public procurement officers, their internal clients, contract managers, and stakeholders in public procurement, and (3) entrepreneurs at privately-held organisations, mainly SMEs as suppliers of innovative sustainability solutions on essential competencies and capabilities.

The additional results and benefits include publishing articles in scientific and managerial journals, building the ECIU and ECIU University, building the new PRECIUS consortium, integrating education and professional development around grand challenges, crossing functional, disciplinary, and national boundaries, and enhancing other provisions by the partners.

From the project plan, the objective of the empirical research during IO3 was to quantify the results of the IO1 and IO2. IO3 aims to provide the basis for future IOs i.e. the design of an online course (IO4), and finally the construction of the MOOC (IO5). A quantitative study is conducted in IO3 whose results form the basis for the development of the module-based online course. The survey method including a validated questionnaire is chosen to reflect and evaluate the results of IO1 and IO2 and collect additional remarks from the participants. The content developed in the IO1 and IO2 was structured to prepare the survey. The survey participants are academics and practitioners in the three target groups/communities.

The survey must bring an understanding of the necessary skills in developing competency frameworks for sustainable innovations and include many entries from the survey participants. The IO3 findings correspond to the goals of PRECIUS to create an innovative module-based online course. They help set the focus of content and link the necessary modules related to each other as learning paths for the holistic course concept. The survey produces an image for developing competency frameworks for promoting collaboration and co-creation of the sustainable innovations needed by public procurement organizations. In addition, the results in the form of IO3 will influence the three learner target groups/communities and beyond. This procedure also represents best practices for application in other specialist areas.

1.4 Research questions of IO3

Based on the outcomes of the studies in IO1 and IO2 regarding the three learning target groups/communities in developing competency frameworks for sustainable innovations, a quantitative study is conducted in IO3 whose results form the basis for the development of the module-based online course and thus form the basis for the further IO 4 and 5. For conducting the quantitative research, the survey method including a validated questionnaire is chosen to reflect and evaluate the results of IO1 and IO2 and collect additional remarks from the participants. To prepare the survey, the content developed in the IO1 and IO2 was structured, and qualified participants for the survey were identified. The survey produces an image for developing competency frameworks for promoting collaboration and co-creation of the sustainable innovations needed by public procurement organisations. In addition, the results in the form of IO3 will influence the three learner target groups/communities and beyond. This procedure also represents best practices for application in other specialist areas.

The survey answers the question of the essential competencies, and the performance outcomes in the form of sustainable innovations based on and decided after the qualitative study.

Research questions at the general level:

RQ1: What is the level of your understanding and execution on the listed specific competences to buy/develop/sell novel sustainable solutions?

RQ2: What is the perception of individual and team's performance to buy/develop/sell novel sustainable solutions?

RQ3: How competent / experienced are you in applying the green levers?

2. Questionnaire-based survey

2.1 Overview of the methodology

The IO3 data collection started in “Literature Review” process in IO1. The applied methodology was a literature review of scientific and practitioners' journal articles on detecting and acquiring innovations and innovative sustainable solutions competencies with the three communities. And further, "the Research World Café" as a technique to accelerate data collection focused on the needed organisational capabilities and competences in a sustainable economy in which public organisations can influence and effectively implement sustainable innovations. This was further strengthened by experts' interviews. This method of data collection was seen as a good way of combining the collection of ideas. The concluded list of competencies was further examined to include in the survey questionnaire of IO3. The survey questionnaire was developed by the rigorous assessment of all the partner universities involved in the project PRECIUS. The set of questions consisted of Control variables, Competencies items, Performance variables, Competencies development mechanism, and Green Levers. There were 156 questions asked in the survey. The Parallel research was performed in the field of leadership and change in developing competence in co-creating and developing sustainable innovations regarding the three targeted learning groups/communities.

2.2 Survey design

The survey design for IO3 was structured to capture a comprehensive understanding of the competencies needed across three distinct communities. The design process was designed on the findings from IO1 and IO2, ensuring that the survey addressed the most relevant and critical aspects of sustainable innovation competencies.

The survey was developed through a collaborative effort involving all partner universities in the PRECIUS consortium. This collaboration ensured that the survey questions were comprehensive, relevant, and tailored to the needs of the target communities. The survey consisted of 156 questions (for the full list of questions please see the appendices) divided into five main sections:

1. Control Variables: Questions related to demographics, education, and professional background to categorise and analyse the respondents' profiles accurately.
2. Competency Items: A series of questions designed to assess the self-reported proficiency in various traditional competencies.
3. Organisational Performance: Questions aimed at understanding the performance outcomes of respondents' organisations in terms of quality, cost, innovation, and sustainability.
4. Competency Development Mechanisms: Items exploring the methods and mechanisms organisations use to develop and enhance their members' competencies.

5. Green Levers Competencies: Questions focused on specific skills related to the application of green levers, which are essential for promoting sustainability within organisations.

The survey utilised a combination of quantitative and qualitative research methodologies. Quantitative data was gathered through a structured questionnaire, while qualitative insights were obtained from open-ended questions, allowing respondents to provide detailed feedback on specific competencies and performance indicators.

Before the full deployment, the survey underwent a rigorous validation process. This included pilot testing with a small group of respondents from each target community to ensure the clarity, relevance, and effectiveness of the questions. Feedback from the pilot test was used to refine the survey, addressing any ambiguities or redundancies.

The data collection process was executed during the period from March 1st, 2024 to June 6th, 2024. The survey was distributed online to a wide range of professionals across Europe, targeting individuals with expertise and practical experience in public procurement, environmental engineering, and SME management. Efforts were made to ensure a diverse and representative sample, encompassing various countries, organisational sizes, and professional backgrounds.

Upon completion of the data collection phase, the responses were systematically analysed using statistical software IBM SPSS and Python programming language. Descriptive statistics were used to summarize the sample characteristics, while advanced statistical techniques, such as Spearman correlation analysis, and Analysis of Variance (ANOVA), were employed to identify significant differences and relationships among competencies and performance outcomes.

Throughout the survey design and implementation, strict ethical guidelines were followed. Participants were informed about the purpose of the research, assured of their anonymity, and provided with the option to withdraw at any stage. Data confidentiality was maintained, and the findings were reported in aggregate to prevent the identification of individual respondents.

In summary, the survey design for IO3 was a well-coordinated and thorough process aimed at capturing the essential competencies required for sustainable innovation. The comprehensive approach ensured that the survey provided valuable insights, which will inform the development of targeted educational modules in subsequent phases of the PRECIUS project.

2.3 Targeted audience

The targeted audiences of the survey were from the communities of Environmental engineering, Procurement professionals, and SMEs involved in different organisations in European countries. The survey participants were practitioners in the field of the three targeted communities. The survey must bring an understanding of the necessary skills in developing competency frameworks for sustainable innovations and include many entries from the survey participants. The IO3 findings correspond to the goals of PRECIUS to create an innovative module-based online course. The findings from IO3 are reflected and

incorporated into the content concept for the design of the course. They help set the focus of content and link the necessary modules related to each other as learning paths for the holistic course concept.

The implementation of a standardised survey on developing competency frameworks for promoting collaboration and co-creation of the sustainable innovations (that are needed by public procurement organisations) targeted at the three learners' groups/communities in the project partners' countries: Finland, Portugal, Lithuania, the Netherlands, and other European countries with participants from different disciplines and backgrounds.

3. Results of the questionnaire-based survey

Chapter three of the presented white paper describes recorded results in the survey of the project PRECIUS. Firstly, white paper deals with the descriptive statistics of analysed sample, highlighting current country of residence of the survey participants, working position which serves as a proxy to assign respondent to specific communities which are the main scope of the project PRECIUS. Descriptive analysis was also focused on control variables such as the highest achieved level of education, field of the study, years of gained experience in the current working position, as well as size of the organisation participant is working for. There is also focus on type of products or services offered/bought in respective organisation. Secondly, there is performed analysis on individual and grouped competencies (skill sets of similar competences falling under one category) of the participants. Evaluation of the highest ranked competencies serves to compare, if there are significant differences among groups of participants in relation to their profession. Evaluation of competencies in relation to the specific community and organisation performance allows to target competencies and skills to be designed in the following work package IO4 as a part of the training modules. In the next stage, the analysis of the green lever competencies was carried out. The analysis of the green levers serves to understand which best practices are used within the different communities to promote and achieve sustainability. In the end, the profiles of skill sets were identified to better describe which competencies are leading to the success when measure on the organisation's performance. Identified skills from communities' profile will be used later for the training modules developed within the scope of the project PRECIUS.

3.1 Descriptive statistics of the sample

Following sub-chapter provides the analysis of answered control variables in the conducted survey. Control variables and their results help to understand sample characteristics. The control variable describing country of the respondent served for the research team primary to monitor how well is the survey spread from the geographical point of view.

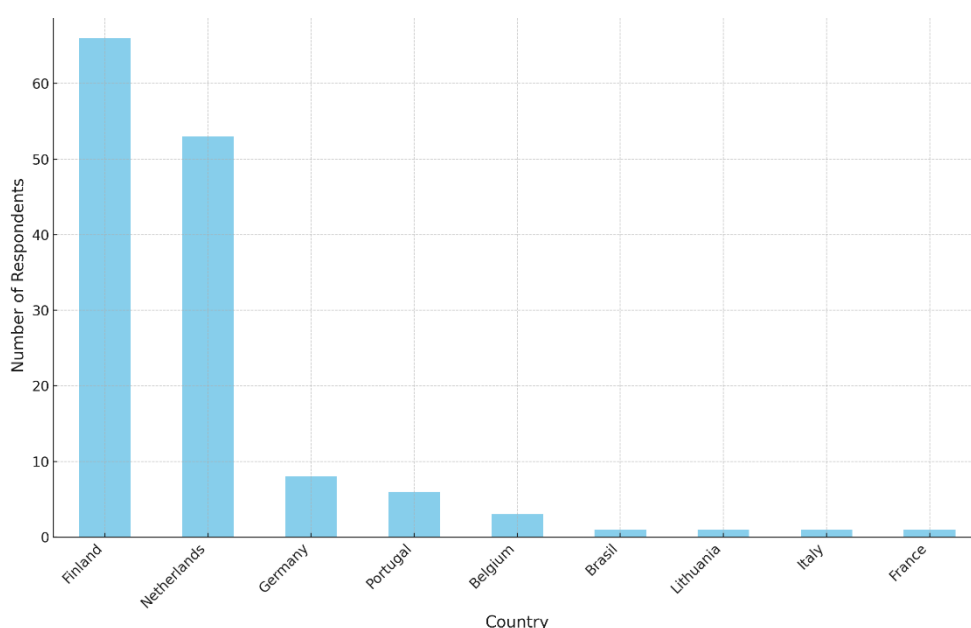


Figure 1 Distribution of the survey participants by country of current residence. Source: Survey PRECIUS.

The distribution of respondents by country, displayed in *Figure 1*, reveals the highest share of the respondents in Finland, which accounts for 47.14% (66 responses) of the total responses. Followed by participants currently living in the Netherlands, contributing 37.86% (53) of the responses. Together, participants currently residing in Finland and the Netherlands dominate the survey sample, representing over 84% (119) of the analysed sample. Germany and Portugal have a smaller presence, with 5.71% (8) and 4.29% (6) respectively. Other countries, including Belgium, Brazil, Lithuania, Italy, and France, each contribute less than 3% to the total 140 analysed responses.

The next analysed control variable represents the participant's current working position. The working position of the participant helps to better approximate reported competencies for the targeted profile among three communities. *Figure 2* illustrates the pie chart showing the distribution of respondents by their current working position indicating a major representation from the public purchasing sector, accounting for 66.43% (93 responses) of the total 140 responses. Followed by individuals in sales positions, who make up 15% (21) of the respondents. Management roles are represented by 8.57% (12), while both private purchasing and R&D and engineering (developing) positions each account for 5% (7) of the total sample.

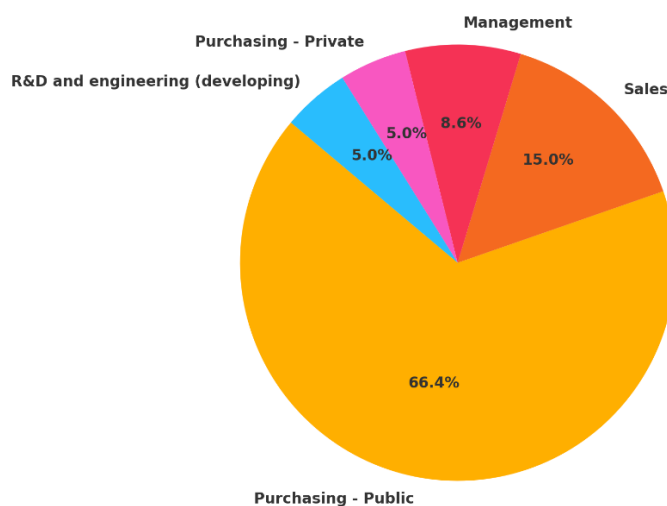


Figure 2 Distribution of the survey participants according to their current position. Source: Survey PRECIUS.

Another analysed variable was the highest achieved education level. The distribution of respondents' highest achieved education level is mostly skewed towards higher education as shown in *Figure 3*. A majority of respondents, 58.6% (82 individuals), hold a master's degree. Followed by those with a bachelor's degree, accounting for 31.4% (44). Secondary or vocational education is the highest level achieved by 7.9% (11) of the respondents. Finally, a small fraction, 2.1% (3), have attained a doctorate degree. This distribution highlights a highly educated respondent *sample*, with nearly 90% holding at least a bachelor's degree, suggesting that the survey targeted or attracted individuals with significant academic qualifications. Most of the survey respondents (56.43%) have a background in Business Administration, followed by Business and Economics (14.29%) and Supply Chain Management (7.14%). Other fields of the study in analysed sample have smaller representations as displayed in the *Table 1*.

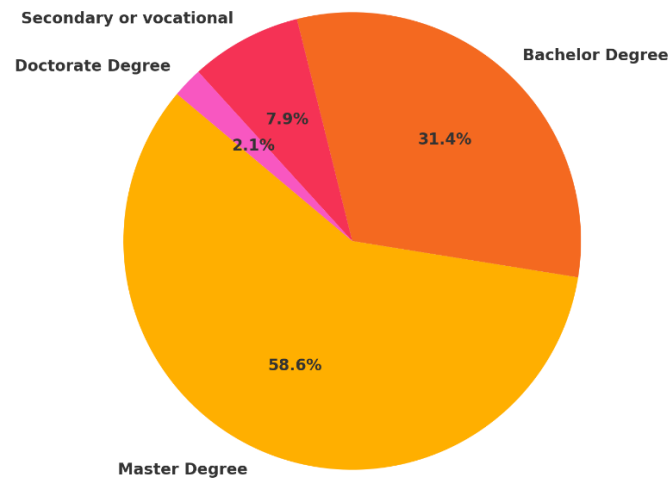


Figure 3 Distribution of the survey participants according to their highest achieved education level. Source: Survey PRECIUS.

Table 1 Field of study as indicated by the survey participants. Source: Survey PRECIUS.

Field of Study	Count	Percentage (%)
Business Administration	79	56.43
Business and Economics	20	14.29
Supply Chain Management	10	7.14
Other	8	5.71
Engineering	7	5.00
Information Technology	6	4.29
Marketing	5	3.57
Law	3	2.14
Finance	2	1.43

The survey data on the number of employees in participants' organisations were categorised into four distinct groups for better visualisation and presentation purposes, as displayed in *Figure 4*. Four categorised groups consisted of small (0-50 employees), medium (51-250 employees), large (251-10000 employees), and very large (10001-20000 employees) organisations. The distribution revealed that 22% (31 organisations) of the participants in the survey were from small organisations, reflecting a significant presence of smaller firms within the survey. Medium-sized organisations accounted for 32% of the sample (42), indicating a substantial representation of this segment. A considerable portion of the respondents belonged to large organisations, comprising 41% of the sample (60), showcasing the dominance of large-scale organisations. Lastly, very large organisations represented 5% of the sample (7), highlighting the relatively few but notable participation from companies with an

extensive employee base. Distribution underscores the diverse range of organisations sizes included in the survey, providing a broad perspective on organisational scales within the study.

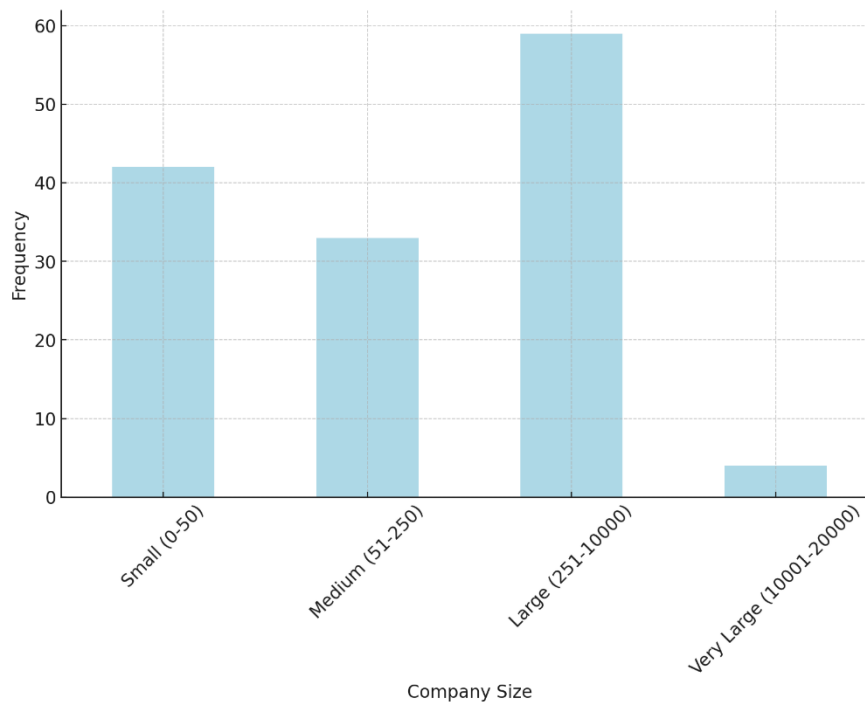


Figure 4 Distribution of the organisations size of the survey participants. Source: Survey PRECIUS.

Figure 5 shows data on the years of experience of participants in their current positions. As in the previous control variable also here the recorded values were categorised into seven distinct groups: less than 1 year, 1-5 years, 6-10 years, 11-20 years, 21-30 years, 31-40 years, and 41-50 years. The distribution illustrated in *Figure 5* shows that 10% of the participants had less than 1 year of experience in their current position (14), reflecting a notable proportion of relatively new employees in their current working position. Participants with 1-5 years of experience constituted 35% of the sample (49), indicating a significant segment of individuals in the early to mid-stage of their current roles. Those with 6-10 years of experience made up 23% of the sample (32), showcasing the presence of experienced individuals in the analysed sample. Participants with 11-20 years of experience accounted for 20% of the sample (36), underscoring a substantial group of long-term position holders. Further, 7% of the participants had 21-30 years of experience (6), while those with 31-40 years and 41-50 years of experience represented 2% (3) and 1% (1) of the sample, respectively. Distribution highlights the diverse range of experience levels among survey participants, providing a comprehensive perspective on their tenure within their current positions.

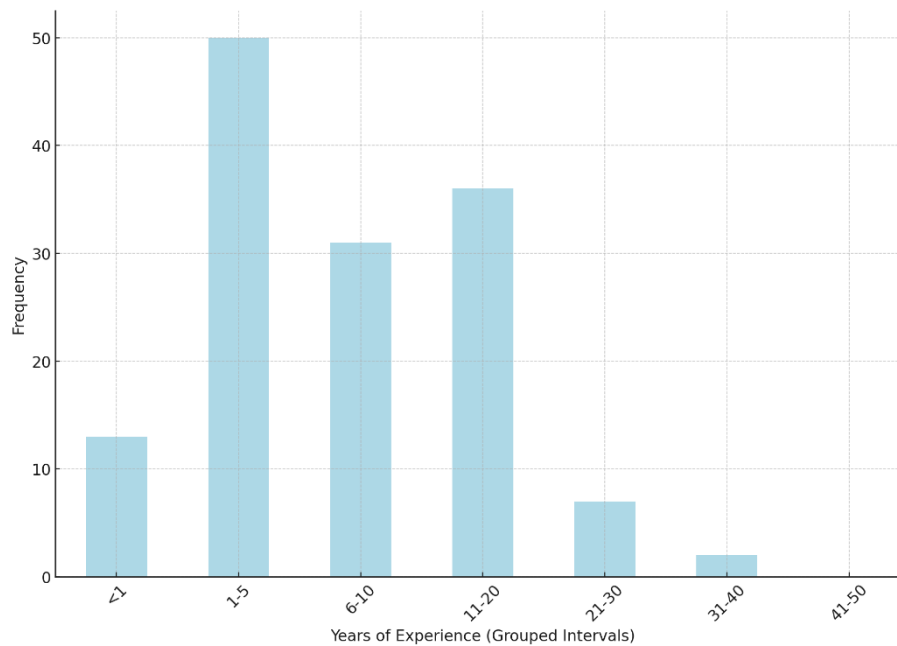


Figure 5 Years of experience of the survey participants. Source: Survey PRECIUS.

The distribution of survey responses regarding the type of products or services offered by the participants' organisations revealed a diverse range of operational focuses as shown in the Figure 6.

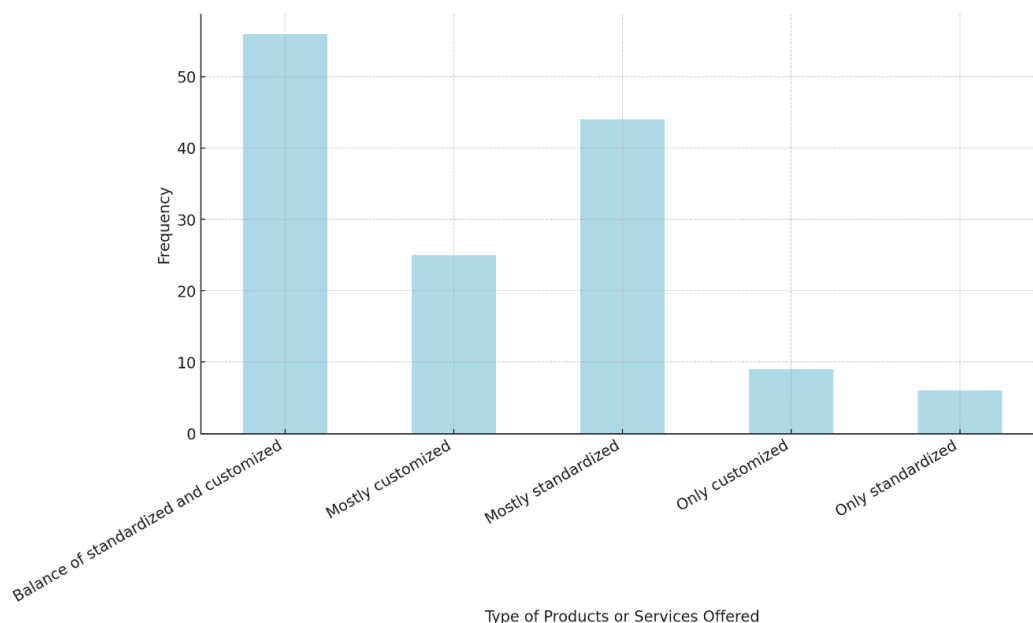


Figure 6 Distribution of the reported offer of physical products and services in the organisation. Source: Survey PRECIUS.

A significant portion of the participants, 40%, indicated that their companies offer a balance of standardized and customized products and services (56 respondents). This result suggests a prevalent strategy of flexibility and adaptability in meeting diverse customer needs. Following, 31.4% of the participants reported that their organisations predominantly offer mostly standardised products and services (44 respondents), reflecting a strong inclination

towards uniformity and efficiency in their offerings. Additionally, 17.9% of the respondents indicated that their organisations primarily offer mostly customised products and services (25 respondents), highlighting a considerable segment focused on tailored solutions to cater to specific customer requirements. A smaller, yet notable portion, 6.4%, reported offering only customised products and services (9 respondents), which indicates a niche market strategy of highly specialised offerings. With the smallest share, 4.3% of the participants stated that their organisation exclusively provides standardised products and services (6 respondents), indicating a possible focus on consistency and mass production. This distribution underscores the varied approaches companies take in their product and service offerings, ranging from balanced and adaptable strategies to highly specialised or standardised models. The diversity in these operational focuses reflects the different market strategies and customer engagement practices prevalent among the surveyed participants and their organisations or respective departments.

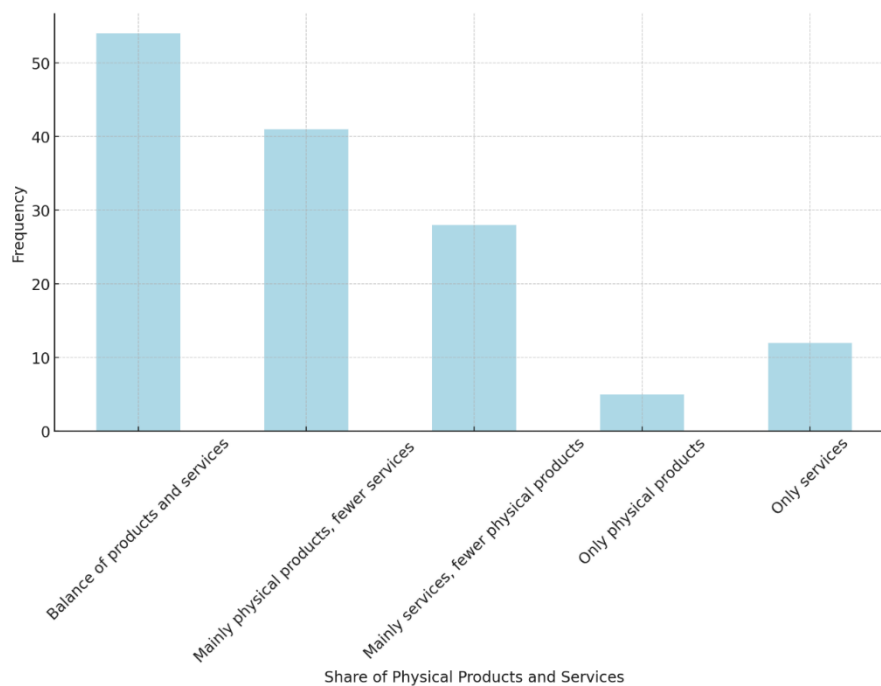


Figure 7 Distribution of the reported share of physical products and services in organisation. Source: Survey PRECIUS.

The last analysed control variable was directed to the share of physical products and services in the organisation's purchases or sales to business partners (*Figure 7*), the distribution showed that 38.6% of participants indicated a balance of products and services (54). Followed by 29.3% of the participants whose organisations or departments mainly offered physical products with fewer services (41). About 20.0% reported that their organisations mainly provided services with fewer physical products (28). Participants of the survey reporting that their respective organisation or department is offering only services constituted 8.6% of the sample (12), whereas those offering only physical products represented 3.6% of the participants (5). Distribution highlights the diverse pool of organisations in our sample, which take in balancing products and services in their operations, providing a comprehensive overview of their market strategies.

3.2 Analysis of the traditional competencies

The next part of the survey results analysis is focused on the competencies. Participants were asked to self-report their competence level on 42 individual skills. These skills are grouped into main constructs (skill sets), consisting of the ability to take risks and support experimentation, Creative mindset, Change management skills, Communication skills, Stakeholder management skills, System thinking, Procedural competencies, Networking, Result orientation, Imagination, Sellership, Leadership, Sustainability science, and Data Analytics. The proposed broad spectrum of the various skills was designed in order to assess and capture the most common and demanded skills within the three communities of public procurement professionals/purchasers, sellers, and environmental engineers.

In the analysis of competencies with the highest average scores, illustrated in *Figure 8*, the top ten individual competencies identified were Honesty (average value 3.9), Loyalty (3.7), Ability to Solve Problems (3.7), Team Ability Skills (3.6), Willingness to Learn (3.6), Comprehension of Complexity (3.5), Capacity to be empathetic (3.5), Holistic Thinking (3.5), Out-of-the-box thinking, and Open mind (3.4). Mentioned competencies reflect a range of attributes including personal integrity, teamwork capabilities, problem-solving skills, and innovative thinking, indicating their critical importance in the sample under analysis. As shown in *Figure 8* the highest average scores suggest that the competencies mentioned are highly valued and well-developed among the survey participants. On average indicating higher than advanced competence. For the next step, there was an assumption, that not all the competencies with the highest average score have the same distribution among analysed groups of participants in relation to their working position.

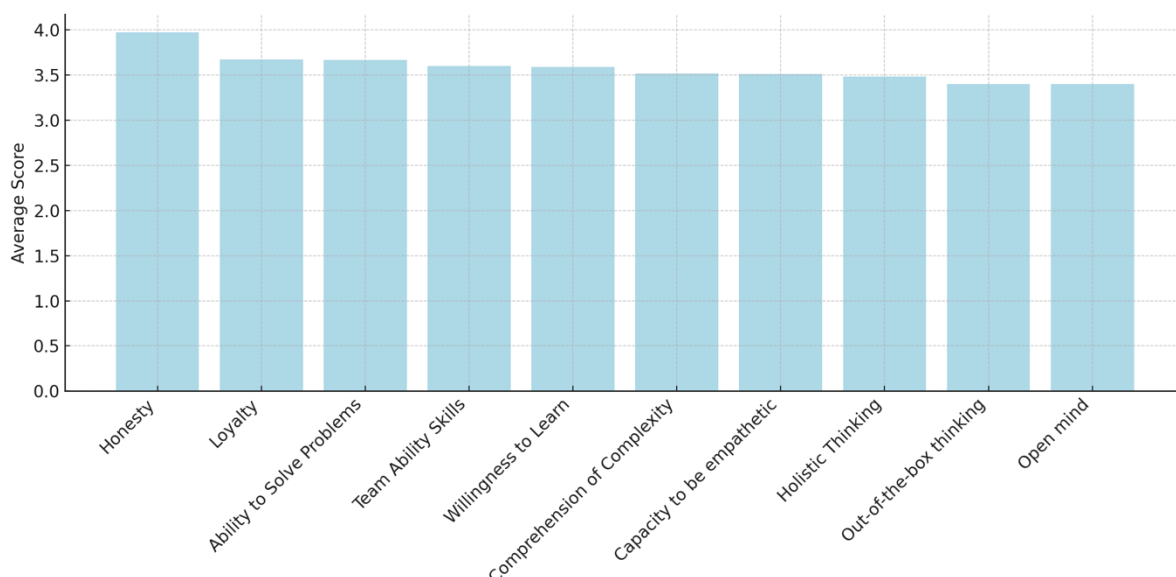


Figure 8 Individual competencies with the highest self-reported score in the sample. Source: Survey PRECIUS.

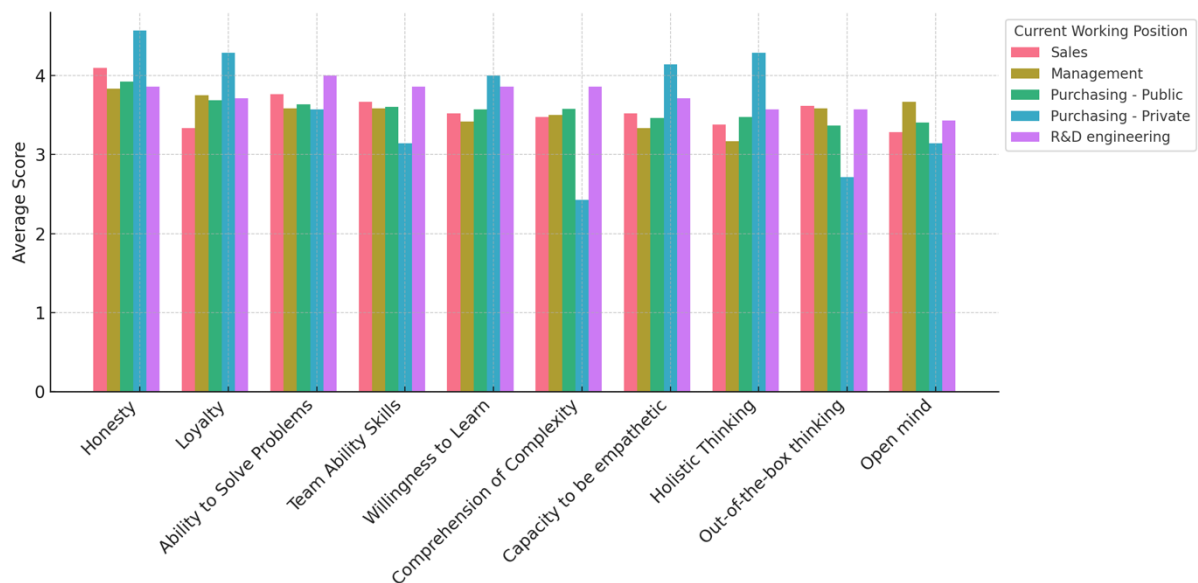


Figure 9 Differences between self-reported competencies according to the working position. Source: Survey PRECIUS.

In examining the statistical significance of differences among the groups based on current working positions (*Figure 9*), several noteworthy findings emerged. The One-Way ANOVA, presented in *Table 2* revealed that Comprehension of Complexity and Holistic Thinking had significant F-values, prompting further investigation through post-hoc Tukey HSD tests. Significant differences were observed in multiple comparisons. Specifically, Comprehension of Complexity showed significant differences between Sales and Purchasing - Private, Sales and R&D engineering, and Purchasing - Public and Purchasing - Private. Holistic Thinking exhibited significant differences between Sales and Purchasing - Private and Purchasing - Public and R&D engineering.

Table 2 Post-hoc Tukey Test results on the average score on competencies among communities. Source: Survey PRECIUS.

Competency	Sales Purchasing Private	vs -	Management Purchasing Private	vs -	Purchasing Public Purchasing Private	- vs -	Purchasing Private vs R&D and engineering
Honesty			Significant		Significant		
Loyalty					Significant		
Willingness to Learn			Significant				
Comprehension of Complexity	Significant		Significant		Significant		Significant
Capacity to be empathetic			Significant		Significant		
Holistic Thinking	Significant		Significant		Significant		
Out-of-the-box thinking	Significant		Significant				Significant

As reported in *Table 2*, findings highlight specific competencies where significant differences in mean scores exist among the group of employees working in purchasing in private organisations. The results from *Figure 9* and *Table 2* confirm statistically significant differences between private purchasers and all other communities in the competencies with the highest score, except Ability to solve problems, Team cooperation ability, and Open mind. These findings underscore the varying emphasis or development of these skills across different working positions, or communities respectively.

In examining the interrelations among various skill sets in the survey data, five of the strongest correlations emerged, indicating significant overlaps in competencies and skill sets as displayed in *Figure 10*.

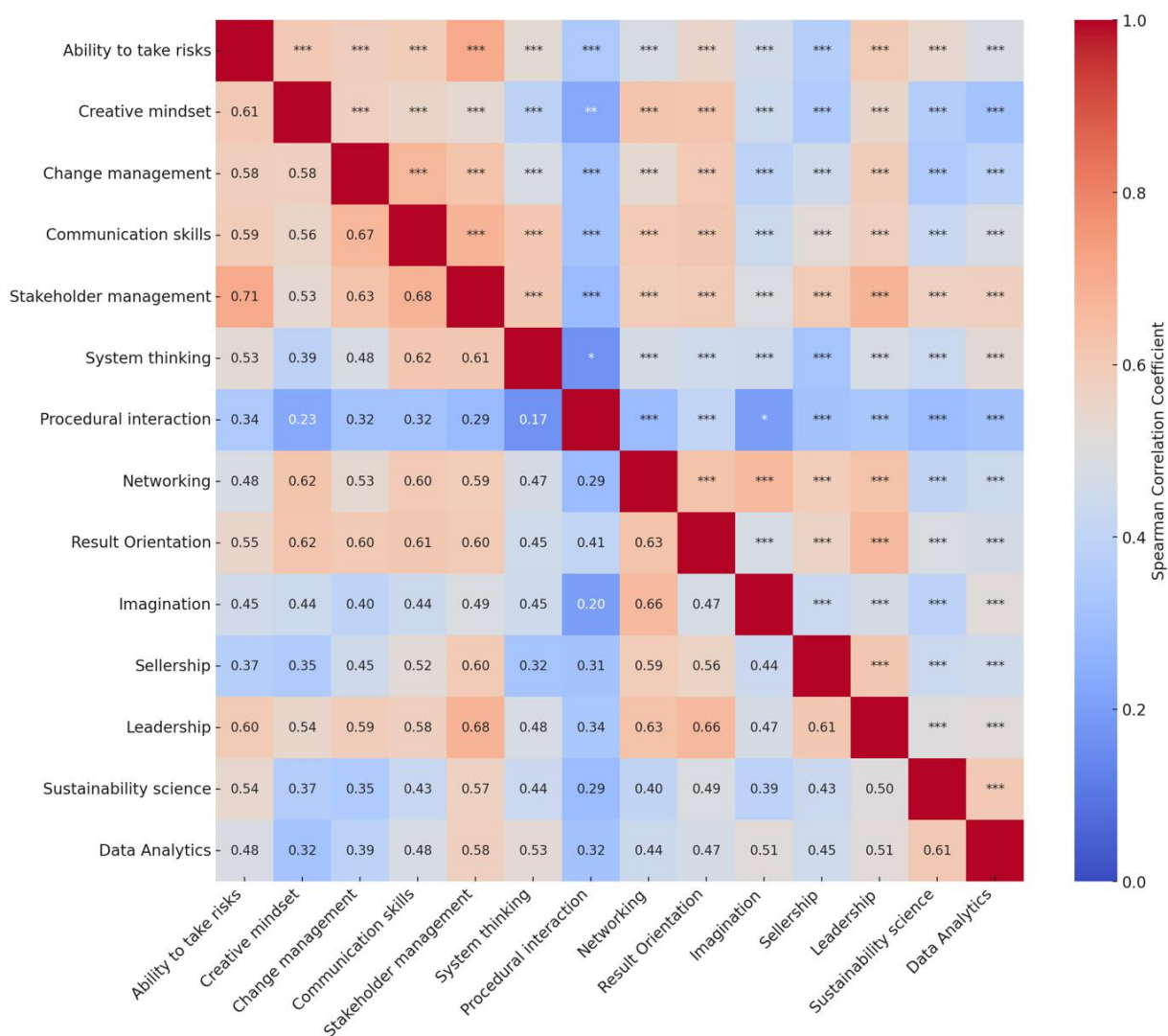


Figure 10 Correlation heatmap among competencies constructs. Source: Survey PRECIUS.

The correlation between "Stakeholder management" and "Ability to take risks" was notably high, with a coefficient of 0.71 ($p\text{-value} < 0.001$), suggesting that individuals proficient in managing stakeholders are also likely to take calculated risks, possibly due to their comfort with uncertainty and decision-making under pressure. Similarly, "Communication skills" and

"Stakeholder management" exhibited a robust correlation of 0.68 ($p < 0.001$), reflecting the importance of effective communication in managing diverse stakeholder interests. The constructs "Leadership" and "Stakeholder management" also showed a strong correlation of 0.68 ($p < 0.001$), emphasizing that leadership qualities are crucial for effectively managing stakeholders. Another significant correlation was found between "Change management" and "Communication skills," with a coefficient of 0.67 ($p < 0.001$), indicating that strong communication is vital for successfully managing and implementing change. Lastly, "Creative mindset" and "Ability to take risks" were highly correlated at 0.61 ($p < 0.001$), implying that creativity often involves a willingness to embrace and manage risks. Conversely, the weakest correlations were observed between "System thinking" and "Procedural interaction," with a coefficient of 0.17 ($p = 0.046$), suggesting that these two skill sets do not strongly influence each other. "Procedural interaction" and "Imagination" also showed a weak correlation of 0.20 ($p = 0.017$), highlighting that procedural skills do not necessarily predict the competence of imaginative thinking. Lastly, the correlation between "Creative mindset" and "Procedural interaction" was among the lowest at 0.23 ($p = 0.005$), indicating that a creative mindset does not strongly align with procedural skills. These findings offer an understanding of how various competencies interrelate, with certain skill sets reinforcing each other while others remain distinct.

3.3 Analysis of the Green Lever Competencies

The following part describes the analysis of the skills related to the green levers and self-reported competence of the survey participants. These skills might be considered as not as traditional when compared to the skills in the previous sub-chapter. Green levers are aimed to measure how competent are participants in applying green levers to promote sustainable approaches. Similarly to the previous sub-chapter, firstly, there is an analysis of individual green lever competencies, while later the green levers are evaluated as skill sets. The objective of the performed analysis was to identify specific skills related to the green levers.

Figure 11 illustrates the average scores of various Green Levers competencies based on a survey of 140 participants. The highest-scoring competency is "Drawing up contracts," with an average score of 2.6, indicating its prominence in the respondents' focus on sustainability. The next most highly scored competency is "Extend use (e.g. through maintenance)" with an average score of 2.3. Notably, the competencies ranked from third to tenth, including "Functional specification with sustainability," "Total cost calculation," "Energy savings (own)," "Energy saving (product)," "Sustainable supply chain initiative," "KPIs / sustainability targets for suppliers," "10Re," and "Optimising logistics," all share the same average score of 2.2. This uniformity in collected responses suggests a broad and equal emphasis on these aspects of sustainability among the participants, reflecting a well-rounded approach to integrating green practices across various operational dimensions.

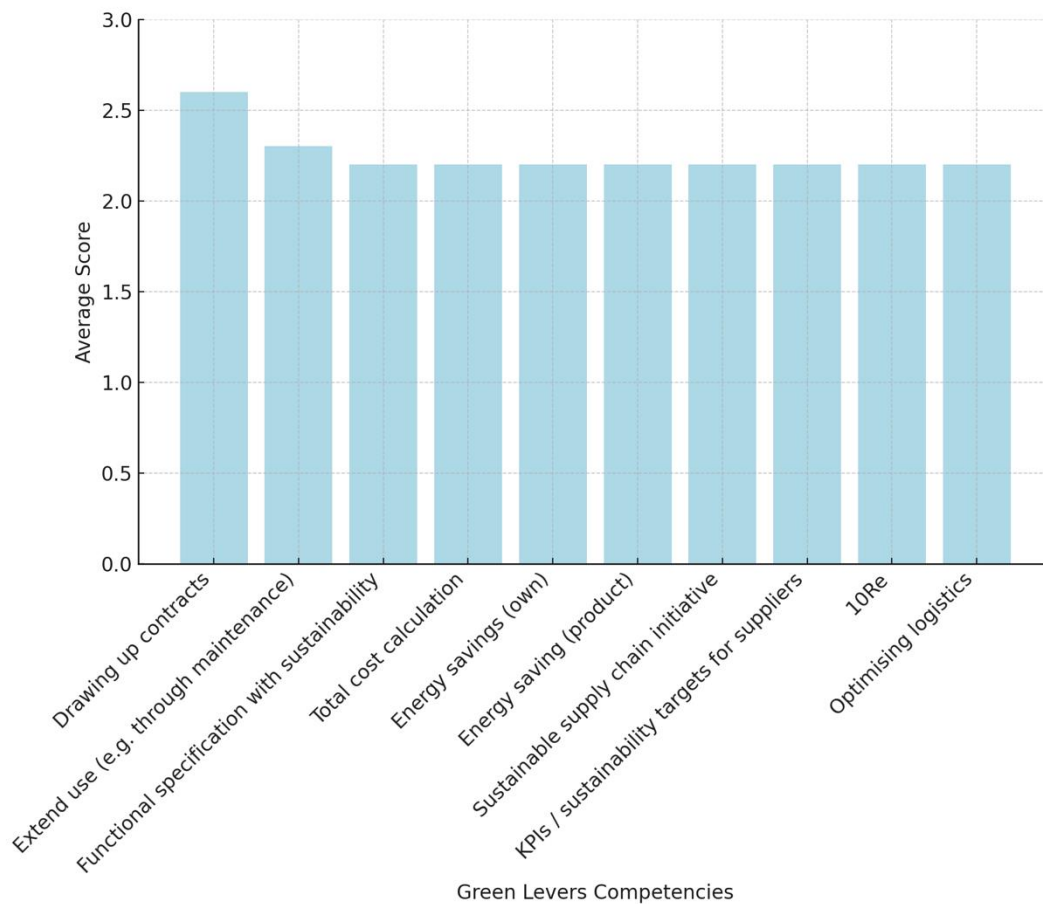


Figure 11 Individual green lever competencies with the highest self-reported score in the sample. Source: Survey PRECIUS.

The results illustrated in *Figure 11* provide several insightful observations regarding the prioritisation of sustainability competencies among the participants. The highest average score for "Drawing up contracts" at 2.6 suggests that formalising sustainability commitments in contractual agreements is perceived as the most critical and actionable step towards achieving sustainable practices as this skill had reported the highest competence level in our sample. This highlights a trend where organisations are likely focusing on embedding sustainability into their foundational business agreements, ensuring long-term commitment and accountability. The next competency, "Extend use (e.g., through maintenance)," scoring 2.3 on the average, indicates a significant emphasis on prolonging the lifecycle of products and assets. This approach not only supports environmental sustainability by reducing waste but also offers economic benefits by maximising the value derived from existing resources. The uniform average score of 2.2 for the remaining competencies from "Functional specification with sustainability" to "Optimising logistics" reveals a balanced attention to multiple aspects of sustainability. It suggests that participants are not overwhelmingly favouring or specialised in application of one particular area of the green levers approach, however, instead adopting a holistic approach. This balanced scoring implies the importance of integrating sustainability across various operational areas, from ensuring sustainable product specifications and cost calculations to enhancing energy savings, fostering sustainable supply chains, and optimising logistics.

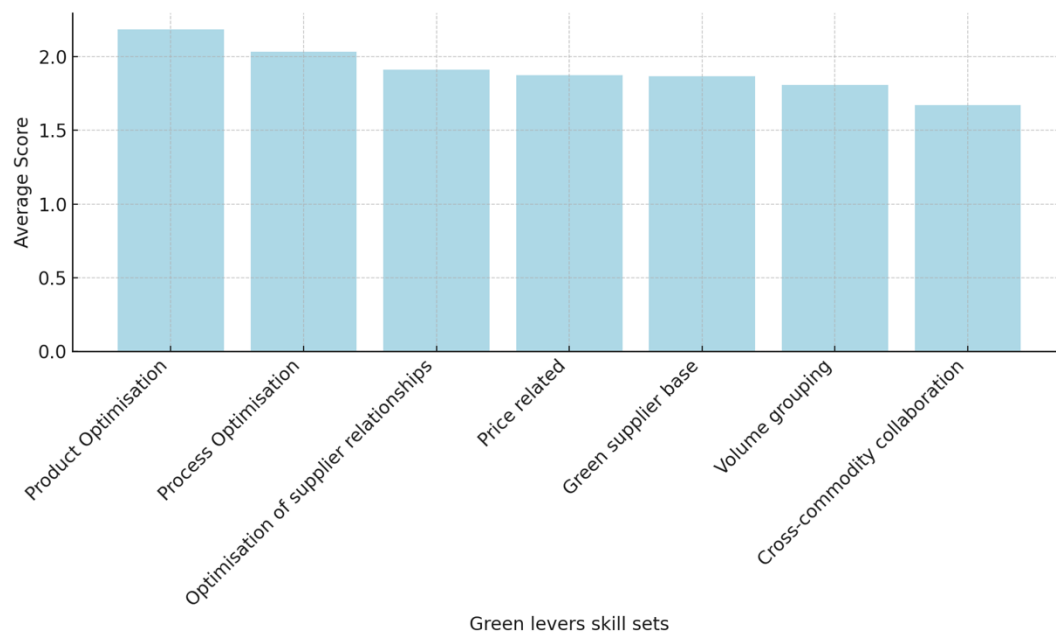


Figure 12 The average score of skill sets competencies in Green levers. Source: Survey PRECIUS.

Figure 12 presents the average competence scores across seven distinct green lever skill sets. "Product Optimisation" leads with an average score of 2.19, indicating the highest proficiency among respondents. This is followed by "Process Optimisation" at 2.03 and "Optimisation of supplier relationships" at 1.91. Other skill sets, including "Price related" (1.88), "Green supplier base" (1.87), and "Volume grouping" (1.81), display moderate competence levels. "Cross-commodity collaboration" has the lowest average score of 1.67, suggesting the greatest need for improvement in this area. The data highlights varied expertise, pointing to strengths and potential areas of stronger competences within the sample.

The survey results of applying Green Levers across different working positions reveal distinct variations in how each group prioritizes and excels in specific sustainability practices as shown in *Figure 13*. Management generally shows moderate scores across all levers, with notable emphasis on Drawing up Contracts (2.67). Sales positions consistently display higher engagement, particularly in Energy Savings (2.67) and Optimizing Logistics (2.67), suggesting a strong alignment with practical, cost-saving measures. In contrast, Purchasing - Public exhibits balanced scores, notably 2.46 in Drawing up Contracts and 2.15 in 10Re, indicating a comprehensive approach towards sustainability. Purchasing - Private highlights higher scores in areas like Functional Specification (2.43) and KPIs for suppliers (2.14), reflecting targeted strategic initiatives. R&D and Engineering positions dominate across nearly all categories, with significant scores in Sustainable Supply Chain Initiatives (3.14) and 10Re (3.29), demonstrating their critical role in driving innovation and sustainability integration. These findings highlight the importance of tailoring sustainability strategies to the unique strengths and priorities of each working community to maximize the overall impact of Green Levers.

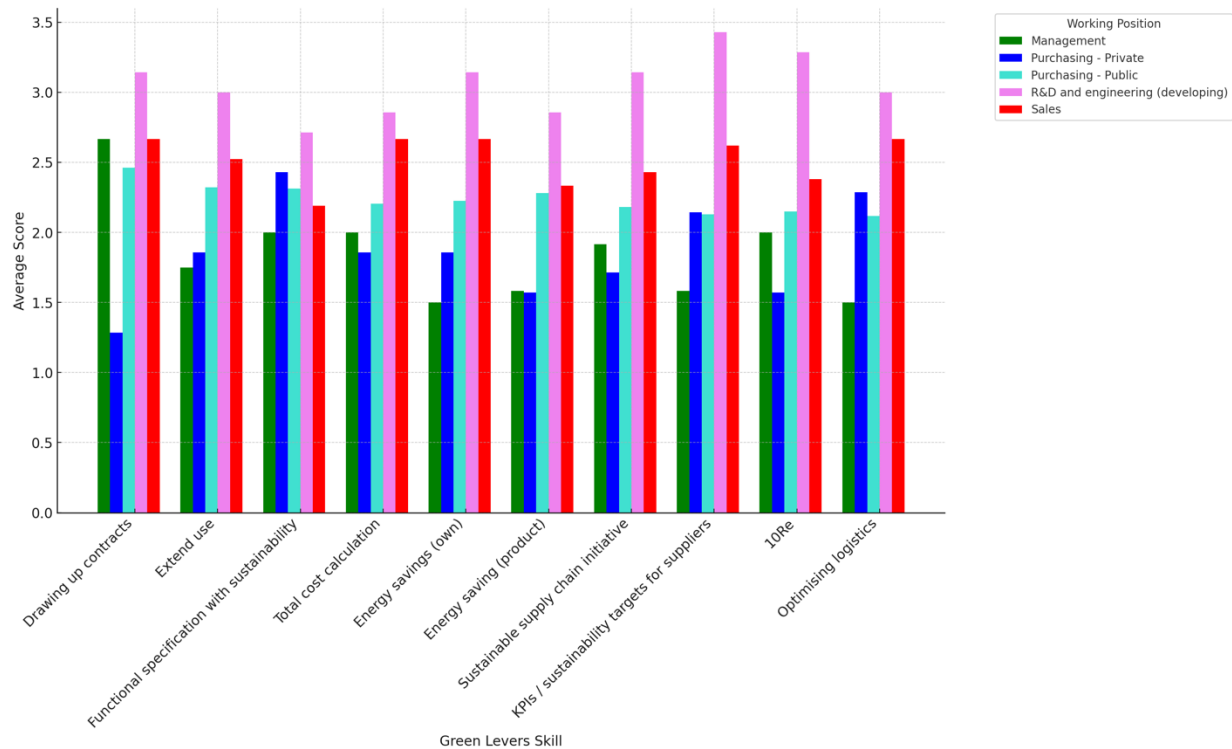


Figure 13 Differences between self-reported competencies in applying Green levers according to the working position. Source: Survey PRECIUS.

Evaluation of the differences in competence scores for various Green Levers among different occupational positions was performed as in the case of traditional competencies: a one-way ANOVA followed by Tukey's HSD post-hoc test to determine the statistical significance of these differences. The results presented in *Table 3* provide every statistically significant difference on competence among communities on competence in Green levers. The ANOVA results revealed significant differences across occupational positions for most Green Levers. Specifically, Drawing up contracts showed an F-value of 3.41 with a p-value of 0.011, indicating significant differences. Competence in "Extend Use" had an F-value of 3.186 and a p-value of 0.016, and Total cost calculation showed significant differences with an F-value of 3.020 and a p-value of 0.0201. GL5 (Energy savings, own) showed a highly significant difference, with an F-value of 5.570 and a p-value of 0.000. KPIs / sustainability targets for suppliers were the most significant, with an F-value of 6.844 and a p-value of 0.000. as presented in *Table 3*.

The Tukey's HSD post-hoc test provided granular confirmation into which specific occupational positions differed significantly. Drawing up contracts, significant differences were observed between Purchasing - Private and R&D and Engineering, with a mean difference of -1.38 and a p-value of 0.038. Sales and R&D and Engineering also differed significantly with a mean difference of 1.177 and a p-value of 0.016. Extend use showed significant differences between various positions, notably between Management and Sales with a mean difference of 1.167 and a p-value of 0.003. Energy savings, own, significant differences were found between Management and R&D and Engineering with a mean difference of 1.274 and a p-value of 0.037. Energy savings, and product, revealed significant differences between Management and R&D and engineering with a mean difference of 1.226 and a p-value of 0.032. In the case of competence in Sustainable supply chain initiative, significant differences were observed

between Purchasing - Private and R&D and Engineering with a mean difference of 1.43 and a p-value of 0.023, and between Purchasing - Public and R&D and Engineering with a mean difference of 0.96 and a p-value of 0.047. KPIs / sustainability targets for suppliers showed significant differences between Management and R&D and Engineering with a mean difference of 1.845 and a p-value of 0.000, and between Management and Sales with a mean difference of 1.036 and a p-value of 0.007. Optimising logistics exhibited significant differences between Management and R&D and Engineering with a mean difference of 1.5 and a p-value of 0.007, and between Management and Sales with a mean difference of 1.167 and a p-value of 0.005. Obtained results underscore the variability in competence scores across different occupational positions for various Green Levers, highlighting specific skills where targeted training or interventions may be needed to enhance sustainability competencies.

Table 3 Results of ANOVA and Tukey's HSD test and significant differences in competence of applying Green levers among studied communities. Source: Survey PRECIUS.

group1	group2	Green Lever
Management	Purchasing - Private	Drawing up contracts
Purchasing - Private	Purchasing - Public	
Purchasing - Private	R&D and engineering (developing)	
Purchasing - Private	Sales	
Management	R&D and engineering (developing)	Extend Use
Management	R&D and engineering (developing)	Energy savings (own)
Management	Sales	
Management	R&D and engineering (developing)	Energy savings (product)
Management	R&D and engineering (developing)	Sustainable SC initiative
Purchasing - Private	R&D and engineering (developing)	
Purchasing - Public	R&D and engineering (developing)	
Management	R&D and engineering (developing)	KPI/sustainable targets
Management	Sales	
Purchasing - Private	R&D and engineering (developing)	
Purchasing - Public	R&D and engineering (developing)	
Management	R&D and engineering (developing)	10Re
Purchasing - Private	R&D and engineering (developing)	
Purchasing - Public	R&D and engineering (developing)	
Management	R&D and engineering (developing)	Optimising logistics
Management	Sales	

3.4 Analysis of relation between skill sets competencies and performance outcomes

The following part of the analysis is focused on exploring possible relationship between analysed groups of skills (skill-sets) and performance indicators of participants organisation or department. The analysed performance indicators in presented White Paper were: Quality

and Costs oriented performance; Innovation focused performance; Sustainability oriented performance and Compliance of the organisation with procedures.

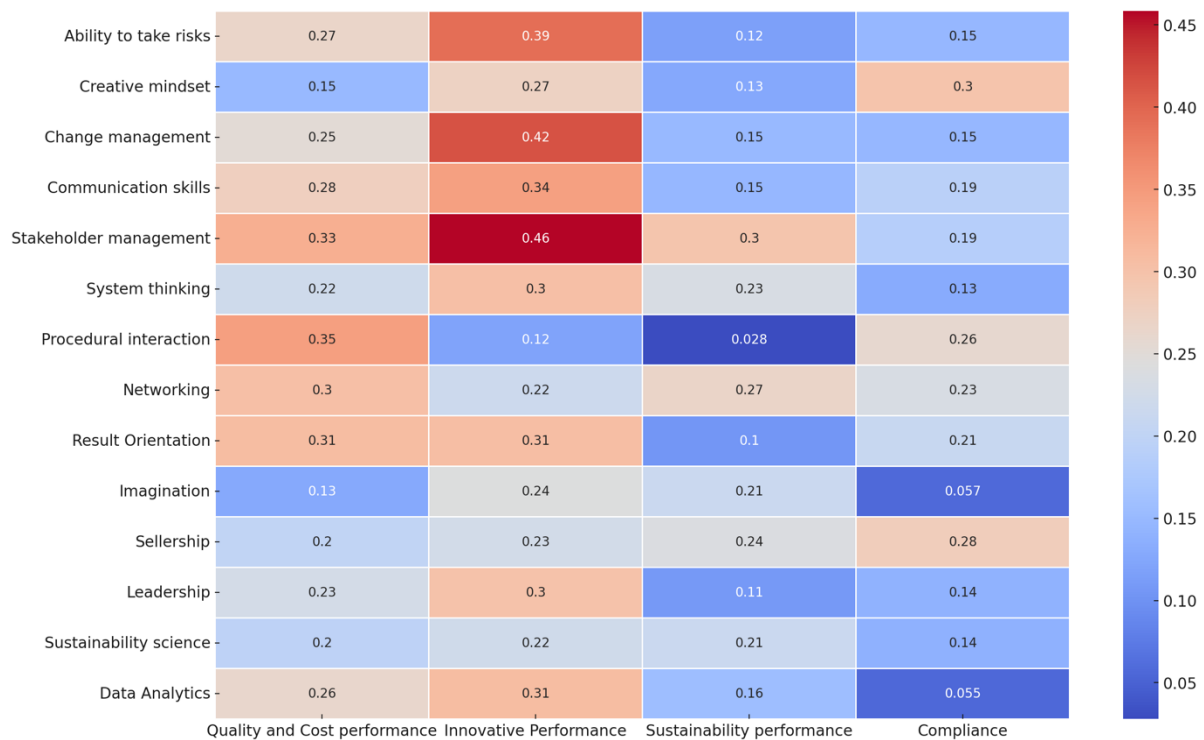


Figure 14 Correlation heatmap between Skill sets of traditional skills competences and Performance indicators. Source: Survey PRECIUS.

The correlation analysis between skill sets and performance variables in *Figure 14* revealed several significant relationships. Among the most robust connections, the data highlights that "Stakeholder management" shows a strong positive correlation with "Innovative Performance" ($r = 0.458$), suggesting that individuals who score higher in managing stakeholder relationships are likely to excel in innovation-related tasks. This is indicative of the essential role stakeholder management plays in driving innovation within organizations. Similarly, "Change management" has a substantial positive correlation with "Innovative Performance" ($r = 0.416$), emphasizing that skills in managing change are crucial for fostering innovation. "Ability to take risks" displays a significant positive relationship with "Innovative Performance" ($r = 0.391$), underscoring the importance of risk-taking in promoting innovative outcomes. The data suggests that individuals who are comfortable taking risks are better at driving innovation within their organizations. Additionally, "Procedural interaction" is strongly correlated with "Quality and Cost performance" ($r = 0.345$), highlighting that skills in procedural interactions contribute significantly to maintaining and improving quality and cost efficiency. Lastly, "Communication skills" are positively correlated with "Innovative Performance" ($r = 0.344$), indicating that effective communication is crucial for achieving innovation-related goals in organizational performance.

The analysis presented in *Figure 14* also identified the weakest relationships. For instance, "Procedural interaction" shows a minimal correlation with "Sustainability performance" ($r = 0.028$), suggesting that these skills do not significantly contribute to sustainability outcomes.

Similarly, "Data Analytics" has a weak relationship with "Compliance" ($r = 0.055$), indicating that analytical capabilities are not strongly linked to adherence to compliance standards. "Imagination" demonstrates a weak correlation with "Compliance" ($r = 0.057$), suggesting that imaginative skills do not play a significant role in ensuring compliance within organisation/department. These results can help prioritise areas for skill development based on their impact on various performance metrics for training and learning materials in IO4.

The correlation analysis between the Green levers skill sets and performance variables reveals several significant relationships, as displayed in *Figure 15*. Among the most robust connections, the data highlights that "Product Optimisation" shows a strong positive correlation with "Innovative Performance" ($r = 0.312$), suggesting that individuals who excel in product optimization are likely to drive innovation within their organizations. This is indicative of the essential role that product optimization plays in fostering innovative outcomes. Similarly, "Process Optimisation" has a substantial positive correlation with "Quality and Cost performance" ($r = 0.298$), emphasizing the importance of optimizing processes to maintain and improve quality and cost efficiency.

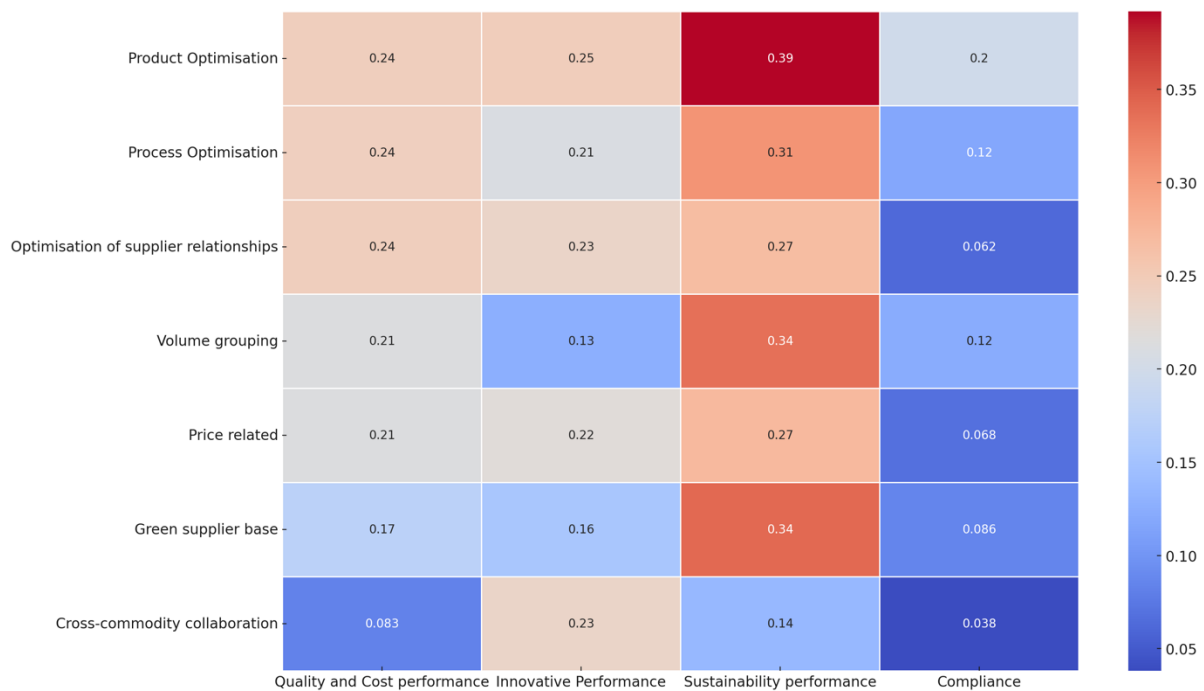


Figure 15 Correlation heatmap between Skill sets of Green lever skills competences and Performance indicators. Source: Survey PRECIUS.

"Optimisation of supplier relationships" displays a significant positive relationship with "Quality and Cost performance" ($r = 0.276$), underscoring the value of effective supplier relationship management in achieving high-quality and cost-effective results. The data suggests that individuals who are adept at optimizing supplier relationships contribute significantly to these performance outcomes. Additionally, "Volume grouping" is strongly correlated with "Compliance" ($r = 0.242$), highlighting that skills in volume grouping are important for ensuring compliance with procedural and regulatory requirements. Lastly, "Price related" shows a notable positive correlation with "Quality and Cost performance" ($r =$

0.221), indicating that managing price-related aspects effectively contributes to better quality and cost outcomes. On the other hand, "Green supplier base" shows a minimal correlation with "Compliance" ($r = 0.057$), suggesting that skills in managing a green supplier base do not significantly contribute to compliance outcomes. Similarly, "Cross-commodity collaboration" has a weak relationship with "Sustainability performance" ($r = 0.065$), indicating that cross-commodity collaboration is not strongly linked to sustainability outcomes. Lastly, "Green supplier base" demonstrates a weak correlation with "Innovative Performance" ($r = 0.072$), suggesting that managing a green supplier base does not play a significant role in driving innovation within organisations.

3.5 Communities' profiles in skills competencies

The following part of the results analysis build up on the previous sub-chapter and examines the correlations between various skill sets and performance variables across five distinct working positions: Sales, Management, Purchasing - Public, Purchasing - Private, and R&D and Engineering (developing). The analysis aims to highlight the most significant differences and similarities in these correlations, providing insights into how the importance of different skill sets varies across the analysed communities.

3.5.1 Sales

The correlation analysis of competencies performed on professionals working in Sales working position/department in the *Figure 16*, has revealed significant relationships between specific skill sets and performance variables. The strongest positive correlation is observed between "Change management" and "Innovative Performance" (0.6), indicating that adept change management is closely associated with enhanced innovation. "Procedural interaction" also shows a high positive correlation with "Quality and Cost performance" (0.47), highlighting the importance of procedural skills in achieving superior quality and cost outcomes. "Stakeholder management" exhibits a strong positive correlation with "Sustainability performance" (0.47), underscoring the role of managing stakeholder relationships in driving sustainability. Next, "Result Orientation" demonstrates a solid positive correlation with both "Innovative Performance" (0.4) and "Sustainability performance" (0.45), suggesting that a strong focus on results is crucial for fostering innovation and sustainability. Among the performance variables, "Innovative Performance" shows the most positive connections with various skills, whereas "Compliance" tends to have weaker or more negative correlations, reflecting its distinct nature from the other performance metrics.

The analysis of competencies in sales has revealed significant correlations between specific skill sets and performance variables. The strongest positive correlation is observed between "Product Optimisation" and "Sustainability performance" (0.66), indicating that product optimization is closely associated with improved sustainability outcomes. "Price related" skills also show a high positive correlation with "Sustainability performance" (0.5), highlighting the importance of price management in achieving sustainability goals. "Volume grouping" exhibits a strong positive correlation with "Sustainability performance" (0.48), underscoring the role of grouping volumes in driving sustainability. "Process Optimisation" demonstrates a solid positive correlation with "Sustainability performance" (0.45), suggesting that optimizing processes is crucial for enhancing sustainability. Among the performance variables,

"Sustainability performance" shows the most positive connections with various skills, whereas "Quality and Cost performance" tends to have weaker or more negative correlations, reflecting its distinct nature from the other performance metrics as illustrated in *Figure 17*.

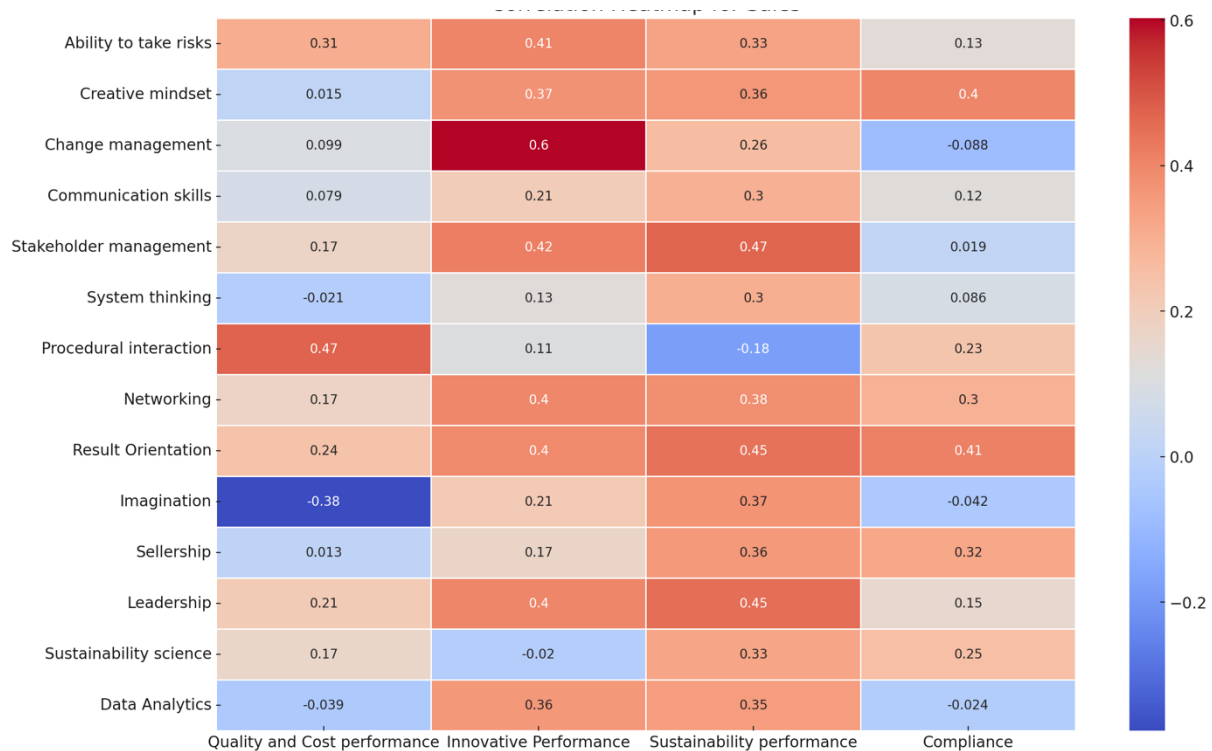


Figure 16 Correlation heatmap of traditional skill sets and performance orientation of organisation: Sales. Source: Survey PRECIUS.

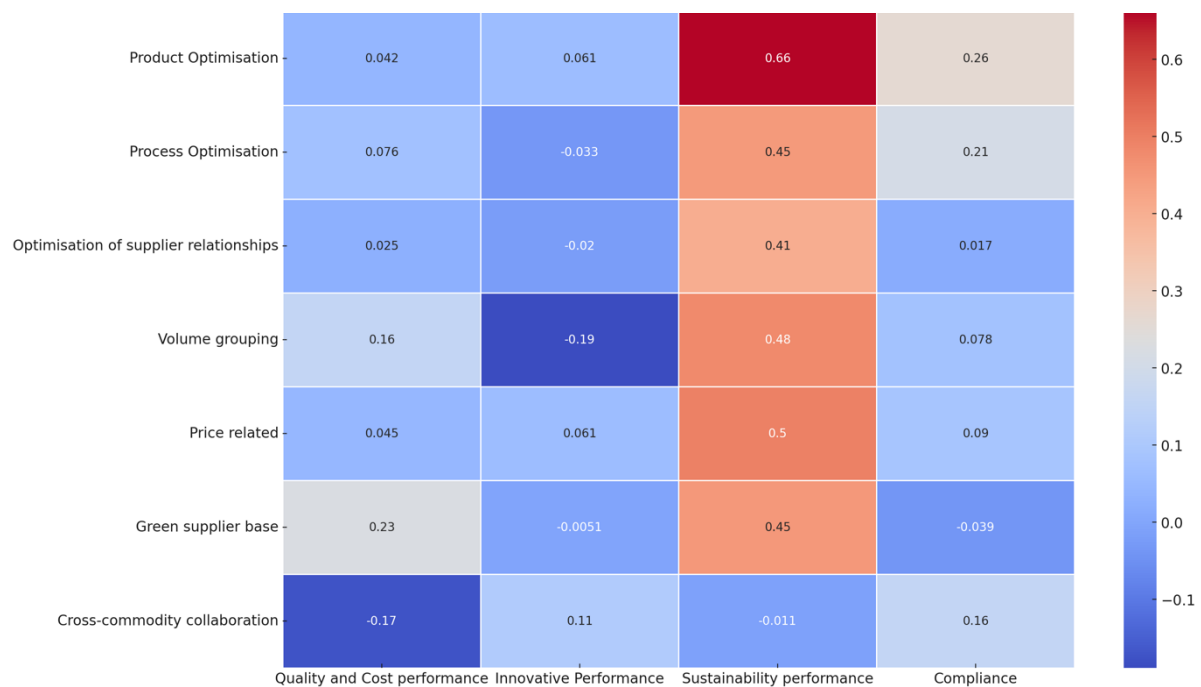


Figure 17 Correlation heatmap of Green levers skill sets and performance orientation of organisation: Sales. Source: Survey PRECIUS.

Results presented in the *Figure 17* also indicate very weak relation between competencies in Green levers skill-sets in relation to the Quality and Cost and Innovative performance of the organisation, as well as compliance with the procedural compliance.

3.5.2 Management

For the Management position and evaluation of the traditional skills and competencies in relation with the organisation/department performance, a strong correlation is noted between "Ability to take risks" and "Compliance" ($r = 0.801$), as shown in the *Figure 18*. emphasizing the critical role of ability to take risks in fostering and following procedural compliance. Surprisingly, the weakest correlation is also observed in the Compliance performance of the organisation or department as "System thinking" and "Compliance Performance" ($r = -0.627$), suggesting that competence in systematic thinking skills do not reflect a positive role in procedural compliance for managers, however "System thinking" shows positive relation with "Innovative Performance". Other notable relation was observed with "Networking" skills, showing significant positive relation to "Quality and Cost performance" and "Innovative performance" of the organisation.

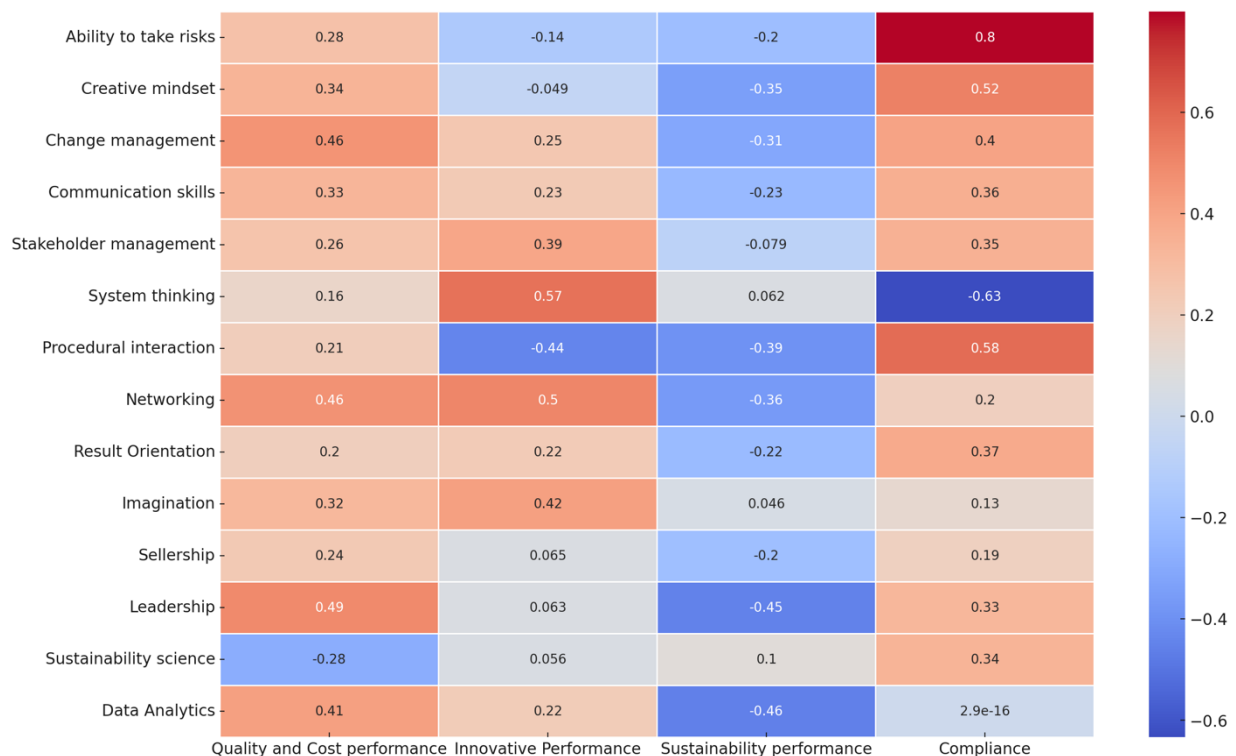


Figure 18 Correlation heatmap of traditional skill sets and performance orientation of organisation: Management. Source: Survey PRECIUS.

For the Management position and evaluation of the competencies in skills from the green lever skill-sets, a strong correlation is noted between "Green base supplier" and "Compliance" ($r = 0.504$) as illustrated in *Figure 19*. This finding is emphasising the critical role of competence in green base supplier in maintaining and improving procedural compliance of the organisation. In relation to the "Compliance", also the competence in "Optimisation of supplier relationships" shows significant positive correlation. The weakest correlations are

observed when looking at the "Sustainability performance" and its relationship with competencies in "Volume grouping" and "Green Finance (Price related) optimisation".

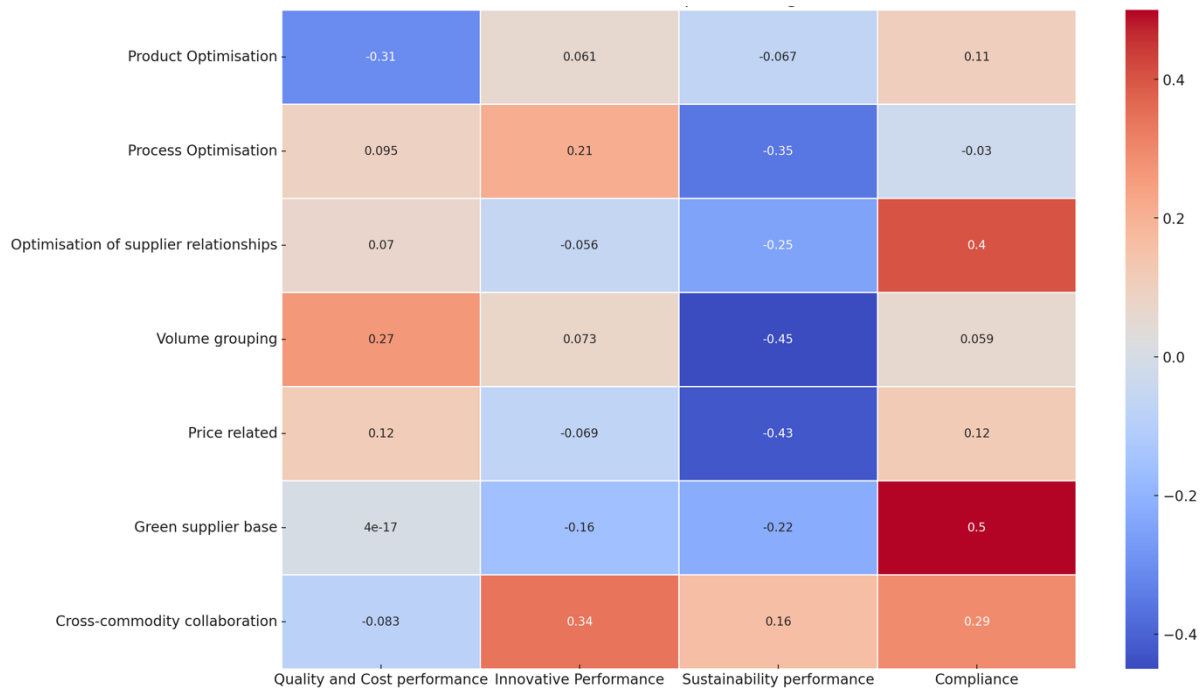


Figure 19 Correlation heatmap of Green levers skill sets and performance orientation of organisation: Management. Source: Survey PRECIUS.

3.5.3 Purchasing – Public

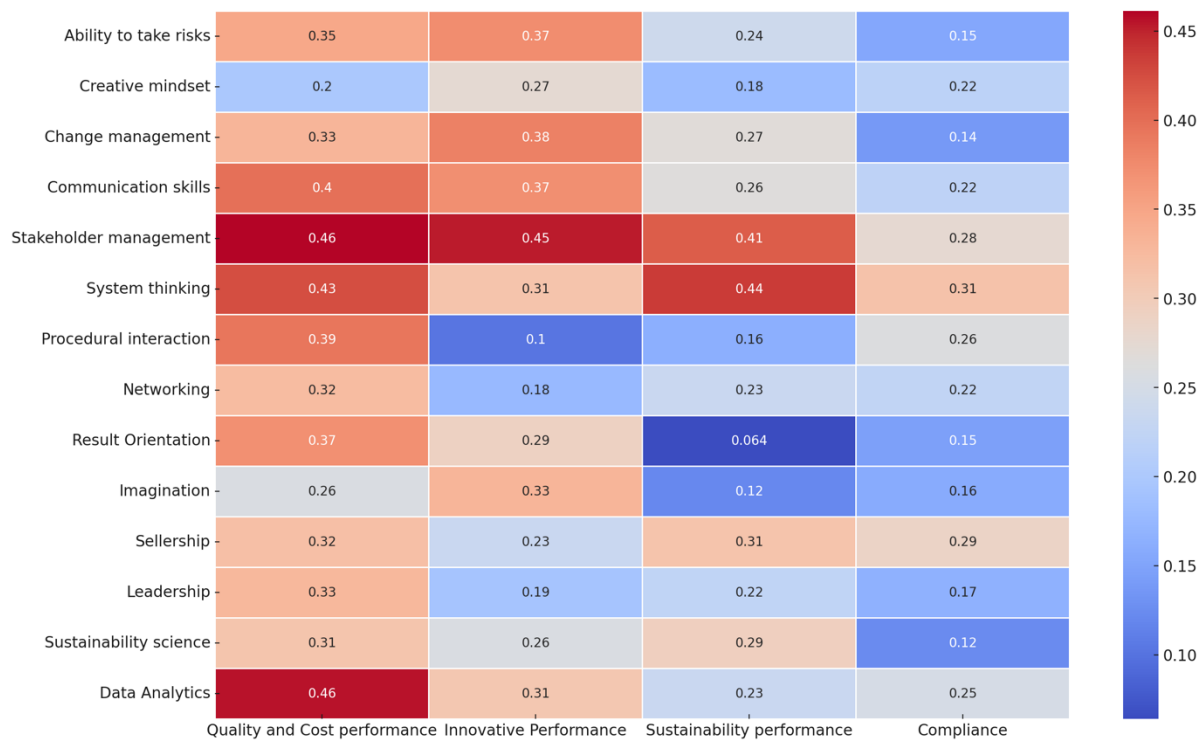


Figure 20 Correlation heatmap of traditional skill sets and performance orientation of organisation: Public Purchasers. Source: Survey PRECIUS.

The correlation analysis of competencies in traditional skills within the public sector professionals has uncovered notable relationships between specific skill sets and performance variables as displayed in *Figure 20*. The most significant positive correlation is observed between "Stakeholder management" and "Quality and Cost performance" (0.46), indicating that effective stakeholder management is closely associated with better quality and cost outcomes. "Data Analytics" also shows a high positive correlation with "Quality and Cost performance" (0.46), underscoring the importance of data analytics in achieving superior quality and cost performance. "System thinking" exhibits a strong positive correlation with "Sustainability performance" (0.44), highlighting the critical role of systematic thinking in driving sustainability outcomes. Additionally, "Communication skills" demonstrate a strong positive correlation with "Innovative Performance" (0.37), suggesting that effective communication is crucial for fostering innovation. Among the performance variables, "Quality and Cost performance" shows the most positive connections with various skills, whereas "Compliance" tends to have weaker or more negative correlations, reflecting its distinct nature from the other performance metrics.

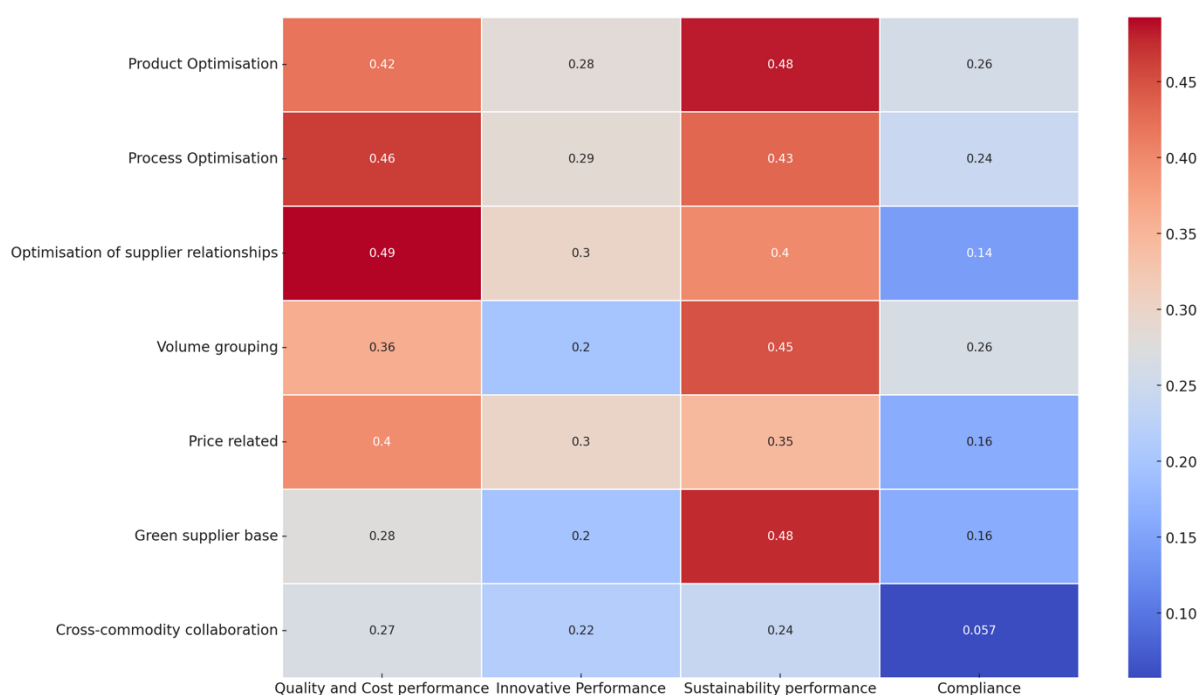


Figure 21 Correlation heatmap of Green levers skill sets and performance orientation of organisation: Public Purchasers. Source: Survey PRECIUS.

The analysis of competencies in applying Green levers in public sector purchasing has shown significant correlations between specific skill sets and performance variables as displayed in *Figure 21*. The strongest positive correlation is observed between "Optimisation of supplier relationships" and "Quality and Cost performance" (0.49), indicating that optimizing supplier relationships is closely associated with improved quality and cost outcomes. "Process Optimisation" also shows a high positive correlation with "Quality and Cost performance" (0.46), highlighting the importance of process optimization in achieving superior quality and cost performance. "Product Optimisation" exhibits a strong positive correlation with "Sustainability performance" (0.48), underscoring the role of product optimization in driving

sustainability outcomes. Additionally, "Volume grouping" demonstrates a solid positive correlation with "Sustainability performance" (0.45), suggesting that effective volume grouping is crucial for enhancing sustainability. Among the performance variables, "Quality and Cost performance" shows the most positive connections with various skills, whereas "Compliance" tends to have weaker or more negative correlations, reflecting its distinct nature from the other performance metrics.

3.5.4 Purchasing – Private

The correlation analysis of competencies in purchasing within the private sector has revealed notable relationships between specific skill sets and performance variables. The most significant positive correlation is observed between "Procedural interaction" and "Innovative Performance" (0.9), indicating that strong procedural skills are closely associated with enhanced innovation. "Change management" also shows a high positive correlation with "Sustainability performance" (0.88), underscoring the importance of adept change management in achieving superior sustainability outcomes. "Networking" exhibits a strong positive correlation with "Innovative Performance" (0.78), highlighting the critical role of networking in driving innovation. Additionally, "Communication skills" demonstrate a strong positive correlation with "Compliance" (0.75), suggesting that effective communication is crucial for meeting compliance standards. Among the performance variables, "Innovative Performance" shows the most positive connections with various skills, whereas "Sustainability performance" tends to have weaker or more negative correlations, reflecting its distinct nature from the other performance metrics.

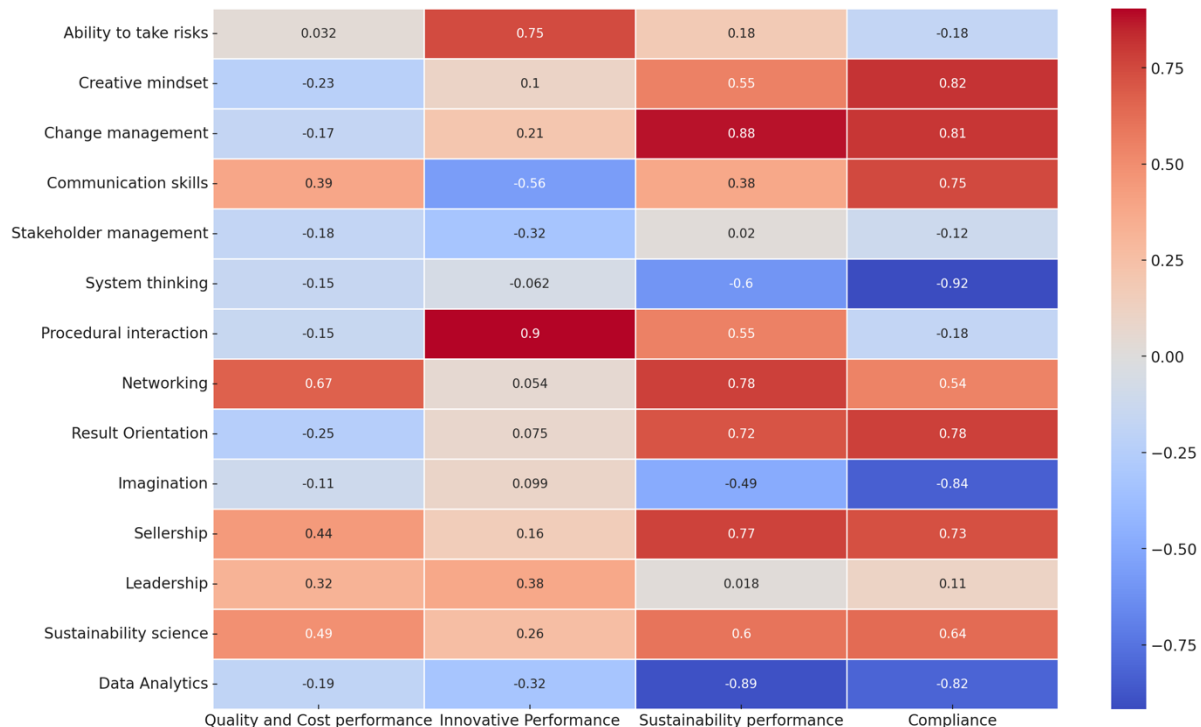


Figure 22 Correlation heatmap of traditional skill sets and performance orientation of organisation: Private Purchasers. Source: Survey PRECIUS.

The correlation analysis of competencies in applying Green levers within purchasing in the private sector illustrated in the *Figure 23* has shown notable relationships between specific skill sets and performance variables. The most significant positive correlation is observed between "Green supplier base" and "Compliance" (0.83), indicating that maintaining a green supplier base is closely associated with better compliance outcomes. "Volume grouping" also shows a high positive correlation with "Innovative Performance" (0.66), underscoring the importance of grouping volumes in achieving superior innovative performance. "Optimisation of supplier relationships" exhibits strong positive correlations with both "Sustainability performance" (0.58) and "Compliance" (0.34), highlighting the critical role of optimizing supplier relationships in driving sustainability and compliance outcomes. Additionally, "Cross-commodity collaboration" demonstrates a strong positive correlation with "Innovative Performance" (0.61), suggesting that collaboration across commodities is crucial for enhancing innovation. Among the performance variables, "Compliance" shows the most positive connections with various skills, whereas "Quality and Cost performance" tends to have weaker or more negative correlations, reflecting its distinct nature from the other performance metrics.

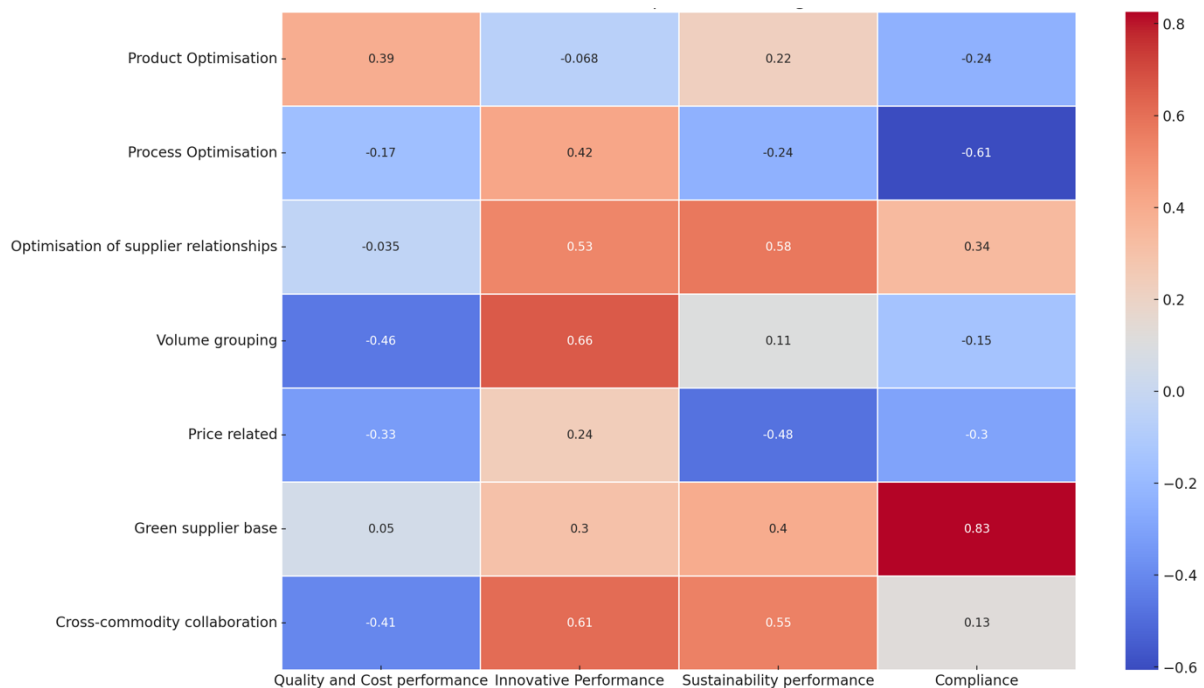


Figure 23 Correlation heatmap of Green levers skill sets and performance orientation of organisation: Private Purchasers. Source: Survey PRECIUS.

3.5.5 R&D – Engineering

The correlation analysis of competencies in traditional skills within R&D and Engineering has shown notable relationships between specific skill sets and performance variables as illustrated in **Figure 24** Correlation heatmap of traditional skill sets and performance orientation of organisation: R&D – Engineering. Source: Survey PRECIUS. *Figure 24*. The most significant positive correlation is observed between "Procedural interaction" and "Quality and Cost performance" (0.67), indicating that strong procedural skills are closely associated with better quality and cost outcomes. "Change management" also shows a high positive correlation with "Quality

and Cost performance" (0.65), underscoring the importance of adept change management in achieving superior quality and cost efficiency. "Sellership" exhibits the highest positive correlation with "Sustainability performance" (0.68), highlighting the critical role of sales skills in driving sustainability outcomes. Additionally, "System thinking" demonstrates the strongest negative correlations across all performance variables, particularly with "Quality and Cost performance" (-0.55), "Innovative Performance" (-0.54), and "Sustainability performance" (-0.53), suggesting that traditional system thinking may hinder these aspects. Among the performance variables, "Quality and Cost performance" shows the most positive connections with various skills, whereas "Compliance" tends to have weaker or more negative correlations, reflecting its distinct nature from the other performance metrics.

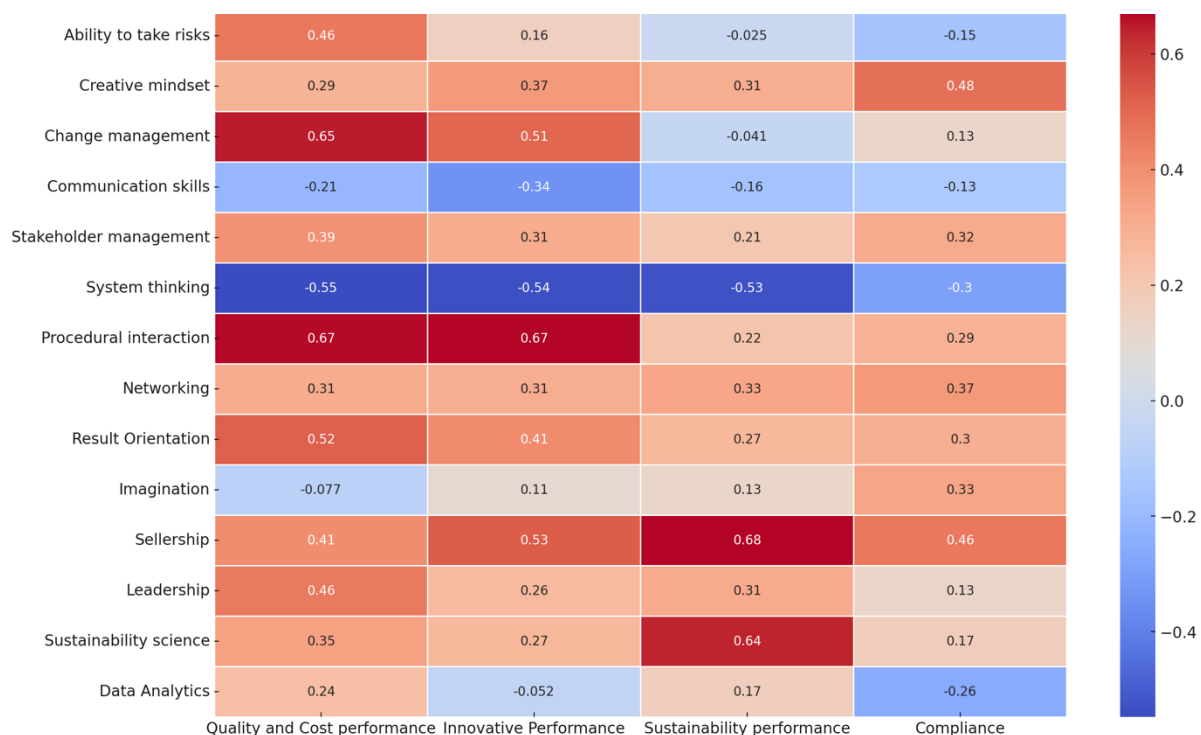


Figure 24 Correlation heatmap of traditional skill sets and performance orientation of organisation: R&D – Engineering. Source: Survey PRECIUS.

The correlation analysis of competencies, displayed in *Figure 25*, of applying Green levers within R&D and Engineering has revealed following relationships between specific skill sets and performance variables. The most significant positive correlation is observed between "Green supplier base" and "Sustainability performance" (0.66), indicating that maintaining a green supplier base is closely associated with improved sustainability outcomes. "Cross-commodity collaboration" also shows a high positive correlation with "Sustainability performance" (0.62), underscoring the importance of collaborative efforts across commodities in achieving superior sustainability performance. "Optimisation of supplier relationships" exhibits a strong positive correlation with both "Sustainability performance" (0.61) and "Compliance" (0.61), highlighting the critical role of optimizing supplier relationships in driving sustainability and compliance outcomes. Additionally, "Product Optimisation" demonstrates a strong positive correlation with "Compliance" (0.61),

suggesting that product optimization is crucial for meeting compliance standards. Among the performance variables, "Sustainability performance" shows the most positive connections with various skills, whereas "Quality and Cost performance" tends to have weaker or more negative correlations, reflecting its distinct nature from the other performance metrics.

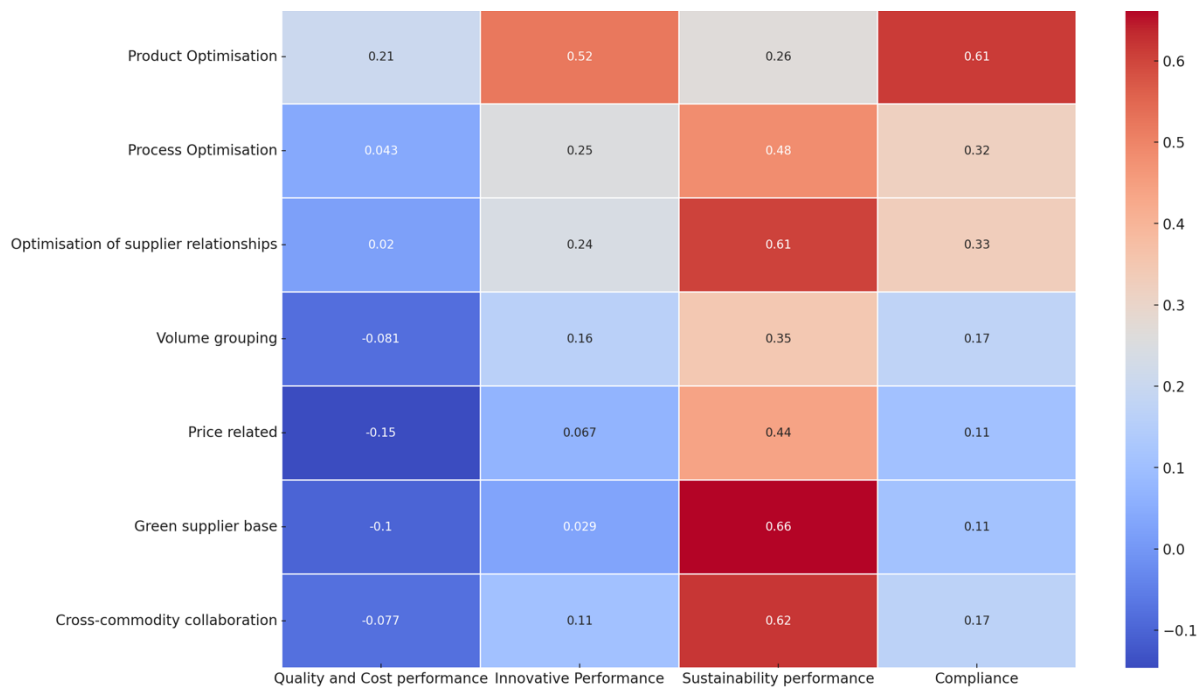


Figure 25 Correlation heatmap of Green levers skill sets and performance orientation of organisation: R&D – Engineering. Source: Survey PRECIUS.

4. Discussion

The following chapter analyses the significant findings from the questionnaire-based survey, highlighting key differences and similarities in competencies across various professional communities. The analysis underscores the critical role of specific skill sets in driving performance outcomes in sectors such as sales, management, public and private procurement, and R&D. Competencies like change management, stakeholder management, and product optimisation exhibit distinct impacts on performance metrics such as innovation, quality, and sustainability. These insights provide a foundation for targeted educational modules aimed at bridging competency gaps and fostering sustainable innovations, aligning with the overarching objectives of the PRECIUS project.

The largest differences in competencies among studied communities were noted in the following skill-sets in traditional skills:

- ***Ability to take risks***

- Sales - Positive correlation with Innovative Performance (0.41) and Quality and Cost performance (0.31).
- Management - Moderate positive correlation with Compliance (0.8), weak correlation with Quality and Cost performance (0.28).
- Purchasing (Public) - Moderate positive correlation with Quality and Cost performance (0.35), weak correlation with Compliance (0.15).
- Purchasing (Private) - Weak correlation with Quality and Cost performance (0.032), weak negative correlation with Compliance (-0.18).
- R&D and Engineering - Moderate positive correlation with Quality and Cost performance (0.46), weak correlation with Compliance (-0.15).

- ***Creative mindset***

- Sales - Moderate positive correlation with Innovative Performance (0.37) and Sustainability performance (0.36).
- Management - Moderate positive correlation with Compliance (0.52), weak negative correlation with Sustainability performance (-0.35).
- Purchasing (Public) - Weak positive correlation with Innovative Performance (0.27), weak correlation with Compliance (0.22).
- Purchasing (Private) - Moderate positive correlation with Innovative Performance (0.55), strong positive correlation with Compliance (0.82).
- R&D and Engineering - Moderate positive correlation with Innovative Performance (0.37), strong positive correlation with Sustainability performance (0.48).

- ***Change management***

- Sales - Strong positive correlation with Innovative Performance (0.6).
- Management - Moderate positive correlation with Quality and Cost performance (0.46), weak negative correlation with Sustainability performance (-0.31).
- Purchasing (Public) - Moderate positive correlation with Innovative Performance (0.38).

- Purchasing (Private) - Strong positive correlation with Sustainability performance (0.88).
- R&D and Engineering - Strong positive correlation with Quality and Cost performance (0.65), weak negative correlation with Sustainability performance (-0.041).
- **System thinking**
 - Sales Weak positive correlation with Innovative Performance (0.13).
 - Management - Moderate positive correlation with Innovative Performance (0.57), strong negative correlation with Sustainability performance (-0.63).
 - Purchasing (Public) - Moderate positive correlation with Sustainability performance (0.44).
 - Purchasing (Private) - Strong negative correlation with Sustainability performance (-0.6).
 - R&D and Engineering - Strong negative correlation with Quality and Cost performance (-0.55), Sustainability performance (-0.53).
- **Procedural interaction**
 - Sales - Strong positive correlation with Quality and Cost performance (0.47).
 - Management - Weak negative correlation with Innovative Performance (-0.44).
 - Purchasing (Public) - Moderate positive correlation with Quality and Cost performance (0.39).
 - Purchasing (Private) - Strong positive correlation with Innovative Performance (0.9).
 - R&D and Engineering - Strong positive correlation with Quality and Cost performance (0.67).

Areas of Conjunction (Similar Competencies) were identified in the following skill-sets, also displayed in a comprehensive **Error! Reference source not found.**

- **Networking**

All five communities show positive correlations with Innovative Performance, with Sales (0.4) and Management (0.5) having the highest correlations.

- **Result Orientation**

This skill set shows moderate to strong positive correlations with both Innovative Performance and Sustainability performance across all five communities, with notable values in Sales (0.4 for both) and Management (0.37 for Innovative Performance).

- **Stakeholder management**

Positive correlations across most performance variables, with the highest in Sales for Sustainability performance (0.47) and Purchasing (Public) for Quality and Cost performance (0.46).

- **Leadership**

Positive correlations with various performance variables, especially Innovative Performance in Sales (0.4) and Compliance in Purchasing (Private) (0.38).

- **Communication skills**

Generally positive correlations across the board, with a high correlation in Sales for Compliance (0.3) and Management for Compliance (0.36).

Table 4 Identified similar competencies levels in traditional skills grouped in skill-sets.

Skill-Set	Sales	Management	Purchasing (Public)	Purchasing (Private)	R&D Engineering
Networking	X	X	X	X	X
Result Orientation	X	X	X	X	X
Stakeholder management	X	X	X	X	X
Leadership	X	X	X	X	X
Communication skills	X	X	X	X	X

When focusing on a skill sets of applying Green levers, the largest differences in competence was shown in the following skill-sets:

- **Product Optimisation**

- Sales - Strong positive correlation with Sustainability performance (0.66).
- Management - Negative correlation with Quality and Cost performance (-0.31), weak positive correlation with Compliance (0.11).
- Purchasing (Public) - Moderate positive correlation with Sustainability performance (0.48).
- Purchasing (Private) - Moderate positive correlation with Quality and Cost performance (0.39), weak negative correlation with Compliance (-0.24).
- R&D and Engineering - Moderate positive correlation with Innovative Performance (0.52), strong positive correlation with Compliance (0.61).

- **Process Optimisation**

- Sales -Moderate positive correlation with Sustainability performance (0.45).
- Management - Weak positive correlation with Innovative Performance (0.21), weak negative correlation with Sustainability performance (-0.35).

- Purchasing (Public) - Moderate positive correlation with Quality and Cost performance (0.46), Sustainability performance (0.43).
 - Purchasing (Private) - Moderate positive correlation with Innovative Performance (0.42), strong negative correlation with Sustainability performance (-0.61).
 - R&D and Engineering - Moderate positive correlation with Sustainability performance (0.48).
- **Optimisation of Supplier Relationships**
 - Sales - Moderate positive correlation with Sustainability performance (0.41).
 - Management - Weak negative correlation with Innovative Performance (-0.056), weak positive correlation with Compliance (0.4).
 - Purchasing (Public): - Moderate positive correlation with Quality and Cost performance (0.49), Sustainability performance (0.4).
 - Purchasing (Private) - Moderate positive correlation with Innovative Performance (0.53), strong positive correlation with Sustainability performance (0.58).
 - R&D and Engineering - Strong positive correlation with Sustainability performance (0.61).
- **Volume Grouping**
 - Sales - Moderate positive correlation with Sustainability performance (0.48).
 - Management - Weak positive correlation with Quality and Cost performance (0.27), strong negative correlation with Sustainability performance (-0.45).
 - Purchasing (Public) - Moderate positive correlation with Quality and Cost performance (0.36), Sustainability performance (0.45).
 - Purchasing (Private) - Strong positive correlation with Innovative Performance (0.66), weak negative correlation with Compliance (-0.15).
 - R&D and Engineering - Weak negative correlation with Quality and Cost performance (-0.081), moderate positive correlation with Sustainability performance (0.35).

Areas of Conjunction (Similar Competencies) where identified across all studied communities as displayed in the **Error! Reference source not found..**

Table 5 Identified similar competencies levels in Green levers skill-sets.

Skill Set	Sales	Management	Purchasing (Public)	Purchasing (Private)	R&D Engineering
Product Optimisation	X	X	X	X	X
Process Optimisation	X	X	X	X	X
Optimisation of Supplier Relationships	X	X	X	X	X
Volume Grouping	X	X	X	X	X
Price Related	X	X	X	X	X

Product Optimisation: All five communities show significant positive correlations with various performance metrics, indicating that optimizing products is universally beneficial across different roles. For instance, it positively impacts Sustainability performance in Sales and R&D and Engineering, while also aiding Quality and Cost performance in Management and Purchasing (Public and Private).

Process Optimisation: This skill set also shows significant positive correlations across all communities, emphasizing its universal importance. It is particularly effective in enhancing Sustainability performance in Sales, Purchasing (Public), and R&D and Engineering, while positively influencing Quality and Cost performance in Management and Purchasing (Public).

Optimisation of Supplier Relationships: Positive correlations across all communities highlight that optimizing supplier relationships is crucial for achieving better performance outcomes. It is especially beneficial for Sustainability performance in Purchasing (Private) and R&D and Engineering, and for Quality and Cost performance in Purchasing (Public).

Volume Grouping - This skill set is consistently valuable across all communities. It positively impacts Sustainability performance in Sales, Purchasing (Public), and R&D and Engineering, while aiding Quality and Cost performance in Management and Purchasing (Public).

Price Related - Competencies in managing price-related aspects show significant positive correlations across all roles, indicating its broad applicability. It particularly benefits Sustainability performance in Sales, Purchasing (Public), and R&D and Engineering, while also enhancing Quality and Cost performance in Management and Purchasing (Public).

The findings from the presented White Paper have shown the competencies required by three distinct communities: public procurement professionals, buyers (preferably from SMEs), and environmental engineers. The competencies identified as key across targeted communities include **stakeholder management**, **communication skills**, **change management approach**, and **product optimisation**. Mentioned skills are pivotal in enhancing performance metrics such as **innovation**, **quality**, and **sustainability**. The correlation analyses have revealed that while each community exhibits unique strengths, there are significant areas of overlap that can be leveraged to foster collaboration and mutual understanding between communities of procurement professionals, buyers, and environmental engineers. Focus on common competencies, the PRECIUS project aims to bridge gaps and promote a cohesive approach to sustainable innovation.

Building on these findings, the next phase (IO4) will involve the design of educational materials suitable to these competencies. These materials will be structured into four 1 ECTS modules, each addressing the specific needs and skill gaps of the target communities. The modules will be designed to facilitate experiential learning and practical application, ensuring that learners can effectively integrate these competencies into their professional practices. The effectiveness of the designed modules will be tested in IO5, providing valuable feedback to refine and enhance the training materials. Ultimately, this comprehensive approach aims to equip public procurement professionals, SME buyers, and environmental engineers with the skills necessary to drive sustainable innovation.

Conclusion

The PRECIUS project has successfully highlighted the essential role of interdisciplinary collaboration in fostering sustainable innovation within public procurement, environmental engineering, and SME communities by conducting questionnaire-based survey research. The presented White Paper has revealed that competency frameworks must integrate diverse skill sets to effectively address the challenges posed by climate change and environmental sustainability. The key findings from the quantitative research conducted in IO3 provide significant insights into the competencies required across three distinct communities.

According to the key findings of the survey results, it can be stated that there is an existing competency overlap. The research identified several overlapping competencies crucial across all three communities, including **stakeholder management**, **communication skills**, **change management**, and **product optimisation**. Mentioned competencies are important in influencing performance metrics such as **innovation**, **quality**, and **sustainability**. By moderation of a shared understanding of these competencies, the project aims to bridge knowledge gaps and promote effective collaboration in its next phase by developing a digital tool and comprehensive learning materials.

The White Paper highlighted specific skill sets related to traditional and green lever competencies. Traditional competencies like change management and stakeholder engagement were shown to have strong positive correlations with innovative and sustainable outcomes. Green lever competencies, particularly in product and process optimisation, were identified as essential for driving sustainability and compliance within organisations.

Based on these findings, the subsequent phase (IO4) will involve designing educational modules focused on these competencies. Learning and training modules, structured into four 1 ECTS units, will focus on experiential learning and practical application, ensuring that learners from all three communities can effectively integrate desired skills into their professional practices.

The designed modules will not only address the specific needs and skill gaps identified in IO3 but will also provide a holistic approach to learning. This approach ensures that public procurement professionals, SME buyers, and environmental engineers are equipped with the necessary tools to drive sustainable innovation, thereby contributing to the overarching goals of the Green Deal and vision of the Industry 5.0.

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Appendices

Table 6 List of the Control variables

Question Number	Item	Description/Explanation
1	Gender	What is your gender? [Multichoice]
2	Year of birth	What is your year of birth?
3	Country	In which country you currently reside?
4	Current position	Please indicate what best suits your current position: [Multichoice]
5	Experience	Years of experience in current position:
6	Education	My highest completed educational level is: [Multichoice]
7	Study discipline	I studied this discipline: [Multichoice]
8	Size	Number of people employed in your company (within entire group)? E.g.: 115 [open question]
9	Work per week	Are you working fulltime or parttime in the present position?[Multichoice]
10	Type of product or service offered	What type of products or services do you buy/sell to business partners?[Multichoice]
11	Type of product or service - share	What is the share of physical products and services in your company's purchase/sales to business partners? [Multichoice]

Table 7 List of measured competence in the skills

Question Number	Item	Description/Explanation
12	Willingness to take risks	The willingness to engage in actions that have uncertain outcomes, where there may be significant gains or losses.
13	Being entrepreneurial	The ability to initiate new ideas, recognize opportunities, and take action that can lead to the creation of new value or the start of a project / venture.
14	Out-of-the-box thinking	The capacity to think differently and creatively, coming up with innovative solutions that are not conventional or traditional.

15	Culture of experimentation in market analysis and finding new innovative solutions in the market	Fostering a culture that encourages experimentation in market analysis to discovery of innovative solutions within the market.
16	Open mind	The readiness to consider different ideas and opinions, even if they challenge one's own beliefs or customary ways of doing things.
17	Creativity	Being creative in professional life
18	Organizational ability to boost ideas, experimentation and suggestions	The skill of creating and maintaining a system or environment that encourages and nurtures the development of new ideas, trials, and contributions from others.
19	Ability to anticipate changes in the operational environment	The ability to lead a team or group successfully through a change process.
20	Ability to anticipate and document possible changes in procurement	The proficiency to foresee potential alterations regarding goods and services and the capability to formally record these predictions for future reference.
21	Change management in value co-creation	The competence to guide and adapt to changes that involve working with others, such as customers or partners, to jointly produce value that benefits all parties involved.
22	Ability to share data with partners via network platform	The capacity to efficiently exchange information and data with business partners using digital platforms to streamline supply chain processes.
23	Ability to communicate the objective to the supplier	The skill of clearly outlining goals and expectations to business partners to ensure mutual understanding and alignment in business relationships.
24	Stakeholder engagement including effective communication, active listening and ability to address diverse viewpoints	The ability to effectively interact with all interested parties, communicate clearly, listen actively, and consider different perspectives to achieve a common goal.

25	Ability to discuss during the contract period on developing activities	The skill of engaging in ongoing conversations with contractual partners about changes and progress in joint activities throughout the contract's lifespan.
26	Ability to set up innovation partnerships	The competence to establish collaborative relationships focused on creating new products, services, or processes that drive innovation.
27	Ability to reduce the barriers for entry of innovative SMEs	The expertise in creating pathways for small and medium-sized enterprises to enter and compete in the market by minimizing regulatory, financial, or technological obstacles.
28	Ability to cooperate with suppliers during the contract period	The aptitude for working collaboratively with business partners to address and solve issues that arise during the execution of a contract.
29	Networking with key stakeholders	The capability to build and maintain strategic relationships with important individuals or groups that have a stake in your business or project outcomes.
30	Ability to motivate consumer suggestions for improvement	The talent for encouraging consumer to provide feedback that can be used to enhance products, services, or experiences.
31	Ability to understand the benefits and business logic of different stakeholders (buyers, suppliers)	Competence to comprehend and appreciate the advantages and business rationale of diverse stakeholders, including buyers and suppliers, within the procurement context.
32	Skills to manage the big picture in value co-creation	The ability to oversee and integrate various aspects of a project or initiative to ensure all parties are working together effectively to add value.
33	System thinking including understanding of the interconnectedness of various elements in a sustainability context	The understanding of how different elements within a system, such as an organization or the environment, are interconnected and the implications of these relationships for sustainable practices.
34	Procedural Interaction Organization	Knowledge in choosing when to, and skills in how to organize interactions based on procedures within public procurement project

35	Knowledge of different types of procurement procedures	Knowledge of various types of public procurement procedures, enabling informed selection and implementation within the chosen process.
36	Capacity to be empathetic	Capacity to listen and understand
37	Social manners	Being tactful, diplomatic and having organisational sensitivity
38	Loyalty	Being loyal in professional life
39	Conscientiousness	Having environmental awareness; understanding what is going on
40	Honesty	Being trustworthy in professional life
41	Comprehension of Complexity	The ability to understand complex problems
42	Building relations	Networking and relations management
43	Ability to Solve Problems	
44	Self-assurance	Being assertive and having self esteem
45	Poise	Being (self)confident

46	Result-orientated action-taking	Aiming on effectiveness
47	Ability to Resolve Conflicts	Being able to avoid and resolve conflicts
48	Proactivity	Being anticipatory, change-oriented and self-initiated behavior in situations
49	Power of Persuasion	Having influential skills
50	Capacity to Advice	Having consultancy skills
51	Inventiveness	Being imaginativeness
52	Willingness to Learn	Being professionally curious, motivation to learn continuously
53	Holistic Thinking	Ability to think and act holistically
54	Sellership Skills	Having the drive to sell and establish trust with a customer
55	Personality Characteristics Development	The ability to develop continuously the own soft skills, qualities and traits (e.g. persuasiveness, creativeness, entrepreneurial, adaptability)
56	Cross-cultural Awareness	The ability to become aware of cultural values, beliefs and perceptions of the own and other one's cultures

57	Customer orientation	Being focussed on the internal customer or internal user group
58	Leadership/ managing personnel	Managing employees in teams
59	Training personnel	Actively giving structured training and education with the aim to improve the knowledge and skills of colleagues
60	Managing change processes	The ability to lead a team or group successfully through a change process.
61	Project Management Skills	Initiating, planning, executing, controlling and closing the work of a project team
62	Team Ability Skills	Having the ability cooperating with others in a team
63	Legal competence CSR, CSDD	Active compliance with the spirit of the law, ethical standards and national or international norms.
64	Understanding of the standards (specified according to the area)	Proficiency in the specific rules, guidelines, or characteristics established by consensus and approved by a recognized body that applies to a particular field or industry.
65	Scientific base - natural sciences	Possessing foundational knowledge in the natural sciences, which includes understanding principles from disciplines such as biology, chemistry, physics, and earth sciences.
66	Environmental economics	The capability to analyze and apply economic principles to the evaluation and management of environmental resources, and to assess the economic impacts of environmental policies.

67	Resource economics, natural resources economics, ecosystem services (biodiversity impact),	Understanding of resource economics, more specifically focusing on the efficient use and conservation of natural resources, balancing economic needs with environmental health, and understanding the value of ecosystem services—such as clean air and water—which are crucial for maintaining biodiversity and overall ecological balance.
68	Life Cycle Assessment	Considering environmental impacts of each distinct part involved in creating and using products and services, such as energy used in production, fuel used in transport, and end-of-life ecological costs.
69	Multicriteria analysis	The skill in evaluating decisions, projects, or policies by considering multiple criteria at once, often involving both quantitative and qualitative aspects of a situation.
70	Forecasting, predicting future trends or needs	Planning of annual demands, based on the sales, forecast and experience as input for annual negotiations.
71	Measurement skill	Skill of quantifying target criteria related to sustainability and innovations
72	Knowledge of ICT solutions	Knowledge of ICT solutions used to support data analytics

Table 8 List of the performance (dependent) variables

Question Number	Item
	Is your performance focussed on cost reductions and efficiency?
73	My actions have contributed positively to higher than average cost reductions.
74	Compared with other departments, my department achieves higher than average reductions in costs.
75	The reductions in costs achieved in my department are considerably higher than our goals.
76	Our department is able to complete its tasks in expected amount of time.
77	Our department implements tasks efficiently.
	Is your performance focussed on quality?
78	Due to my actions, we achieve a higher than average level of quality.
79	Compared to other departments, my department achieves higher level of quality.

80	The improvements in quality achieved in my organization/department are considerably higher than our goals.
81	Our procurement/selling team produces high-quality solutions.
	Is your performance focussed on procurement/offering of innovative solutions?
82	My actions contribute positively to the procurement/offering of innovative solutions (products/services).
83	The procurement/offering of solutions in my organization/department are significantly more innovative than expected.
84	Our department is superior in identifying new solutions with business partners compared to similar organisations.
	Is your performance focussed on making your processes innovative?
85	My actions contribute positively to innovating the process of procurement/offering solutions in my organization/department.
86	The process of procurement/offering of solutions in my organization/department showcases significantly more innovations than expected.
87	Process innovations achieved in my organization/department are considerably better than those of other similar organizations/departments.
	Is your performance focussed on sustainability?
88	My actions contribute to achieving a higher sustainability level of operations than the average within our organization/department.
89	In comparison with other departments, my department/organization has higher sustainability performance.
90	The sustainability performance achieved in my department/organization considerably exceeds our set goals.
91	My actions positively contribute to prioritizing the purchasing/offering of goods, services, works, and utilities with a reduced carbon footprint.
92	Long-term sustainable solutions are the result of our procurement/development/selling activities.
	Is your performance focussed on compliance?
93	I ensure strict compliance with rules imposed by the central government for the procedure of buying/offering a solution (for example, rules related to public procurement procedures).
94	Compared to other departments, my department maintains superior compliance with central government regulations for the procedure of buying/offering a solution (for example, regulations related to public procurement procedures).
95	I ensure strict compliance with current environmental sustainability rules and regulations in all my activities.
96	Compared to other departments, my department maintains superior compliance with current environmental sustainability rules and regulations in all our activities.

Table 9 List of the competence development mechanisms

Competence development mechanism	Question Number	Description/explanation
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Trainings and Mentoring Programs:	97	We participate in specialized training programs focused on innovative and sustainable public procurement or selling/offering innovative and sustainable .
	98	We engage in mentorship programs to transfer knowledge related to procurement/sales competencies.
Learning by Doing	99	We enhance competencies in complex procurement/sales projects by learning from our past experiences.
	100	We learn from practical experiences to enhance competencies in complex procurement/sales projects.
Internal Co-Creation:	101	We establish internal teams dedicated to collaborative innovation within the organization.
	102	We encourage cross-functional collaboration inside the organization to co-create sustainable and innovative solutions.
Hiring New Employees:	103	We actively recruit individuals with expertise in innovative and sustainable procurement/sales practices.
	104	We build diverse teams with competencies that complement and enhance the procurement/selling of innovative and sustainable solutions.
Building Competencies with Intermediaries/Consultants:	105	We collaborate with external experts and consultants to develop and integrate new competencies needed for innovative and sustainable solutions.
	106	We initiate partnerships with intermediaries (like the Keino academy) for knowledge exchange and competence development.
Building Competencies with Suppliers:	107	We build new competencies with suppliers/customers through interactions in market dialogues.
	108	We get new competencies when co-creating the solutions with suppliers/public buyers in projects.
Enhancing External Competencies via R&D Funding:	109	We invest in research and development initiatives of external entities, for example funding research projects
	110	We support the joint R&D projects with suppliers/buyers, through new initiatives, to contribute to the development of innovative procurement/sales/environmental engineering competencies.
Active Involvement in Market Dialogues, Workshops, and Seminars:	111	We actively participate in market dialogues, to stay informed/share information about emerging technologies and solutions and required competencies.
	112	We attend workshops and seminars for interactive learning and skill acquisition.

Collaboration with Universities:	113	We establish partnerships with academic institutions to leverage external knowledge resources.
	114	We collaborate on research projects with universities to access and integrate academic competencies.
Seeking Technical Consulting and adapting available solutions:	115	We collaborate with external consultants to leverage specialized technical expertise.
	116	We engage in partnerships to obtain indirect access to external competencies for procurement/sales/environmental engineering projects.
	117	We evaluate and adapt solutions already available in market to fit specific procurement/sales/environmental engineering needs.

Table 10 List of competencies related to Green Levers

Question number	Item	Description/explanation
118	Material replacement	Research into alternative materials that are more sustainable, economical and readily available; analysing the possibilities of using recycled, bio-based or renewable materials (circular economy)
119	Functional specification with sustainability	Competition between suppliers to consult/choose new ideas, technologies, processes, materials and trends
120	Decarbonisation of products / sale of certifications	Analysing the sources of emissions (CO ₂) and eliminating/reducing them; in the case of participation in emissions trading, direct costs can be avoided
121	Energy saving (product)	Analysing energy consumption; identifying possibilities for reduction through new production methods, new equipment, efficient use, waste reduction...
122	Energy savings (own)	Optimisation of product design to reduce energy consumption during manufacture, use and disposal; implementation of energy-efficient components or systems to reduce operating costs

123	Sustainable supply chain initiative	optimisation of the supply chain to reduce transport costs and emissions; suppliers who prioritise sustainability and offer economical and environmentally friendly materials or product parts
124	10Re	10 Re-s (refuse, rethink, reduce, reuse, repair, refurbish, remanufacture, reuse, recover, recycle)
125	Pollution / water / waste reduction	Optimisation to reduce water consumption during manufacture, use and disposal; identification of pollutants and their elimination
126	Land use	Land use has negative effects on sustainability; reduced need for space, as a result of the superior organisation of the prothecess, saves land and costs
127	Optimising logistics	Supplier and logistics design - for example, for pool transport operations and packaging optimisation
128	Forecasting / planning / capacity	Increased efficiency through better planning that leads to less consumption of resources, generating sustainability benefits
129	Reduction of consumables	Identification of consumables, but also maintenance / repair / overhaul and analysis of replacement with sustainable products
130	Circular economy strategies	Implementing circular economy principles, such as product take-back programmes and recycling initiatives; reusing waste materials and by-products to create new revenue streams
131	Extend use (e.g. through maintenance)	Extending the useful life of installations/products avoids early replacement and the associated costs
132	E-process / automation / robotics	Exploitation of automation and robotics to increase efficiency, reduce labour costs and minimise manufacturing errors; implementation of predictive maintenance to avoid costly breakdowns

133	I4.0 technology	Use of new 4.0 technologies (AI, blockchain, cyber-physical systems [sensors], 3D printing, digital twins)
134	Green finance	Use of sustainable financial products for financing; portfolio review with possible cost reduction
135	Regulations	Implement mandatory regulations in a way that combines them with cost-saving benefits, e.g. ESG implementation together with risk management; continuous updating on environmental regulations and incentives
136	Drawing up contracts	Inclusion of sustainability targets as part of the supplier incentive system
137	Sharing environmental profits/costs	Partnership contracts with suppliers, establishing joint sustainability savings targets with proportional sharing of savings
138	KPIs / sustainability targets for suppliers	Establishment of sustainability measures as part of the quality system
139	Collaboration between suppliers	Collaboration between suppliers, e.g. joint use of measuring equipment, planning data, analysing the interfaces of their products... including n-tier
140	Sustainability technology week / workshop	Innovation week with sustainability goal, suppliers invited to work on ideas / start-up pitches
141	Green lever workshop with supplier	Holding workshops on green leverage with individual suppliers, targeting their scope
142	Reverse marketing	Establishing communication with suppliers as a "sustainability champion", attracting ideas from suppliers and becoming a preferred customer
143	Energy/resource audit	Auditing operational or manufacturing processes to identify areas where energy and resources can be conserved; identifying opportunities to reduce waste and improve efficiency
144	Development of ecological suppliers	Implementation of Lean Six Sigma (or similar) to optimise processes and eliminate waste; green manufacturing practices to reduce environmental impact and costs at

		the same time, training of suppliers' employees
145	Collaboration for innovation with third parties	Collaboration with suppliers, research institutions and other organisations to explore new materials and technologies
146	Grouping of ecological suppliers	Assessment of the sustainability of the supply base, using the score to test the concentration of volume on sustainable suppliers, achieving volume savings and benefiting the environment
147	Ecological complementary products/services	Identifying related products and obtaining resources from more sustainable sources
148	Outsourcing to a greener supplier	If your own sustainability efforts don't produce the desired results, this may be another reason to consider outsourcing processes and components to a greener supplier
149	Variant reduction	Evaluation of the sustainability of own product variants and elimination of those that cause the most emissions; gradual elimination of the respective suppliers
150	Total cost calculation	Evaluation of the total cost of ownership of a component/service; modification for sustainability with a positive total cost
151	Calculation of target emission costs	Based on the possible final emission of a product/service, the possible scope of emission per component is determined, finding solutions with the respective suppliers to achieve
152	Green auction	Organisation of an electronic auction with sustainability scores included
153	Ecological suppliers (sourcing criteria)	Assessing the sustainability of all suppliers, changing the supplier portfolio based on these criteria
154	Import substitution	Identifying suppliers from countries that do not comply with environmental regulations or do not reduce emissions and systematically replacing them

155	Replacing functional suppliers	Identification of suppliers with functionally comparable products, but with more sustainable production
156	Collaboration with other commodities	Analysing whether this commodity could benefit from changes in other commodities/create sustainability cost benefits in them