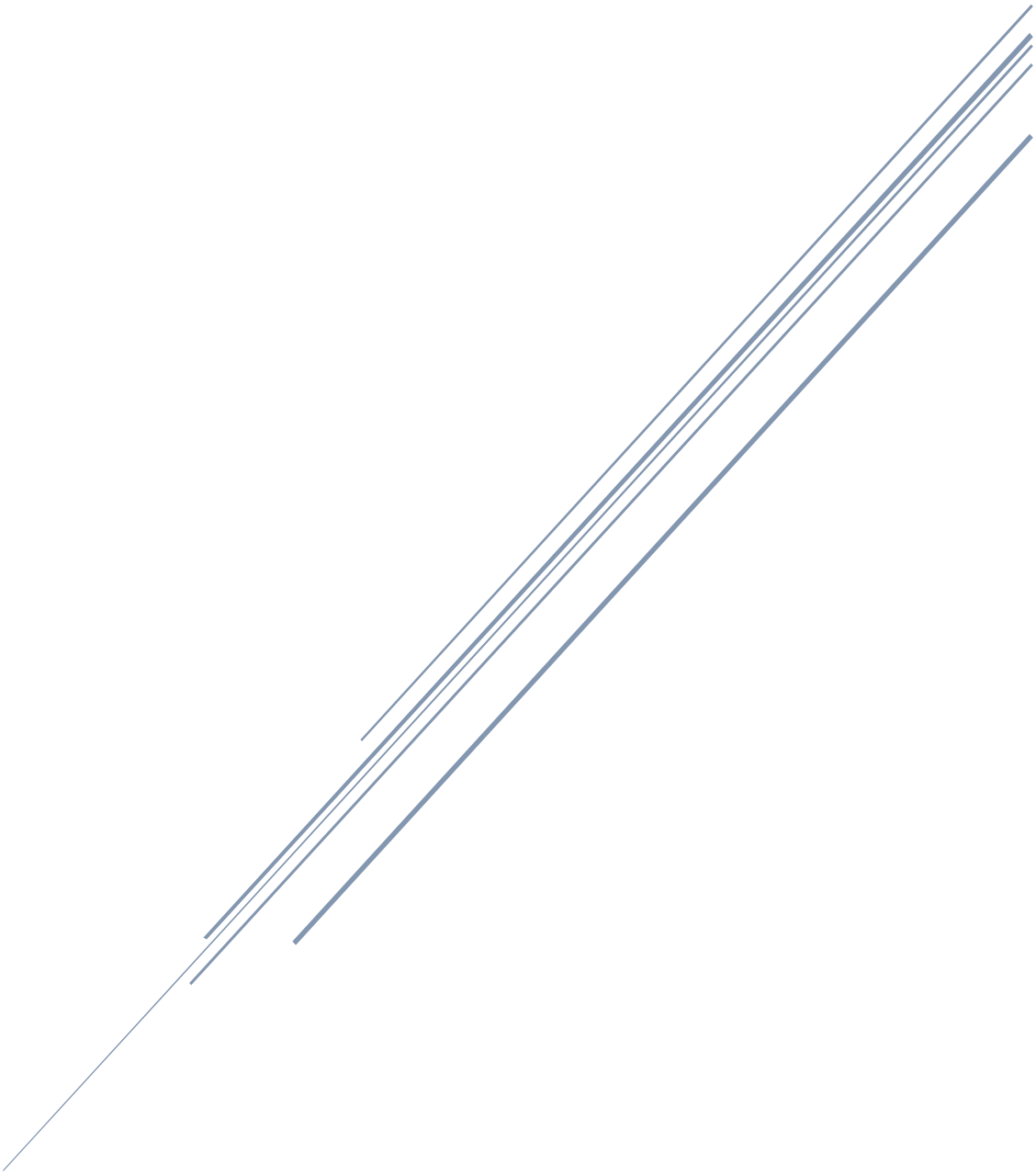
NAVIGATING COMPLEXITY IN GLOBAL SOURCING: INSIGHTS FROM TECHNOLOGY PROVIDERS



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Title Page

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Navigating Complexity in Global Sourcing: Insights from Technology Providers

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Abstract

Global sourcing offers strategic benefits such as cost efficiency, innovation, and access to international supplier networks. At the same time, it introduces growing complexity through regulatory demands, fragmented data, and limited visibility across supply chains. This study investigates how digital technologies support organisations in managing this complexity, based on twelve expert interviews with technology solution providers. Using the ABCDE visibility framework, the study shows that sourcing complexity is closely tied to visibility challenges. A distinction is made between physical visibility, which relates to the traceability of goods, and informational visibility, which concerns the structure and accessibility of procurement and compliance data. Different technologies are needed to address these distinct gaps. An integrated theoretical framework combining the Technology-Organisation-Environment (TOE) model and the Technology Acceptance Model (TAM) was applied to analyse how technological characteristics, organisational conditions, and environmental factors influence the effectiveness of technology in sourcing contexts. The findings show that sourcing complexity can only be effectively managed when technologies are selected based on the specific problem they are intended to solve. Organisations typically combine specialised tools that address concrete challenges such as ESG compliance, risk monitoring, or supplier data quality. These tools improve the quality, availability, and structure of sourcing information, enabling faster and more evidence-based decision-making in complex global environments. This study contributes by offering a structured explanation of how visibility gaps shape global sourcing complexity and how digital technologies can support targeted, adaptive responses. Technology does not remove complexity but enables organisations to manage it more effectively through improved transparency, informed decision-making, and better alignment with sourcing needs.

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1. Introduction: Technology as an antecedence for future global sourcing

Global trade has undergone significant changes in recent decades, driven by interconnectedness and open trade.[1] However, this era of global sourcing and international trade is not without complexities, including sustainability issues, changing regulations, and the complex nature of supply chains.[2] Increased regulatory compliance requirements and a growing demand for visibility continue to challenge companies managing global supply chains.[3] Effective supply chain management is crucial in this environment, requiring alignment with global trade processes and anticipation of dynamic changes and uncertainties.[4] These complexities have been further increased by regulatory frameworks such as the EU Corporate Sustainability Due Diligence Directive (CSDDD), emphasising the necessity for companies to transparently report their environmental and human rights impacts.[5]

The evolution of global trade, particularly in the manufacturing industry, has resulted in complex supply networks.[6] To address these challenges, companies are increasingly looking for digital technologies that can improve supply chain visibility.[7] Achieving visibility within supply chains has become critical to mitigate risk and manage complexity effectively, highlighting the importance of frameworks such as the ABCDE-model of supply chain visibility by Kalaiarasan et al. (2022). Many companies struggle to obtain reliable and timely information across their supply networks. The findings of this study show that lack of supply chain visibility is the underlying factor for most complexity in global sourcing. Supply chain visibility can be divided into two types: physical visibility, which relates to the traceability of goods, and informational visibility, which relates to the availability and reliability of data on suppliers, risks and compliance. The lack of informational visibility, also known as transparency, creates challenges as companies struggle to access structured and timely sourcing data. Without this transparency, it becomes difficult to manage risks, comply with legal requirements or make reliable sourcing decisions, for example. The study also shows that no single technology can

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[1] See Riad et al. (2012, p. 6)
[2] See Nelson, Rueda, and Vermeulen (2018, p. 176)
[3] See Kalaiarasan, Olhager, Agrawal, and Wiktorsson (2022, p. 8), Monczka, Handfield, Giunipero, and Patterson (2021, pp. 378-385)
[4] See H. L. Lee (2010, p. 175)
[5] See Commission (2022)
[6] See Guilhoto, Hewings, Johnstone, Webb, and Yamano (2019, p. 8)
[7] See Colombo, Boffelli, Kalchschmidt, and Legenvre (2023, p. 633); Hallikas, Immonen, and Brax (2021, pp. 4-8)

address the full scope of global sourcing complexity. Since the nature of complexity varies across cases, it is essential to first identify the specific challenges before selecting appropriate technologies. Digital tools only create value when they are applied to clearly defined problems. By providing access to real-time data, monitoring tools, and risk signals, technology improves decision-making by enabling faster more focused and evidence-based choices in sourcing.

This research emerged from a broader exploratory project in which different researchers focused on buyers, suppliers, or technologies in global sourcing. This thesis focuses specifically on technology solution providers, based on both analytical relevance and data access. This scope reflects a conscious decision to understand how technologies support sourcing complexity from the perspective of those who design and deliver such solutions.

The central research question of this study is formulated as follows:
"How to mitigate the increasing complexity in global sourcing activities with the support of technology?"

1. *What are the challenges and complexities faced in global sourcing activities?*
2. *What technologies are currently available to mitigate the complexities of global sourcing?*
3. *How do technological solutions impact decision-making and outcomes in global sourcing activities?*

A qualitative research design was adopted, utilising semi-structured expert interviews with twelve technology solution providers. These interviews were structured according to an integrated theoretical framework combining the Technology-Organisation-Environment (TOE) model (Tornatzky & Fleischer, 1990) and the Technology Acceptance Model (TAM) (Davis, 1989). This structured approach enabled systematic exploration of how technology characteristics, organisational readiness, and external environmental pressures influence the effectiveness of technologies in global sourcing.

The remainder of this thesis is structured as follows. Chapter 2 reviews the relevant literature on global sourcing complexity and technology. Chapter 3 describes the research methodology. Chapter 4 presents the empirical findings. Chapter 5 discusses these findings in relation to existing literature. Finally, Chapter 6 indicates limitations and directions for future research.

2. Theoretical Background: Understanding the complexity of global sourcing and the role of technology

2.1.1 History: From the early days of global sourcing to the complexities faced today, technology has emerged as a crucial solution.

Global sourcing relies on the movement of goods and services among nations, facilitated by interconnectedness and open trade. Engaging in international trade fosters economic incentives for maintaining peaceful relationships with trading partners, often achieved through the establishment of interdependent connections.[8]

Global sourcing gained momentum in response to crises such as the oil embargo in the 1970s and materials shortages, leading companies to shift to international suppliers mainly from developed countries. However, after the Cold War in 1987, emerging markets in China and Eastern Europe started popping up, significantly increasing sourcing opportunities and making the managing of global supply chains more complex. Therefore, geopolitical factors, particularly trade agreements, have significantly influenced the expansion of international supply chains.[9] The 1980s highlighted a big shift in global trade. While international investments traditionally focused mainly on market-oriented goals, such as access to new sales markets and economies of scale, there is a growing understanding that global sourcing can also contribute to long-term competitive advantages. Here, global sourcing includes not only reducing costs through international sourcing, but also the strategic use of global resources for innovation, technological know-how, and risk diversification.[10]

Another key driver was the advancement of communication and transportation technologies. Especially after 2000, technologies were emerging which significantly reduced geographical barriers, making global sourcing easier. Innovations such as digital communications, improved logistics platforms and enhanced tracking capabilities boosted global sourcing.[11] This shift also led to the development of international logistics strategies and the growth of global sourcing as a competitive strategy.[12]

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[8] See Daniels, Radebaugh, and Sullivan (2019, p. 48)
[9] See Monczka et al. (2021, p. 369)
[10] See Arnold (1989, pp. 20-25)
[11] See Monczka et al. (2021, p. 375)
[12] See Anderson (1985, pp. 5-19); Monczka and Trent (1991, pp. 2-8)

However, the interconnectedness of global supply chains also brings vulnerabilities to the surface, especially in times of crisis. The COVID-19 pandemic exposed these vulnerabilities and caused significant disruptions in several sectors. However, recent research by Koerber and Schiele (2022) suggests that this has not led to a permanent break in global sourcing. In particular, transcontinental sourcing continues to show a slight increase. The continuing appeal of cost advantages, resource availability and technological capabilities ensures that global sourcing remains a vital strategic approach, even under crisis conditions. At the same time, this increased global dependency adds layers of complexity, making supply chains more difficult to coordinate and manage effectively.[13]

This complexity is not only logistical or operational but also stems from the interaction between participants within international supply networks. Global sourcing is often presented in theory as a logical and step-by-step process, practical research shows that it is more relational, and interaction driven. A case study of IKEA by Hultman, Johnsen, Johnsen, and Hertz (2012) shows how decisions on global sourcing are strongly influenced by interactions between parties in the chain. In this case, IKEA played an active role in directing its suppliers to engage with new international suppliers. This led suppliers to adjust their own sourcing strategies, indicating a chain effect in which global sourcing comes about through shared coordination and mutual influence, rather than from isolated decisions.[14]

This complexity is consistent with what Monczka et al. (2021) describes as common barriers faced by companies sourcing globally. These include, lack of skills, increased supply risk, resistance to change, longer lead times, cultural differences and currency fluctuations. As supply chains expand globally, managing these barriers becomes crucial to maintaining resilience and visibility. Visibility is defined in the literature as “the extent to which actors within a supply chain have visual access to the timely and accurate supply and demand information they consider essential or useful for their operations and supply chains.” Low visibility restricts the ability to build resilience, particularly when supplier risks, disruptions, or compliance requirements are not transparent. Increasing supply chain visibility is therefore a key response to managing these global sourcing complexities.

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[13] See Koerber and Schiele (2022, pp. 230-231)
[14] See Hultman et al. (2012, pp. 10, 19-21)

To examine this more systematically, the ABCDE framework of supply chain visibility by Kalaiarasan et al. (2022, pp. 6-8) is applied. This model categorises visibility-related aspects into four broad domains: 'antecedents', 'barriers and challenges', 'drivers', and 'effects'. These relationships are visualised in Figure 1.[15]

Under the 'antecedents' category, there is a subcategory titled 'technology', which is central to this study and will be further elaborated. Technologies play an important role in improving supply chain visibility. Connectivity and integrated data solutions are essential to enable real-time and end-to-end supply chain visibility. To systematically analyse these supply chain complexities, a clear structure is required. This study adopts the ABCDE visibility framework by Kalaiarasan et al. (2022, p. 8) as the theoretical foundation to identify and structure sourcing complexities. The model's components, including antecedents, barriers, drivers, and effects, provide the analytical lens through which the complexities in global sourcing are categorised and interpreted.

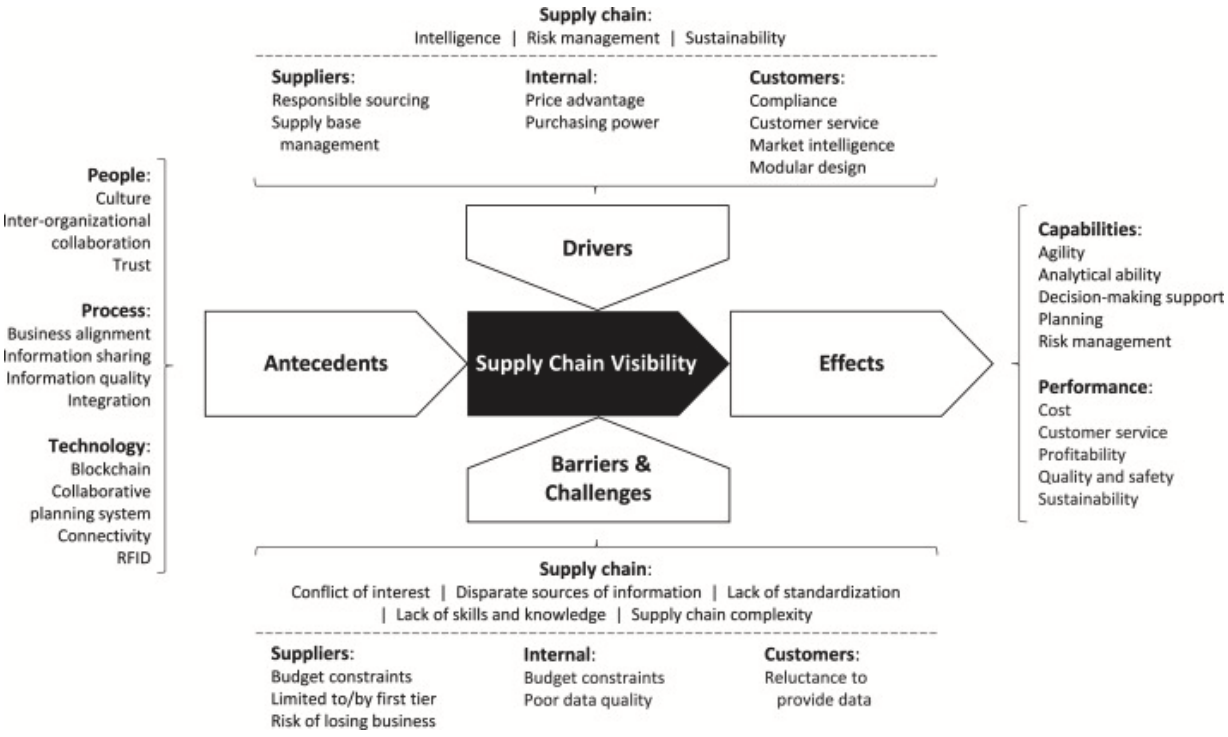

Figure 1: The ABCDE framework of supply chain visibility (Kalaiarasan et al., 2022)

[15] See Kalaiarasan et al. (2022, p. 3)

2.1.2 Digitalisation: Revolutionising supply chains

Digitalisation is revolutionising traditional supply chains.[16] The transformation is visible as digitalisation improves traceability, safety and sustainability.[17] Digitalisation itself is not new. The continuous development of production technologies and the implementation of ERP systems in FSC has enabled the streamlining of activities in the supply chain from upstream to downstream, improving efficiency.[18]

Digitalisation in procurement and supply chain management (PSM) plays an important role in improving supply chain performance. Data analytics improves decision-making by increasing visibility in the supply chain and enabling early detection of potential disruptions.[19] Combining internal procurement data with external market or logistics information helps organisations predict demand more accurately and act proactively.[20]

Digital tools also support better collaboration between buyers and suppliers. Platforms with standardised data exchange enable more integrated collaboration, improving both efficiency and communication.[21] Even simple solutions such as e-signatures, shared dashboards or contract lifecycle tools can contribute significantly to smoother interaction with suppliers.

With highly integrated digital platforms, supply chains become more cost-effective with reduced labour requirements and fewer errors in the chain, while increasing responsiveness to market demands. Moreover, automation increases efficiency and increases decision autonomy, especially at operational and tactical levels, by taking over repetitive tasks and streamlining data flows.[22]

The advancement of digital technologies and the availability of big data have been increasingly enabling international supply chains to be more efficient. With highly integrated digital platforms, supply chains become more cost effective with less labour needs and mistakes along the chain while increasing the responsiveness to market demands.[23]

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[16] See Rogetzer, Nowak, Jammernegg, and Wakolbinger (2019, p. 1)
[17] See Kittipanya-Ngam and Tan (2020, p. 2)
[18] See Gharehgozli, Iakovou, Chang, and Swaney (2017, p. 9)
[19] See Hallikas et al. (2021, p. 633)
[20] See Hallikas et al. (2021, p. 635)
[21] See Hallikas et al. (2021, p. 634); Herold, Heller, Rozemeijer, and Mahr (2023, p. 10)
[22] See Colombo et al. (2023, p. 9)
[23] See Siavash H Khajavi and Holmström (2015, p. 180)

2.1.3 Technological Industry 4.0: Transforming procurement and supply chains

Where digitalisation belongs to the third industrial revolution, we have now arrived at the fourth industrial revolution. This industrial revolution is called 'Industry 4.0'. The fourth industrial Revolution represents a significant shift in manufacturing and production processes through the integration of digital technologies. [24] It involves the use of advanced technologies such as the Internet of Things (IoT), artificial intelligence (AI), big data and automation to create smart factories and optimise operations. Industry 4.0 aims to enhance efficiency, flexibility, and customisation in manufacturing, leading to improved productivity and competitiveness. Experts estimated that the impact on social life due industry 4.0 is enormous and define it as a super disruptive innovation.[25] Various factors contribute to the societal impacts of this transformation. Among these, the IoT stands out, enabling machine-to-machine (M2M) communication and fostering a manufacturing environment with reduced human intervention. Another significant driver is autonomy, as systems increasingly exhibit self-governing behaviour. Additionally, sensors and cyber-physical systems (CPS) play a crucial role by facilitating seamless communication between machines. When CPS, IoT, M2M communication, and autonomy converge, they create manufacturing systems that are more reliable, flexible, and intelligent.[26]

To clarify the implications for procurement, it is important to distinguish between direct and indirect procurement. Direct procurement refers to the purchase of goods and services that are directly incorporated into a company's product, such as raw materials, components, or parts. Indirect procurement, by contrast, covers purchases that support business operations, such as IT services, office supplies, consulting, and facilities management.[27]

Direct procurement requires deeper technical expertise focused on integrating CPS, IoT and joint development of innovation with suppliers. In contrast, indirect procurement emphasises skills around data-driven decision-making, flexible international sourcing, internal communication with stakeholders and process optimisation using e-tools.[28] AI and machine learning (ML) are increasingly used in procurement for predictive analytics and proactive risk

[24] See Oztemel and Gursev (2020, p. 128)
[25] See Glas and Kleemann (2016, pp. 58-59); M. Lee et al. (2018, p. 6)
[26] See Schiele and Torn (2020, pp. 512-513)
[27] See Delke, Schiele, and Buchholz (2023, p. 21)
[28] See Delke et al. (2023, pp. 16-18)

management, improving visibility and responsiveness within supply chains.[29] In addition, these technologies are often applied in supplier evaluation, contract analysis and demand forecasting.

Besides, AI also supports external negotiation processes by simulating and analysing negotiation behaviour based on mechanism design principles, leading to improved procurement performance and cost savings.[30] Machines are beginning to take on the role of decision-making board members, with full authority to make decisions.[31] Routine-based jobs will vanish, and individuals' roles within organisations will increasingly revolve around auditing tasks, as well as, crucially, fostering innovation and critical thinking.[32] AI is not expected to replace buyers, but to complement their role as a supportive tool. This shift requires procurement staff to adapt, particularly in learning how to interact with and trust AI systems. Continuous training becomes essential, especially when working with expert systems that still depend on human judgment. Rather than replacing expertise, AI is positioned as a facilitator for a more effective and efficient procurement function.[33]

However, adoption of more advanced applications remains limited by challenges such as poor data quality, lack of IT integration and organisational resistance.[34] But a successful implementation of AI in procurement in the PSM requires standardised data, integration of processes, structured data environments, willingness and continuous monitoring and training of staff and systems.[35]

While the literature on Industry 4.0 primarily focuses on technical optimisation and automation, its implications for environmental and social considerations in global sourcing remain underexplored. Although this study does not explicitly focus on sustainability, several of the technologies examined, such as ESG compliance tools or carbon tracking solutions, show how digital innovations are increasingly used to address external pressures and societal expectations. These solutions reflect the growing need for companies to manage not only operational efficiency but also regulatory alignment and environmental responsibility across international

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[29] See Althabatah, Yaqot, Menezes, and Kerbache (2023, pp. 12-13); Spreitzenbarth, Bode, and Stuckenschmidt (2024, pp. 12-14)
[30] See Schulze-Horn, Hueren, Scheffler, and Schiele (2020, pp. 630-633)
[31] See Oztemel and Gursev (2020, p. 128)
[32] See M. Lee et al. (2018, p. 9)
[33] See Schulze-Horn et al. (2020, p. 634)
[34] See Spreitzenbarth et al. (2024, pp. 13, 15)
[35] See Meyer and Henke (2023, pp. 7-8, 11)

supply chains. Sustainability-related functionalities do form a part of how technological solutions aim to address complexity in modern global sourcing environments.[36]

2.2 Supply chain complexity and risk: The need for technological advancement and visibility

2.2.1 The relationship and long tail of buyer and suppliers (complexity of supply chains)

The complexity of supply chains has increased in recent years due to several interrelated factors. An important factor is the growing scale of global sourcing and e-commerce.[37] Although companies have long sourced materials and products from around the world, the size and complexity of these global networks have increased significantly. With the rise of emerging markets, advances in transport and communication technologies and the trade agreements, companies now have access to a wider range of suppliers and markets than ever before. International trade has doubled within the last 15 years. However, the growth seems to flatten. As a result, with the rise of global sourcing, the supply chain has become increasingly elaborate and interconnected, spanning multiple continents, and involving numerous stakeholders.[38] The drive of efficiency and cost optimisation has led to supply chain strategies that prioritise lean inventories, just-in-time production, and complex network configurations.[39]

Changing consumer preferences and behaviours have added further complexity to supply chains and therefore riskier. All these complexities will require more attention to risk management. Today's consumers expect greater product variety, adaptability, and faster delivery times. To meet these demands, supply chains need to be highly flexible, agile, and responsive so that they can quickly adapt to changing market conditions and customer preferences.[40] As they are exposed to a greater number of vulnerabilities and risks, their nature is also becoming increasingly complex, which can lead to increased vulnerability and reduced ability to deal with disruptions.[41] To successfully navigate this complexity, organisations need to take a holistic approach to supply chain management, where technological developments can help address the increasing complexity in supply networks and the need for greater transparency.[42]

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[36] See Müller, Kiel, and Voigt (2018, p. 2)
[37] See Dong and Kouvelis (2020, p. 25)
[38] See Vidrova (2020, p. 6); WTO (2023)
[39] See Ahmed and Huma (2021, p. 39)
[40] See Ahmed and Huma (2021, p. 37)
[41] See Iftikhar, Purvis, Giannoccaro, and Wang (2023, p. 1)
[42] See Bai and Sarkis (2020, p. 4)

2.2.2 Navigating the intersection of global supply chains and sustainability: Challenges, obligations and opportunities

The landscape of manufacturing production has evolved significantly in recent decades, with the expansion of supply chains and the rise of global supply.[43] This has led to increased complexity and challenges in managing and controlling these extensive supply chains, due to their low overall transparency.[44] The globalisation of supply chains has resulted in the worldwide shipment of raw materials and components, leading to the delivery of final products to end-users through complex supply chains.[45] These changes have been driven by factors such as global sourcing of raw materials and finished goods, and the need for supply chain professionals to adapt to the new, riskier environment.[46] The development of supply chain management is expected to be influenced by technological changes, individual customer requirements, shorter delivery times, and increasing cost pressure.[47]

Transportation is essential to a supply chain; materials or products must be moved from the source to the processing location and afterwards to the customer. Currently, most goods are moved via road transport, a very polluting transportation mode and responsible for nearly one-fifth of the total EU greenhouse emissions.[48] To reduce this contribution, action must be taken to reduce the amount of road transport or road transport itself can be made more sustainable. This shift requires both technological innovation and behavioural change.[49]

Industrialisation has led to a one-degree Celsius increase in the biosphere's temperature over the past two centuries, with projections indicating a further rise of two to five degrees by 2100 unless greenhouse gas emissions are substantially reduced.[50] This temperature escalation is expected to have significant impacts on biodiversity, health, and ecosystems, underscoring the urgency of sustainability considerations.[51] The UN General Assembly and health journals

[43] See Free and Hecimovic (2021, p. 58)
[44] See Saberi, Kouhizadeh, Sarkis, and Shen (2019, pp. 1-2)
[45] See Kandil, Battaïa, and Hammami (2020, pp. 277-281)
[46] See Scheller-Wolf and Tayur (1999, p. 705)
[47] See Schiffer and Dörr (2020, p. 36)
[48] See Commission (2019)
[49] See Chapman (2007, pp. 364-365)
[50] See Harvey, Lehmann, and Chown (2023, p. 2)
[51] See Wieland (2021, pp. 58-59)

worldwide have called for urgent action to limit global temperature increases, restore biodiversity, and protect health.[52]

Asian countries have become pivotal production centre's within global supply chains, and the production industry, being a major emitter, has turned sustainability into a critical supply chain issue. The globalisation-driven offshoring of production to Asian countries also translates into increased greenhouse gas emissions.[53]

The intersection of global supply chains and sustainability proves complex. Historically, longer supply chains were designed with cost considerations in mind, often overlooking their environmental impact.[54] Sourcing strategies, such as choosing between in-house production or external suppliers, have predominantly focused on cost efficiency rather than environmental indicators. Offshoring, a cost-effective option, tends to prioritise company expenses without adequate consideration of potential impacts. In contrast, sustainability, with its focus on the broader planetary impact, diverges from the cost-centric approach of supply chains as currently structured. Something will have to change within the supply chain and pay more attention to environmental Social Governance (ESG).[55]

2.2.3 Safeguarding sustainability: The role of corporate sustainability due diligence Directive in enforcing responsible supply chain practices

The Corporate Sustainability Due Diligence Directive (CSDDD) represents a pivotal step towards ensuring corporate accountability and fostering sustainable practices within supply chains. Enforced by the European Union, this directive mandates large enterprises to report on sustainability and social issues in their annual reports, marking a significant milestone in the realm of corporate governance and environmental stewardship.[56]

Aligned with global sustainability agendas such as the European Green Deal and the UN Sustainable Development Goals, the CSDDD aims to propel companies across all sectors towards a transition to a climate-neutral and green economy. By emphasising human rights and

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[52] See Atwoli et al. (2021, pp. 1182-1184)
[53] See Glushkova, Lomakina, and Sakulyeva (2019, p. 876); Khattak, Ahmad, ul Haq, Shaofu, and Hang (2022, p. 406)
[54] See (Linton, Klassen, & Jayaraman, 2007, p. 1075)
[55] See (Darvish, Archetti, & Coelho, 2019, p. 269)
[56] See Commission (2019)

environmental objectives, the directive underscores the critical importance of integrating sustainability principles into corporate operations and governance frameworks.[57]

Key principles outlined by the European Commission's Directorate-General for Justice and Consumers necessitate detailed planning to mitigate adverse impacts on human rights and the environment within supply chains. This includes integrating sustainability considerations into operational management and governance, thereby fostering long-term resilience and responsible business practices.[58]

Innovative technologies such as 'big data' and 'blockchain' hold promise in facilitating responsible and sustainable supply chain management. Leveraging these technologies can enhance transparency, traceability, and accountability throughout the supply chain, aligning with the objectives of the CSDDD.[59]

Anticipated benefits of the CSDDD extend beyond corporate accountability to encompass safeguarding human rights, promoting a healthier environment, and fostering trust among stakeholders. By driving stakeholder analysis on critical sustainability issues and encouraging investment in sustainability initiatives, the directive has the potential to catalyse positive change and contribute to better living conditions, both locally and globally.[60]

So, the CSDDD represents a move towards promoting sustainability within business practices and supply chain activities. As large enterprises adapt to meet its requirements, the integration of innovative technologies and steadfast commitment to sustainability principles will be essential in realising the vision of a more equitable, resilient, and environmentally sustainable supply chain. It requires organisations to identify their negative impacts on human rights and the environment and, where necessary, prevent, end, or reduce them. Failure by organisations to comply with the European directives can result in a heavy fine or reputational damage to the company. In this way, the CSDDD tries to ensure that the guidelines are enforced.[61]

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[57] See Commission (2022)
[58] See Commission (2022)
[59] See Gurzawska (2020, p. 284)
[60] See Elliott (2023, p. 51); Smit et al. (2020, p. 7)
[61] See Ventura (2021, p. 602)

2.3 Supply chain visibility: differentiating physical and informational gaps

Following the increasing regulatory pressure outlined in the CSDDD, one of the most pressing challenges in global sourcing is the lack of supply chain visibility. Access to reliable and timely information across supply networks is essential for managing complexity, mitigating risks, and ensuring compliance. In practice, visibility is often limited to first-tier suppliers, which restricts a company's ability to anticipate disruptions or take informed action. Achieving broader visibility is technically demanding, time-consuming, and requires significant resources.[62]

To analyse this challenge, this study distinguishes between two types of visibility: physical visibility and informational visibility. Physical visibility refers to the traceability of goods and materials across the supply chain, supported by technologies such as tracking tools or logistics systems. This type of visibility focuses on where products are and is often referred to as traceability.[63]

Informational visibility concerns the availability, accuracy, and structure of data needed to support sourcing decisions. This includes supplier performance, compliance documentation, ESG metrics, and risk indicators. In this study, the term transparency refers specifically to informational visibility. When this data is missing or unreliable, companies are unable to make informed decisions, meet legal requirements, or act effectively on risks. [64]

Technology can support both types of visibility, but only when matched to the right visibility need. RFID, for example, can improve physical traceability, while tools for risk analysis or contract management target informational gaps. As noted by Kalaiarasan et al. (2022), technology can improve visibility, but only if it is applied to a clearly defined problem. This study uses the distinction between physical and informational visibility throughout Chapter 4 to categorise sourcing challenges and evaluate how digital tools respond to them.

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[62] See Choi, Shao, and Shi (2015); Kalaiarasan et al. (2022, p. 8)
[63] See Sunny, Undralla, and Pillai (2020, p. 3)
[64] See Hofmann and Rüsch (2017, p. 25)

2.4 Leveraging Industry 4.0 technologies to manage complexity in global supply chains

2.4.1 Internet of Things (IoT): Enabling real-time tracking and operational visibility

The Internet of Things (IoT) is a network in which physical objects are connected to each other via the internet, allowing data to be exchanged.[65] This interconnected system integrates sensors and actuators in the environment, facilitating information sharing between platforms.[66] By establishing a global infrastructure that connects physical and virtual objects, the Internet of Things enables advanced services through the convergence of different technologies.[67] It envisions a future where digital and physical entities are connected, fostering new applications and services.[68]

In the field of global sourcing, IoT has a major impact on supply chain management. By using IoT technologies, supply chain processes can be improved through real-time tracking, monitoring, and data-driven decision-making.[69] The impact of IoT on business operations and supply chain management is significant, with emerging technologies such as artificial intelligence and blockchain playing a central role in this transformation.[70]

2.4.2 Artificial Intelligence (AI): Supporting global sourcing and risk management

AI was created for the act of replacing human intelligence in decision-making processes by developing software that could mimic learning.[71] AI is referred to as a set of tools that enhance the intelligence of a product, service, or solution based on intelligent programs, algorithms, and machines. In addition, AI is rapidly gaining interest as a research topic due to its ability to reshape and optimise processes. Current AI applications are available for everyone, including businesses.[72] AI is getting more embedded within digitalisation and connectivity. Therefore, AI is a part of the fourth industrial revolution (industry 4.0), where ecosystems are getting connected and transparent. The fourth industrial revolution is allowing businesses to deepen

[65] See Li, Xu, and Zhao (2015, p. 243)
[66] See Gubbi, Buyya, Marusic, and Palaniswami (2013, p. 1645)
[67] See De Donno, Tange, and Dragoni (2019, p. 150940)
[68] See Miorandi, Sicari, De Pellegrini, and Chlamtac (2012, p. 1497)
[69] See Ben-Daya, Hassini, and Bahroun (2019, p. 4720)
[70] See Mithas, Chen, Saldanha, and De Oliveira Silveira (2022, p. 1)
[71] See Min (2010, p. 14)
[72] See Shankar (2018, p. 1)

their connections with their suppliers and customers, which increases their competitive advantage.[73]

AI is increasingly being integrated into global procurement and sourcing practices, especially in supply chain management and procurement processes. Research has shown that AI can improve decision-making in procurement strategies by analysing patterns, behaviour, and supplier data.[74]

Nowadays, supply chains are becoming more complex and diverse due to increasing possibilities which could lead to visibility problems and low information levels.[75] Luckily, the use of AI may enhance intelligence within supply chain management. Previous studies have shown possible AI applications contributing towards a transparent and visible supply chain.

Data-driven decision-making enables businesses to make quick decisions based on vast amounts of data. Historical purchase data, market trends, supplier performance metrics, and other cross-functional factors can be analysed quickly and accurately with AI, which potentially optimises purchasing strategies.[76] Procurement processes could potentially be *streamlined* due to AI implementation. Repetitive tasks could be executed autonomously by AI, which frees up valuable time and resources. This allows procurement employees to focus on strategic procurement activities.[77] In addition, AI algorithms could be used when forecasting. Purchasing departments may optimise inventory levels, foresee demand variations, and guarantee that the correct products are accessible at the right time by utilising *predictive analytics*. By being proactive, this strategy reduces extra inventory, avoids stockouts, raises customer satisfaction, and increases competitive advantage.[78] Historical data such as delivery times, quality levels, and product pricing can be analysed by an AI-powered tool. The tool identifies top-performing suppliers and possible improvement areas. *Performance visibility* therefore could be enhanced with the AI tool. Businesses can use the data to provide feedback to suppliers or express leverage for better negotiation terms.[79] With the use of AI, businesses may achieve *Cost*

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[73] See S. H. Khajavi and et al. (2015, p. 2)
[74] See Jahani, Sepehri, Vandchali, and Tirkolaee (2021, pp. 1-2)
[75] See Kache and Seuring (2017, p. 29)
[76] See Karttunen, Lintukangas, and Hallikas (2023, p. 700)
[77] See Allal-Chérif, Simón-Moya, and Ballester (2021, p. 70), and Shankar (2018, p. 11)
[78] See Helo and Hao (2022, p. 1577), and Karttunen et al. (2023, p. 697)
[79] See Helo and Hao (2022, p. 1576)

reduction and Savings. For example, the overall effectiveness of negotiations can be enhanced with mechanism-designed theories which are facilitated by AI. Furthermore, the paper suggested that AI can surmount the barriers to the application of mechanism design-based negotiations that arise due to cognitive constraints of human nature.[80]

Lastly, AI can help purchasing departments identify and mitigate various *Risks*. External factors could be monitored by an AI tool, giving early warnings to purchasing departments for more time to anticipate supply chain disruptions.[81]

These advantages sound appealing in theory. Unfortunately, implementing AI in business purchasing departments does come with a set of challenges. AI algorithms rely heavily on data. Therefore, the *Data quality* of the used data can make or break the success of the AI tool. Outdated, incomplete, and inaccurate data can result in poor decision-making performance of the AI tool and generate an unreliable outcome.[82] Even if the data quality is sufficient for creating an algorithm, *integration problems* are common. Many businesses use established purchasing systems that do not support the integration of AI. AI integration can therefore be costly, time-consuming, and require significant resources.[83]

Also, the level of trust in AI can influence the success of the implementation of such a tool. Studies have shown a negative link between trust in AI and income, age, and occupation. Designing a fitting *change management strategy* thus can be important for the success of the implementation. In addition to the trust in AI, its performance often creates *ethical or legal concerns*. Some cases in the past presented biased and discriminatory outcomes of an AI tool which lowered the trust.[84] The implementation of AI also depends on the business itself. Sometimes, businesses operate in simple and conservative environments that do not need AI to function effectively. Limitations to the use of such tools may come from skill gaps, cybersecurity policies, lack of data, and lack of human judgment. The opposite limits the use of an AI tool as well when a process is simply too complicated to be enhanced with AI.[85]

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[80] See Schulze-Horn et al. (2020, p. 633)
[81] See Eling, Nuessle, and Staubli (2022, p. 225)
[82] See Kache and Seuring (2017, pp. 13-14)
[83] See Kache and Seuring (2017, p. 14)
[84] See Omrani and et al. (2022, p. 6)
[85] See Omrani and et al. (2022, p. 8)

2.4.3 Big data: Leveraging analytics for informed decision-making in global supply chains

Big data involves the examination of huge amounts of data to discover valuable insights beyond the capacity of traditional methods and smaller data sets. It involves processing, analysing, and extracting knowledge from large amounts of structured and unstructured data from different sources.[86] Big data can be classified into two categories. Data from the physical world, obtained through sensors and observations, and data from human society, from platforms such as social networks and the internet.[87]

The importance of big data in global sourcing stems from its ability to process extensive and varied data from different sources, providing significant value across different industry sectors. The 3V model of big data, which emphasises high volume, velocity, and variety, requires innovative processing techniques to improve decision-making and insights. In the field of global sourcing, big data enables organisations to effectively manage, analyse and visualise large and complex datasets, facilitating informed decision-making and process optimisation.[88]

Table 1: Summary of Industry 4.0 Technologies, Their Benefits and Limitations

Technology	Benefits	Limitations
Internet of Things (IOT)	- Transparency & Visibility - Tracking & traceability - Inventory management & control - Communication - Improved operational efficiency [89]	- Security & privacy challenges [90]
Artificial Intelligence (AI)	- Can improve decision-making in procurement strategies by analysing patterns, behaviour, and supplier data [91] - Mitigate various risk [92] - Cost reduction [93] - Work faster & more efficiently	- For some businesses hard to implement - Lack of data - Cybersecurity policies [95] - Ethical and/or legal concerns [96]

[86] See Hajirahimova and Aliyeva (2017, pp. 1-2)
[87] See Jin, Wah, Cheng, and Wang (2015, p. 59)
[88] See Bello-Orgaz, Jung, and Camacho (2016, pp. 45-46)
[89] See Haddud, DeSouza, Khare, and Lee (2017, p. 1058)
[90] See Tariq, Ahmed, Bashir, and Shaukat (2023, p. 1)
[91] See Jahani et al. (2021, pp. 1-2)
[92] See Eling et al. (2022, p. 225)
[93] See Schulze-Horn et al. (2020, p. 633)
[95] See Omrani and et al. (2022, p. 8)
[96] See Omrani and et al. (2022, p. 6)

	- Predictive analytics [94]	
Big Data	- Discovery of valuable insights - Processing and analysing data [97] - Classification of data [98] - Facilitating informed decision-making and process optimalisation [99]	- Data privacy and security - Data quality and cost [100] - Technical challenges - Must be aware of biased results [101]

2.5 Understanding technology adaption: Technology Acceptance Model (TAM) in combination with Technology-Organisation-environment (TOE) framework

2.5.1 Technology Acceptance Model (TAM)

With the rapid advancement of technology, it is helpful to understand the factors that influence a company's decision to adopt or not adopt a particular technology. Identifying the reasons behind these decisions helps in understanding the drivers of technology implementation within organisations. This knowledge not only provides insight into the decision-making process but also helps in developing strategies to improve technology adoption. The Technology Acceptance Model (TAM) provides a systematic framework for evaluating the requirements of a technology and the behaviours within a company that influence its implementation. By applying TAM, organisations can gain a structured understanding of both the technology characteristics and organisational dynamics that drive successful technology implementation.[102]

[94] See Helo and Hao (2022, p. 1577), and Karttunen et al. (2023, p. 697)
[97] See Hajirahimova and Aliyeva (2017, pp. 1-2)
[98] See Jin et al. (2015, p. 59)
[99] See Bello-Orgaz et al. (2016, pp. 45-46)
[100] See Salkuti (2020, p. 579)
[101] See C. H. Lee and Yoon (2017, pp. 7-8)
[102] See Marangunić and Granić (2015, pp. 85-89); Venkatesh (1999, pp. 240-241)

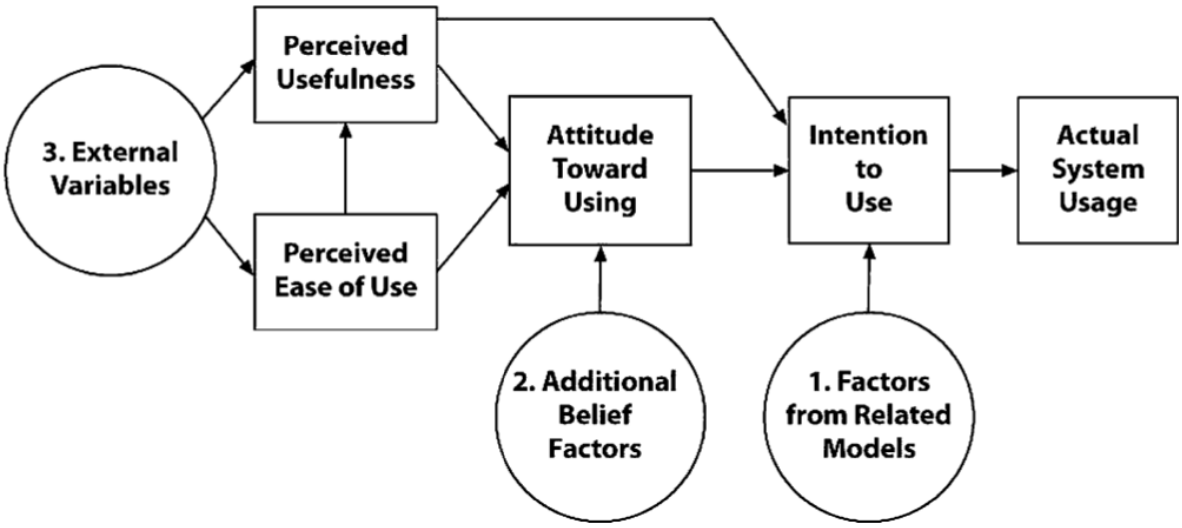

Figure 2: Technology Acceptance Model (TAM) (Marangunić & Granić, 2015)

In the mid-1980s, a visionary named Fred Davis proposed a conceptual model for technology acceptance. This model emerged from research and theories in the field of psychology, aiming to explain how and why users accept or reject technology. Davis's initial concept revolved around user motivation, influenced by the actual system's features and capabilities. He refined this idea into what we now know as the Technology Acceptance Model (TAM). Over the years, this model has continued to evolve, towards the model shown in Figure 2.[103]

TAM suggested that a user's motivation to use a system is driven by three primary factors:

1. *External variables:* which has an influence on the perceived usefulness and the perceived ease of use.
    - *Perceived usefulness:* This is the degree to which a person believes that using a particular system would enhance their job performance.
    - *Perceived Ease of Use:* This is the degree to which a person believes that using a particular system would be free of effort.
2. *Attitude Toward Using:*
    - This is influenced by both perceived usefulness and perceived ease of use. If a user finds the system useful and easy to use, they will have a positive attitude toward using it.
3. *Intention to use:*

[103] See Marangunić and Granić (2015, pp. 85-89); Venkatesh and Davis (2000, pp. 187-188, 197)

- The attitude towards using the system shapes the intention to use it. If a user has a positive attitude, they are more likely to intend to use the system.

4. *Actual System Usage:*
    - This is the end goal of the model. If the user intends to use the system, it will lead to actual system usage.

Three major factors and variables can be distinguished in the TAM model.

1. *Factors from Related Models:* These include subjective norms, perceived behavioural control, and self-efficacy. These factors are derived from other theoretical models and help in shaping users' beliefs and attitudes towards the system.
2. *Additional Belief Factors:* Factors such as trialability, visibility, result demonstrability, and content richness. These are borrowed from the diffusion of innovation literature and address additional belief constructs.
3. *External variables:* Various external variables or moderating factors which are related to 'perceived usefulness' and 'perceived ease of use'. These factors may include personality traits and increasing pressure to adopt more sustainable practices.

2.5.2 Technology-Organisation-Environment (TOE) framework

The external variables in the technology acceptance model (TAM) are based on the technology-organisation-environment (TOE) framework. This framework was developed in 1990 by Tornatzky and Fleisher. The TOE framework is a theoretical framework that explains the adoption and implementation of technological innovations within an organisation. The principle of the TOE framework is influenced by these three main elements. The elements help in analysing and understanding the external variables. This creates a view of the drivers and barriers for the implementation of the technology.[104]

- *Technology:* The technological context includes both internal and external technologies relevant to the organisation. This includes the company's current practices and internal equipment, as well as the range of technologies available outside the organisation.
- *Organisation:* Organisational context refers to descriptive measures about the organisation such as scope, size, and managerial structure.

[104] See Na, Heo, Han, Shin, and Roh (2022, p. 4); Tornatzky and Fleischer (1990)

- *Environment:* The environmental context is the area in which a company does business - its industry, competitors and dealings with the government.[105]

To avoid confusion, this study defines the environmental dimension, as external pressures such as regulations (e.g. CSDDD), market expectations, and sustainability demands. These factors shape how technologies are developed and positioned. As organisations face increasing external requirements, technologies are adapted to meet those demands. For example, by enabling ESG compliance or carbon tracking. In this research, such external demands are treated as sources of complexity that technologies are specifically designed to reduce.[106]

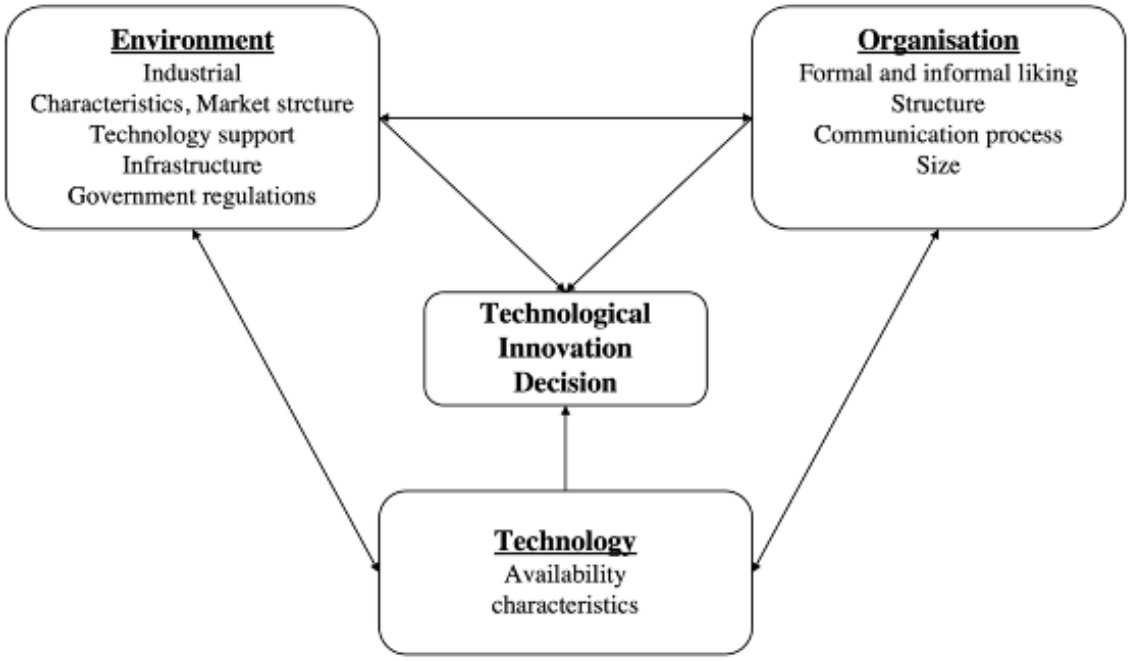

Figure 3: Technology-Organisation-Environmental (TOE) Framework (Na et al., 2022)

2.5.3 Implication of the model (TOE +TAM)

The TAM is traditionally used to explain technology adoption at the individual level Venkatesh and Davis (2000). However, more recent studies show that TAM can also be applied at the organisational level, especially when the focus is on company-wide technology positioning and the added value that technologies can offer to organisations Jo and Bang (2023); Na et al. (2022); Qin, Shi, Lyu, and Mo (2020) This study analyses the solution provider perspective to explore how technologies are positioned in the market. Solution providers have a clear view of how technologies are generally perceived and positioned as solutions in the market. This makes

[105] See Oliveira and Martins (2011, p. 112)
[106] See Tornatzky and Fleischer (1990)

them a valuable source for understanding how technologies are designed, communicated and offered to reduce complexity in global sourcing processes.

The combination of TAM and the TOE framework is the most suitable approach for this study. TAM is used here not to analyse technology adoption, but to understand how solution providers perceive and position the usability (Perceived Ease of Use) and added value (Perceived Usefulness) of their technologies as answers to sourcing complexities. This is directly relevant to answering the research question, because the way solution providers define the usefulness and ease of use of their technologies gives concrete insight into how technologies are expected to reduce sourcing complexity in practice. By focusing on this perspective, the research uncovers how solution providers translate complex sourcing challenges into tangible technological solutions. This is essential to understand which technological features and mechanisms are used to support complexity reduction in areas such as visibility, risk management and decision support.

The TOE framework is essential to structure the external factors that influence the technological design and the way solutions are positioned in the market. These include regulatory requirements, supply chain risks and sustainability demand. The TOE framework ensures that both the technological capabilities and the broader organisational and environmental pressures are systematically considered when analysing how solution providers address complexity in global sourcing.

This combination is widely supported in literature. Na et al. (2022, p. 13) applied a TAM–TOE model to analyse how AI technologies are positioned and adopted in organisations. Their research shows that TOE can replace the external variables in TAM and that TAM can be applied at the organisational level when technology decisions are driven by broader company considerations. Qin et al. (2020, p. 274) confirmed that organisational-level decisions, can be effectively analysed with TAM–TOE models because these models capture how technology solutions are positioned to address industry-wide challenges. Jo and Bang (2023, pp. 9-10) further demonstrated that TAM and TOE can be integrated to study how companies evaluate long-term technological value and system usability at the organisational level, particularly in relation to complex implementation contexts.

These studies show that the combined TAM–TOE model is a valid method not only for adoption studies, but also to analyse how technologies are perceived, evaluated and positioned as solutions to complex business challenges. In this research, the solution providers provide that perspective by explaining how their technologies are designed to reduce complexity in global sourcing. This approach ensures that the research focuses on the mechanisms by which technologies can address sourcing problems, not on whether they are adopted or not.

The combined model in this study replaces the external variables in TAM with the TOE dimensions: technology, organisation, and environment. The TAM variables 'Additional Belief Factors' and 'Factors from Related Models' are excluded.

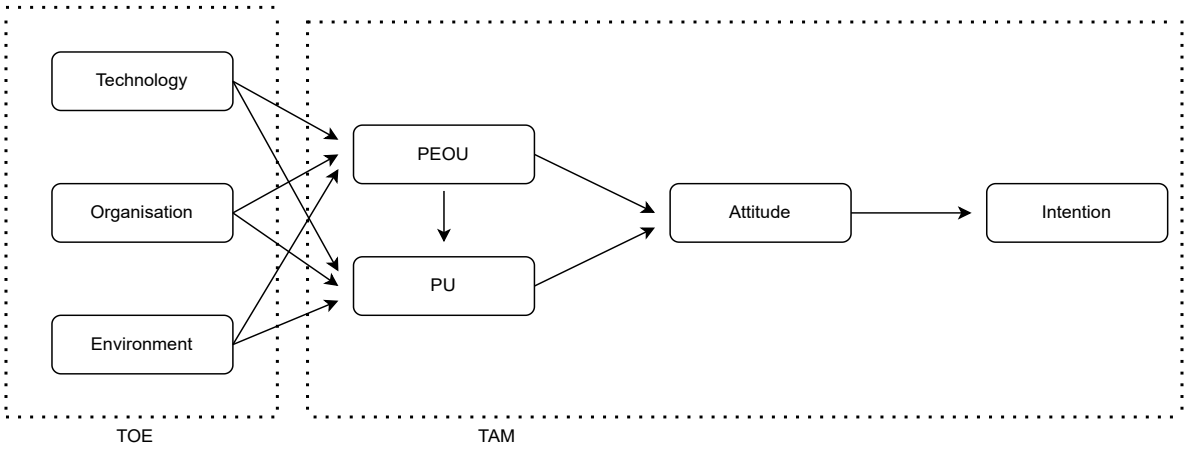

Figure 4: TOE + TAM

The final framework will be tested through semi-structured interviews with technology and software providers. Each variable serves as a theme in the interviews and is operationalised through specific items (see Appendix I). This model provides a complete view of both the internal characteristics of the technology and the external pressures that shape how technologies are designed and positioned as solutions to sourcing complexities. It is therefore the most appropriate approach to answer the research question.

3. Research Design and Methodology

3.1 Research Design: Expert interviews to explore technological solutions in sourcing

This research uses expert interviews to explore how technologies contribute to reducing complexity in global sourcing processes. The central focus is on understanding which technological features and mechanisms help organisations manage sourcing complexities, such as regulatory compliance, supply chain visibility, and risk resilience.

Solution providers were selected as interview partners because they have detailed knowledge of the design, functionality, and practical application of their technologies across multiple customer environments. This makes them a valuable source for understanding how their solutions are used to address sourcing challenges in practice. A solution provider may have insight into usage patterns and functional feedback across dozens or even hundreds of client organisations, which is not feasible to capture through individual user interviews. In addition, this research is not focused on measuring individual adoption behaviour, but rather on understanding how technologies function in practice. Specifically, how they reduce complexity, how useful they are perceived to be, and how easy they are to implement and operate. This aligns with the objective of this research, which is to explore how technological solutions help organisations mitigate complexity in global sourcing. Not to analyse adoption behaviour at the individual level.

This scope originated from a broader exploratory project in which multiple researchers focused on different actors in global sourcing. While others examined buyers or suppliers, this study focused on technology solution providers, based on both analytical relevance and data access.

Each sub-research question in this study is answered using a specific methodological approach. Sub-question 1 “What are the challenges and complexities faced in global sourcing activities?” is addressed through a literature review, structured around the ABCDE visibility framework by Kalaiarasan et al. (2022). Sub-question 2 “What technologies are currently available to mitigate the complexities of global sourcing?” is answered through empirical data from interviews with twelve solution providers. The focus lies on the technologies represented in the sample, not on a comprehensive list of all possible technologies. This approach ensures that the analysis remains closely aligned with the empirical scope of the study and avoids speculation about technologies that were not directly investigated. Sub-question 3 “How do technological solutions impact decision-making and outcomes in global sourcing activities?” is also addressed based on the interviews, by analysing how the studied technologies support various sourcing decisions.

The study deliberately focuses on solution providers as the unit of analysis. This is a conscious and practical choice. Due to time constraints and the unique opportunity to collect data at the DPW 2024 event, it was not feasible to also include buyers or end-users in this research. Additionally, this research is not aimed at individual user adoption behaviour but at

understanding which technological features reduce complexity in sourcing processes at an organisational level.

The potential bias of using only solution providers is fully acknowledged. All TAM variables in this study, including PU, PEOU, attitude towards using, and intention to use, are entirely based on the supplier perspective. These variables reflect how solution providers expect their technologies to reduce complexity and be experienced by customers. However, they do not capture actual buyer experiences or user behaviour. Especially for attitude and intention to use, solution providers can only make assumptions based on their customer interactions. Additionally, evaluations of usefulness and ease of use may be subject to commercial bias.

Nevertheless, this supplier-focused approach is academically acceptable when carefully bounded. Roh, Whipple, and Boyer (2013, p. 12) show that supplier-based studies can deliver valid results if the analysis remains within the supplier's domain and does not attempt to represent the buyer's internal decision-making. Hüttinger, Schiele, and Schröer (2014, pp. 712-713) confirm that suppliers can provide reliable insights into technological functionality and complexity-reduction mechanisms, especially when based on experience across multiple customer organisations.

This study adopts that supplier perspective consciously and transparently. Solution providers are well-positioned to explain how their technologies are designed to reduce global sourcing complexity, and which features specifically address sourcing challenges. This information is crucial to answering the research question.

As already indicated, the limitations of this approach are discussed in Section 5.1, where the TOE–TAM model is revisited to assess which, elements are well-covered by the supplier perspective and which aspects require further validation in future research. To support this assessment, the visualisation below clarifies which theoretical relationships are empirically grounded in the supplier-based data and which are not.

Figure 5 shows the relationships between the TOE and TAM constructs, using different arrow colours to reflect the level of empirical support: green arrows indicate support across multiple cases, orange arrows reflect partial or case-dependent support, and red arrows denote theoretical relationships that were not supported by the interview data. This figure does not intend to

challenge the original model but rather makes transparent which elements are empirically supported by data in this specific study.

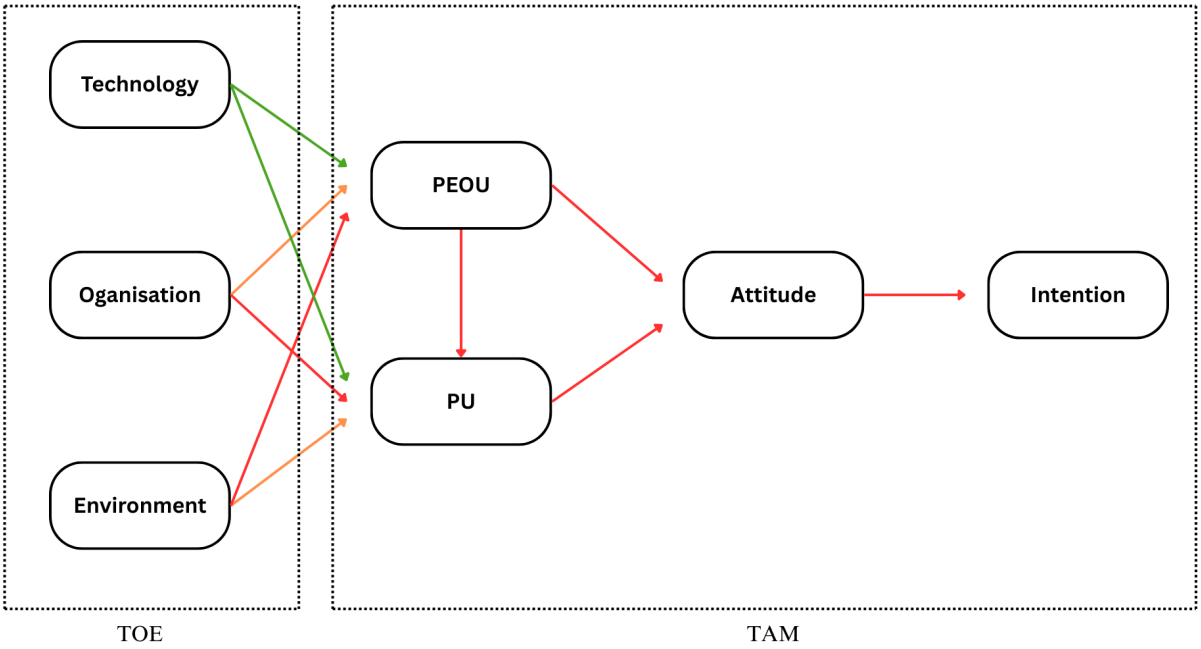

Figure 5: TOE + TAM: Empirical Findings

Table 2: Empirical support of the relationships

Relationship	Empirical Support	Explanation
Technology → Perceived Ease of Use	Yes	Supported by multiple cases.
Technology → Perceived Usefulness	Yes	Supported by multiple cases.
Organisation → Perceived Ease of Use	Yes/No	Supported by multiple cases.
Organisation → Perceived Usefulness	No	Discussed, but no evidence found.
Environmental → Perceived Ease of Use	No	Discussed, but no evidence found.
Environmental → Perceived Usefulness	Yes/No	Supported, though possibly spurious.
Perceived Ease of Use → Perceived Usefulness	No	Mentioned by providers; not directly tested.

Perceived Ease of Use → Attitude Towards Using	No	Based on indirect supplier observations.
Perceived Usefulness → Attitude Towards Using	No	Based on indirect supplier observations.
Attitude Towards Using → Intention to Use	No	Based on indirect supplier observations.

3.2 Data collection: Semi-structured interviews guided by TOE & TAM models

As each technology differs in use and purpose, several technology providers were interviewed. This provides a comprehensive insight of how different types of technologies counter the increasing complexity of global sourcing. The interview reflects the technology features and give insights why and when a technology is implemented by a company. The interviews are conducted using a semi-structured questionnaire, which allows for a flexible yet focused approach. There is a predetermined set of key questions that are formulated using the variables of the TOE and TAM framework. The questions in the interview are open-ended to facilitate the introduction and exploration of new concepts. Below you will find the table with the main questions of the questionnaire. Appendix II contains the full interview guide.

Table 3: Main Questions Interview

Theme	Question
Technology	*Could you please describe the technology your company offers?*
Organisation	*What does the organisation look like?*
Environmental	*Does the technology help compliance with global regulations, such as Corporate Sustainability Due Diligence Directive (CSDDD)?*
Perceived Usefulness	*How do your customers see the perceived usefulness of the technology in global sourcing?*
Perceived Ease of Use	*What is the perceived ease of use for your customers to implement and use the technology?*
Attitude Towards Using Technology	*What is the overall attitude of customers towards the technology?*
Intention to Use	*What is the primary intention for customers of implementing and using the technology?*

3.3 Sample overview: Technology providers

A major part of the sample was collected during the DPW 2024 exhibition in Amsterdam, an international tech event focused on digital innovations in procurement and supply chain management. This event brings together many different technology suppliers, startups and industry leaders, offering a suitable setting to approach relevant companies for this research.[107]

[107] See DPW (2024)

In addition, several interviews were arranged through the Business Days Twente 2025, a career fair which was led through the University of Twente that attracts companies from different sectors.[108] Another source of inspiration and identification for new contacts was Linq'24, an event organised by Spendlinq, which focuses on the digital transformation of Source-to-Pay processes.[109] Since many of the technologies presented at DPW and Linq'24 are positioned for use in international procurement settings, the solutions and insights gathered are directly relevant for global sourcing contexts. The sample consists of a varied group of technology providers, differing in size, location, and area of expertise. This variation ensures that the findings reflect a broad range of perspectives on sourcing complexity and technological solutions. The aim of this research is not statistical representativeness, but to gain in-depth insight into how different technologies help address specific challenges in global sourcing. Where possible, the interview data was supported by secondary sources such as websites or product documentation to strengthen the reliability of the findings. The table below gives an overview to the sample used for the data.

Table 4: Sample Data

Case	Core Expertise	Job Title of Interviewee	Duration (in min)
Case 1	Risk Management Software	-	16:04
Case 2	Procurement Data Management	-	21:20
Case 3	ESG Sustainability Scoring	Senior Account Executive	7:25
Case 4	Procurement Outsourcing Solutions	VP Procurement Solutions	2:54
Case 5	News and Risk Monitoring	Customer Success	8:30
Case 6	Supply Chain Risk Monitoring	Business Development Manager	20:59
Case 7	Contract Lifecycle Management	Sales Director	26:06
Case 8	AI for Procurement and Master Data	Founder & Marketing Manager	40:34
Case 9	B2B Marketplace	Sales Manager	35:14
Case 10	Advanced Analytics & Supply Chain Optimisation	Senior Business Consultant & Project Manager	49:03
Case 11	Smart Supply chain Technology & RFID Solutions	New Business Developer	30:21
Case 12	Source-to-pay provider	Sales Director, Benelux	59:09

3.4 Data analysis: A hybrid coding approach based on TOE & TAM

All interviews were recorded using either a mobile device or the recording function within Microsoft Teams, Permission was sought from the participants of all interviews. Recordings were transcribed verbatim, and interviews in Dutch were translated into English where

[108] See BusinessDaysTwente (2025)
[109] See Linq'24 (2025)

necessary. Analysis of the transcripts was performed with Atlas.TI, based on a hybrid coding approach combining both deductive and inductive methods.

Initially, the analysis followed a deductive approach by applying a predefined coding framework derived from the variables from the TOE and TAM models. This deductive coding process, also known as 'protocol coding', involved creating code groups for each main theme (e.g. perceived usefulness, technology, intention to use). Each group contained specific items (codes) that made the themes measurable. The full list of these themes and their associated codes is provided in Appendix I.[110]

During the coding process, several new insights emerged from the data itself, which led to the addition of inductive codes within the existing items (codes). This reflects a hybrid approach, as discussed by Huberman (2014, p. 86), who note that qualitative data analysis often starts from a structured theoretical framework but must remain open and responsive to new patterns and insights emerging directly from the empirical data.[111] To improve data validity, the results were systematically checked against secondary data where available, such as company websites, product documentation, and public reports. Where secondary confirmation was possible, this has been explicitly marked in the TOE and TAM result tables presented in Appendix III.

A cross-case analysis was then conducted to identify patterns and variations between cases, allowing comparison of similar variables under different conditions. In this study, each case refers to a single interviewed solution provider and the technological solution they offer. Maintaining a consistent structure of code groups and items ensured comparability between cases. This structured yet flexible approach improves both the rigor and the depth of the analysis. An overview of the themes (variables) and their measurable items (codes) can be found in Appendix I.

The identification and structuring of sourcing complexities in this study, which addresses sub-question 1, are based on existing literature and guided by the ABCDE visibility model by Kalaiarasan et al. (2022). The model provided a systematic overview of key supply chain

[110] See Huberman (2014, p. 83)
[111] See Huberman (2014, p. 86)

visibility challenges, which served as the starting point for this study. To provide additional analytical clarity, this research distinguishes between physical and informational visibility as two main categories to classify these complexities. The complexities were used as a theoretical lens to frame the overall analysis.

The technology clusters analysed in this study are based on the technologies represented by the interviewed solution providers. The interviews provided detailed insights into the core functionalities and application areas of each technology, which formed the basis for categorising the technological solutions into distinct clusters. It is acknowledged that other technology types, such as blockchain-based solutions, may also play a role in enhancing supply chain visibility. However, these were not included in this research as they were not represented in the sample. This selection reflects the scope and limitations of the available data and ensures that the analysis remains closely aligned with the technologies directly discussed by the participants.

4. Results: Empirical findings on the role of technology in reducing complexity and supporting decision-making in global sourcing.

4.1 Results of the TOE framework

Before presenting the table, a brief clarification of each variable is provided to guide interpretation.

- *Technology* refers to the functionalities, integration level and complexity of the solution. A pattern of modularity, AI usage and ERP/API integration is observed.
- *Organisation* refers to internal requirements such as team involvement or project management capacity. While some tools are tailored to large enterprises or specific sectors, others require minimal internal resources.
- *Environmental* describes external drivers such as regulations (e.g. CSDDD), ESG expectations, or market pressure. These factors shape technological features, with many tools including ESG or compliance functionalities in response.

Table 4 presents a reduced summary of the key technological, organisational, and environmental characteristics of the twelve solution providers that were interviewed and analysed. This reduced version includes only the most prominent and recurring aspects identified across the cases, based on the TOE framework. Where necessary, results have been

validated with secondary data, which is referenced in the complete and detailed table. Some cells remain empty due to missing information. The full version is available in Appendix III.

Table 5: Overview: Resuls TOE framework

Case number	Technology	Organisation	Environmental
Case 1	- AI-based risk analysis - NLP - Real-time risk analysis - SaaS/on-premises - ERP integration	- Defined risk policies - Internal risk appetite understanding	- Compliance CSDDD - Configurable ESG risk assessments - Monitoring of regulatory developments - Increasing market demand for compliance solutions
Case 2	- AI-based risk and ESG intelligence - Supplier risk analysis - ESG assessment and reporting - Supplier data consolidation - Customisable risk models - ERP integration	- Procurement team - ESG team	- Tracking product-level environmental data - Enables suppliers to document sustainability impact - Aligns with regulatory requirements
Case 3	- AI-based sustainability performance assessment - Automated compliance and ESG risk tracking - REST API Integration	- Sustainability program manager	- ESG compliance - Regulatory monitoring
Case 4	- AI-based risk monitoring and disruption detection - Dashboard-based monitoring - Social media & public data analysis - Automated risk classification - Early warning system		- Supports compliance with regulatory requirements - Contributes to enhanced supply chain resilience
Case 5	- AI-based risk intelligence - NLP & LLMs-based data extraction - Real-time risk insights - Dashboard & API integration	- Large enterprises - No specialist knowledge required	- Tracks regulatory & compliance developments - Adapts to evolving regulations
Case 6	- AI-based supplier risk monitoring and visibility - Real-time supplier tracking & early warnings - Tier 2 & Tier 3 visibility extension	- Large enterprises - Complex supply chains - Supplier data contact person	- Supports monitoring of compliance risks - Contributes to ESG-related due diligence

	- REST API integration		
Case 7	- AI-based Contract Lifecycle Management (CLM) - AI-based contract creation and compliance tracking - Contract analysis and obligation management - open API integration	- Project teams - Contract structure knowledge	- Aligns contracts with sustainability & compliance requirements - Enables contract structuring for ESG regulations - Adapts to evolving legal & competitive market trends
Case 8	- AI-based procurement data optimisation - Data classification and cleansing - ERP integration - Structuring unstructured data	- Large multinationals (€5B+ turnover) - Manufacturing companies, - Financial & service industries excluded	- Indirect sustainability impact (optimises inventory) - Market & competitor monitoring to drive innovation
Case 9	- B2B E-procurement marketplace - API & EDI integration - Automated purchasing & invoicing - Algorithm-driven supplier selection - Supplier & product screening	- SMEs, large enterprises - No specialist knowledge required (web-only users)	- Compliance with EU sustainability regulations - Carbon footprint tracking - Member of UN Global Compact & Sustainable Procurement Initiative
Case 10	- Scenario-based supply chain planning and optimisation - Mathematical modelling & simulations - Digital twin & scenario analysis - Technology-agnostic approach, selected per client needs - ERP & risk system integration - Human oversight remains crucial	- Project teams - Knowledge of internal processes and data structures	- Compliance with international standards (ISO, client-specific regulations) - Data security best practices, client data remains within managed environments - Technology choices influenced by market trends & vendor preferences - Supports supply chain transparency & ESG compliance - Facilitates ESG integration but does not enforce sustainability policies

Case 11	- RFID-based item-level traceability - Item-level identification - Real-time tracking	- Dedicated project teams - RFID knowledge - Large fashion brands	- Increased urgency for visibility post-COVID-19 - Depressed RFID tag prices improve affordability - Supports compliance by verifying shipments and preventing contract violations
Case 12	- Source-to-Pay (S2P) platform - Tender management & supplier pre-screening - Risk & compliance tracking - Eco-spend analysis - Supplier performance management	- Licensing model - Cooperation Finance & - Procurement team - Understanding of internal end-to-end processes	- Supports CSDDD & CSRD compliance - Tracks spend-based emissions - Enhances transparency in sustainability reporting

4.2 Results of the TAM model

Before presenting the table, a short clarification of each TAM variable is provided to guide interpretation.

- *Perceived Usefulness* describes how the technology helps users reduce complexity, often by improving transparency, risk resilience or decision-making.
- *Perceived Ease of Use* refers to the implementation time, user-friendliness, and technical barriers. Integration with ERP or API is a common factor.
- *Attitude Towards Using* reflects how users' perceptions evolve, often following a pattern of early enthusiasm followed by adjustment.
- *Intention to Use* is linked to specific sourcing challenges such as compliance, risk management, or supplier visibility.

The following table presents a reduced summary of the key findings for each case study according to the TAM framework. Perceived usefulness, perceived ease of use, attitude towards using, and intention to use are shown for all twelve solution providers. This reduced version highlights the most prominent and recurring aspects identified across the cases. As with the TOE table, the full version with additional details is available in Appendix III. Some cells remain empty due to insufficient information from the interviews. In addition, several entries have been validated with secondary data, which is referenced in the complete and detailed table.

Table 6: Overview: Results TAM Model

Case number	Perceived usefulness	Perceived Ease of Use	Attitude Towards Using	Intention to use
Case 1	- Improved Efficiency - Enhances risk resilience - Improves decision-making - enhances transparency	- Intuitive interface - Implementation time: rapid - Bulk supplier upload - Customisable dashboard - Low-maintenance and minimal fault sensitivity - API-based integration - ERP integration		- Risk management - Regulatory compliance - Supply chain transparency
Case 2	- Improves decision-making in procurement - Automates risk alerts & supplier evaluations - Enhances transparency & real-time visibility - Optimises procurement strategy & sustainability tracking - Reduces administrative workload	- Intuitive interface - Implementation time: rapid - Customisable alerts for supplier compliance - API-based integration - ERP integration increases complexity		- Reduce procurement complexity - Automate risk management & supplier evaluations - Enhance sustainability compliance & decision-making
Case 3	- Enhances sustainability-driven procurement decisions - Improves transparency, traceability & operational efficiency - Supports supplier risk evaluation & continuous monitoring	- Cloud-based intuitive interface - Implementation time: few months (depending on complexity) - REST API integration - User-friendly, but non-technical users may need training		- Supplier pre-selection & sustainability compliance - Strategic procurement & risk management support

Case 4	- Enhances risk resilience - Supports preventive decision-making	- Intuitive dashboard interface - Implementation time: rapid deployment & easy adoption - API-based integration - Minimal setup effort required		- Early risk detection in supply chains - Efficient inventory & supplier communication
Case 5	- Enhances risk visibility & decision-making - Filters noise & delivers critical insights - Improves transparency & compliance tracking	- Intuitive interface - Implementation time: rapid - Custom alerts & email notifications - API-based integration - Minimal training required		- Regulatory risk monitoring - Compliance tracking
Case 6	- Enhances risk visibility & proactive decision-making - Automates compliance & supplier risk management - Reduces manual monitoring efforts	- Intuitive interface - Implementation time: 4–8 weeks - REST API integration - AI filters risk alerts, reducing manual effort - Requires initial guidance for effective adoption	- Requires initial guidance for users - Adoption improves after product training	- Regulatory compliance - Automated supply chain risk monitoring - Reduction of manual compliance workload
Case 7	- Automates contract processes - enchances transparency & efficiency in procurement - Reduces complexity & enhances risk management - Reduces complexity & enhances risk management	- Cloud-based intuitive interface - Implementation time: 3 months - Open API integration (standard integrations with ERP/CRM systems) - Requires configuration & training depending on organisational needs	- Generally positive due to configurability & continuous improvement - Low churn rate, 20-30% annual growth	- Contract management & compliance - Contract standardisation - Process automation for efficiency & risk reduction

		- Generative AI reduces training efforts over time		
Case 8	- Improves procurement decisions & data visibility - Reduces duplicate entries & optimises inventory - Enhances categorisation & sourcing efficiency	- User-friendly AI platform - Implementation time: 4–6 months - ERP integration - Human-in-the-loop validation required - Requires training for effective adoption	- Adoption curve follows Gartner Hype Cycle - Initial enthusiasm → adjustment period → realistic expectations	- Data foundation for reducing complexity - Visibility, transparency & compliance - Optimisation of procurement strategies & elimination of redundancies
Case 9	- Streamlines procurement & supplier management - Enhances transparency & compliance - Reduces administrative overhead - Supports sustainability reporting	- Web-based intuitive marketplace interface - Implementation time: 6–12 weeks (depending on customisation) - API and EDI integration - ERP/EDI integration increases complexity	- Generally positive	- Reduce Maverick procurement - Simplify invoicing & supplier management - Support sustainability KPIs & compliance
Case 10	- Improves decision-making in supply chain management - Enhances transparency, efficiency & risk mitigation - Supports cost reduction & operational efficiency - Facilitates data-driven decision-making	- Interface usability varies by user role (technical users vs. business users) - Implementation time: weeks to years (depending on project size) - ERP & risk management system integration depends on IT infrastructure - Data often requires manual review	- Increasingly positive attitude across all organisational levels - Employees recognise efficiency gains & process improvements - Change resistance remains a factor, but adoption is rising - Successful adoption depends on clear communication & integration - Continuous feedback loops	- Primarily adopted to enhance decision-making - Optimises supply chains & improves operational efficiency

			optimise solutions over time	
Case 11	- Improves supply chain visibility & traceability - Enables real-time product identification - Enhances decision-making through improved data	- Intuitive dashboard interface - Implementation is complex and time-intensive - Requires dedicated project teams and expertise - High entry barriers (calibration of tags and multi-factory implementations)	- Generally positive attitude - Scepticism in cases of previous negative implementation experiences	- Intended for improving product verification - Aims to enhance supply chain integrity and prevent costly errors
Case 12	- Enhances sourcing transparency & compliance - Supports risk monitoring and supplier qualification - Prevents Maverick Buying	- Modular, user-configurable apps - Implementation time: quick deployment depending on system landscape - Central dashboard for sourcing, contracts, invoicing - ERP integration possible		- Drive compliance improvement - Consolidate procurement processes - Risk management (grey market, product quality verification)

4.3 Empirical findings per TOE–TAM variable

Technology

The technologies examined in this study serve different purposes within global sourcing processes, including risk assessment, data structuring, contract management, ESG analysis and process optimisation. Many of these tools are modular and designed for integration with existing ERP or procurement systems. This interoperability proves essential for smooth implementation. Despite this shared focus on integration, the level of complexity varies considerably. Some solutions can be implemented with minimal configuration and technical expertise, while others require extensive onboarding, data preparation or internal coordination. These differences are partly due to the degree of technology use.

Organisation

The organisational fit varies across technologies. Some solutions are designed for large enterprises or companies with complex supply chains, while others can be used by SMEs. Several technologies require the involvement of procurement, finance, or ESG teams. In some

cases, buyer organisations must establish project teams or appoint dedicated contacts for supplier data management. Web-based solutions generally require fewer internal resources and can be used without specialist knowledge. Certain technologies specifically target manufacturing or fashion companies, while others are broadly applicable across industries.

Environmental

In this study, environmental variables are understood as external pressures that shape the way technologies are developed and positioned. These external drivers directly influence which features are prioritised in the design and development of these technologies. Solution providers increasingly aim to support compliance with sustainability regulations such as CSDDD, CSRD, or national frameworks. Most tools include ESG-related features, like risk scoring, emissions tracking, or supplier screening, to help customers meet reporting or due diligence requirements. These functions typically provide structured data and dashboards, but do not enforce compliance. Interpretation and follow-up remain the customer's responsibility. Several providers actively monitor legal developments and integrate third-party ESG data sources to keep their solutions up to date with regulatory demands. Solution providers indicated that their technologies are designed to support regulatory compliance with frameworks. They emphasised that ESG-related features are an important part of their offering to meet these external requirements.

Perceived Usefulness

Technologies are generally seen as valuable tools to manage different types of complexity in global sourcing. Depending on the situation, these include regulatory uncertainty, fragmented supplier data or limited visibility of risks. Solutions aim to address these issues by consolidating data, automating monitoring and highlighting ESG or compliance risks. This often improves transparency and helps with the decision-making process, enabling faster and more confident action.

Perceived Ease of Use

Most technologies are designed with user accessibility in mind and often offer intuitive dashboards, low technical barriers and ERP/API integration capabilities. For many users, this means that the tools can be used without requiring in-depth technical knowledge. However, ease of use often depends on the complexity of the existing IT landscape and procurement processes. While basic functions can be implemented quickly, deeper system integration or

advanced configuration may still require a lot of time, resources or internal tuning. In some cases, customers appoint a dedicated specialist or receive structured onboarding and training support from the solution provider.

Attitude Towards Using

User attitudes toward sourcing technologies among end users in client organisations tend to develop over time. In several cases, an initial phase of enthusiasm is followed by more critical reflection, particularly when early expectations are too high. This resembles the familiar adoption curve, where practical limitations of the tool become clearer after initial deployment. Long-term engagement improves when users are properly onboarded and know what to expect from the technology. Transparent communication about its scope and limitations helps prevent disappointment. In environments where procurement tools are structurally embedded and supported by feedback loops, attitudes stabilise and often become more positive over time.

Intention to Use

Companies choose technologies based on the specific challenges they want to solve. Sometimes the focus is on complying with ESG or CSDDD, other times it is about improving supplier visibility, managing risk or making procurement more efficient. The intention behind the use of a tool often reflects the type of complexity a company faces. This means that technologies are used not just because of their functions, but because they help address a specific complexity in the sourcing process.

4.4 Global sourcing complexity arises from regulatory demands, limited visibility, supplier selection challenges, and internal data inefficiencies

The table below summarises the main sources of complexity in global sourcing as derived from the ABCDE visibility model. For each complexity, it indicates which cases are involved and which technological solutions are provided by the solution providers.

Table 7: Complexities in Global Sourcing

Complexity	Solution Provided	Involved Cases
Compliance regulations (CSDDD, ESG, Carbon footprint, Legal compliance)	*Automates compliance tracking, ensures audit-ready ESG reports, standardises legal compliance processes, and supports structured tendering based on regulatory requirements.*	*2, 3,6, 7, 9, 12*

Limited multi-tier visibility	*Extends visibility to Tier 2 & Tier 3 suppliers, provides automated monitoring, real-time tracking of supplier risks. RFID contributes Item-level visibility.*	*4, 5, 6, 8, 9, 10, 11*
Supply chain disruptions (Risk resilience)	*Uses AI-driven risk detection, predictive analytics for disruptions, early warning systems for supply chain instability. RFID can assist in tracing deviations and logistics issues.*	*1, 2, 3, 4, 5, 6, 10, 11*
Difficult to choose between the many suppliers worldwide (Risk resilience, Policies, Contracts, Standardisation)	*Provides automated supplier evaluation, contract standardisation, risk policies integration, supplier benchmarking.*	*2, 3, 5, 7, 9, 12*
Procurement and Inventory Management inefficiencies	*Enhances data accuracy in procurement, optimises warehouse stock, reduces redundant purchasing. RFID is able to see bottlenecks on item-level.*	*2, 8, 9, 10, 11*
Maverick Buying	*Consolidates purchasing on a centralised platform, prevents unauthorised supplier engagement, and restricts sourcing actions through role-based user permissions.*	*9, 12*
Master data Issues in procurement	*Automates and structures procurement data, reduces inconsistencies, ensures data accuracy in sourcing decisions.*	*8, 10*

This section focuses on the main complexities companies encounter in global sourcing. The findings are based on insights from 12 interviews with solution providers, who reflected on the challenges their technologies aim to address. Table 6 summarises the key complexity categories, related technologies, and technological responses.

What is being observed is the difficulty of complying with sustainability and due diligence regulations, such as the CSDDD and ESG reporting obligations. Without technological support, many organisations struggle to achieve sufficient transparency, particularly when sustainability or origin data is lacking or fragmented. For instance, estimating the carbon footprint of a supplier or validating compliance across tiers becomes highly challenging without automated data collection. In addition, many companies find it unclear what exactly will be expected of

them in the near future, as these regulations are still evolving and often perceived as vague. This uncertainty further complicates efforts to align internal processes with external compliance requirements.

Another common issue is the limited multi-tier visibility and traceability within supply chains. This goes beyond Tier 1 suppliers; visibility into Tier 2 and Tier 3 partners is often missing. As a result, risk management tends to be reactive rather than proactive, especially in cases of quality issues, delays, or disruptions. Organisations emphasise the need for better insights to allow timely interventions and improve overall resilience.

Moreover, selecting the right suppliers is not always straightforward. Companies often face a multitude of supplier options, each with different contract terms, risk levels, and compliance statuses. This variation complicates benchmarking, standardisation, and strategic sourcing decisions.

Finally, internal inefficiencies were highlighted. These include misalignment between procurement and inventory operations, as well as inconsistent or poor-quality procurement data, and difficulties in controlling unauthorised purchasing activities (maverick buying)**.** When master data is incomplete or outdated, it limits the reliability of procurement planning and decision-making.

These complexities illustrate that most sourcing challenges are fundamentally visibility issues, whether related to regulatory compliance, multi-tier supplier tracking, supplier evaluation, or internal data inefficiencies. The interviews confirm that global sourcing solutions are specifically designed to reduce these complexities by enhancing informational and physical visibility across global supply networks.

4.5 Global sourcing technologies reduce complexity by addressing risk, compliance, data quality, and supply chain visibility through targeted digital solutions

The technology clusters presented in Table 7 are the result of an inductive, case-based categorisation. After coding the individual technologies described in each interview, the tools were grouped based on their primary function in reducing sourcing complexity, as perceived

by solution providers. This categorisation reflects how digital tools operate in practice to manage supply chain visibility challenges within global sourcing.

Importantly, these clusters are exclusively based on the technologies represented in the twelve cases included in this study. The table does not aim to provide a comprehensive classification of all existing sourcing technologies, but rather an overview of those tools that were empirically observed during the interviews.

The purpose of this classification is not to offer a universal taxonomy, but to identify the dominant mechanisms through which digital tools contribute to complexity reduction. The clusters should be understood as functional categories grounded in empirical observations, not as generalisable or exhaustive groupings. Future research could test and refine these categories across broader datasets.

Table 8: Technologies Based on the Cases

Technology Cluster	Complexity Reduction	Cases
AI-based Risk Intelligence	*Enhances transparency and supplier visibility, enables real-time risk alerts and monitoring, and reduces uncertainty in global sourcing. (Helps also with compliance)*	*1, 2, 4, 5, 6*
ESG Performance & Compliance tools	*Provides standardised ESG ratings, automates compliance tracking, and delivers audit-ready reports for supplier assessment.*	*3*
Contract Lifecycle Management (CLM) Tool	*Automates contract creation and management, ensures compliance across jurisdictions, and reduces legal complexity in global sourcing.*	*7*
AI-based Procurement Data Optimisation Tools	*Uses AI to structure and cleanse procurement data, eliminate duplicates, and improve sourcing accuracy and decision-making through enhanced data quality.*	*8*
Algorithmic Supplier Selection & Marketplace Tools (B2B-marketplace)	*Prevents Maverick Buying through algorithm-driven supplier matching, compliance checks, and centralised purchasing.*	*9, 12*
Scenario-based Supply Chain Planning Tools	*Enhances decision-making through data-driven scenario planning, simulation, and improved visibility into supply chain dynamics.*	*10*
RFID-Based solutions	*Enables item-level visibility and tracking, improving traceability and transparency in global supply chains; application value depends on industry context.*	*11*

AI-based risk intelligence tools were most common across the cases. Companies such as case 2, use combinations of artificial intelligence, big data and NLP to monitor supplier risks, provide real-time alerts, and support compliance reporting. These tools help reduce uncertainty by improving transparency and enabling early risk detection. By making supplier risks and compliance issues more visible in real time, these tools enable companies to proactively manage supplier-related complexity in dynamic and extended supply networks.

Standardised ESG scoring platforms, such as case 3, use AI and big data to automate compliance tracking and generate audit-ready reports. These systems reduce complexity by translating diverse ESG inputs into comparable metrics for supplier assessment. This allows companies to manage the complexity of evolving ESG requirements across diverse supplier networks in a more structured and auditable way

Contract Lifecycle Management (CLM) tools, such as case 7, address legal complexity in global sourcing by automating the creation, approval and management of contracts. These tools standardise contractual language and workflows, facilitating consistent enforcement and simplifying compliance with different legal requirements in different jurisdictions. CLM systems reduce manual workload and ensure regulatory alignment, allowing companies to manage their contractual obligations more effectively globally. As such, these tools help organisations manage the legal and contractual complexity inherent in global sourcing operations.

AI-based procurement data optimisation tools, such as those offered by case 8, focus on improving the quality and usability of procurement data. Through AI-driven classification and cleansing, they eliminate duplicate records, harmonise terminology across systems, and enhance data accuracy enabling more effective spend analysis, supplier comparison, and sourcing decisions. This contributes to reducing internal sourcing complexity by ensuring that procurement decisions are based on consistent, reliable, and high-quality data.

Marketplace and e-procurement platforms, such as case 9, reduce sourcing complexity through algorithm-driven supplier matching and purchasing standardisation. These technologies help organisations prevent Maverick Buying and streamline decision-making. In doing so, they address the complexity of supplier selection and policy enforcement in large, decentralised sourcing environments.

Scenario-based supply chain planning tools, such as those from case 10, apply data-driven simulation to improve visibility and inform strategic sourcing decisions under uncertainty. This helps organisations manage supply chain complexity by supporting more informed and flexible sourcing decisions under dynamic and uncertain conditions.

RFID solutions, as used by case 11, offer item-level traceability and visibility across supply chains. These technologies address complexity by enabling granular tracking, although their effectiveness depends on sector-specific requirements and use cases. By enhancing traceability and supply chain visibility, RFID solutions support better management of sourcing complexity related to product origin, compliance, and multi-tier transparency.

4.5.1 Integrating sourcing complexities and digital technologies

This section integrates the sourcing complexities and the digital technologies analysed in this study. Figure 6 provides an overview of which technologies address which complexities, and shows whether these technologies primarily support physical visibility, informational visibility, or both. This visibility-based classification helps to systematically understand how technologies contribute to managing global sourcing complexity.

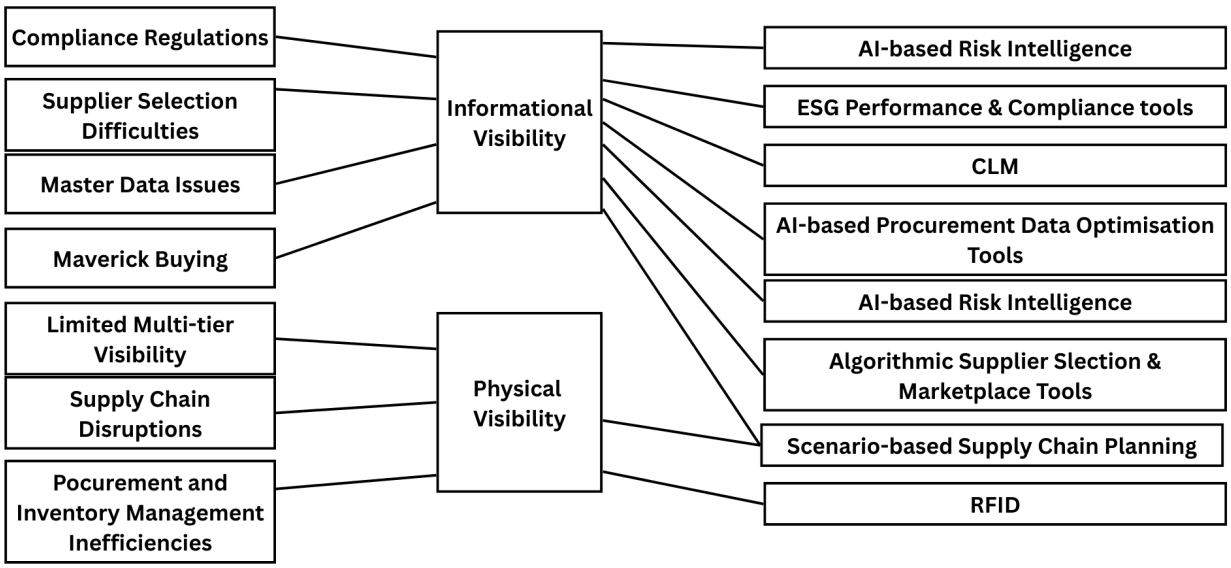

Figure 6: Integrating sourcing complexities and digital technologies

The results show that physical visibility challenges are addressed by RFID-based solutions and scenario-based supply chain planning tools. RFID enables real-time, item-level tracking, which allows companies to physically trace the movement of goods, monitor inventory positions, and

gain direct insight into supplier locations and flows. This is especially important for managing limited multi-tier visibility and effectively tracking supply chain disruptions. Scenario-based supply chain planning tools contribute to physical visibility by offering dynamic visualisations of stock levels, material flows, and potential bottlenecks. These tools help organisations not only track current operations but also anticipate supply chain dynamics under different scenarios.

In contrast, informational visibility challenges are addressed by technologies that primarily improve the quality, structure, and accessibility of procurement and supplier information. AI-based procurement data optimisation tools play an important role by cleansing and standardising procurement datasets, ensuring reliable and consistent decision-making input. Algorithmic supplier selection and marketplace tools improve informational visibility by consolidating supplier data and supporting structured, data-driven supplier selection processes. ESG performance and compliance tools provide standardised insights into supplier sustainability and compliance scores, which are essential for regulatory transparency. CLM tools also contribute by structuring and centralising contract information, offering better visibility over supplier agreements and procurement terms. Scenario-based supply chain planning tools bridge both visibility types by combining physical tracking capabilities with scenario-based informational insights that support data-driven decision-making.

4.6 Technological solutions enhance decision-making quality and speed in global sourcing by supporting risk, compliance, supplier selection, and planning.

Building on the visibility-based classification in the previous sections, Table 9 presents four key types of decision-making processes supported by the observed technologies. These categories were derived through inductive analysis of the case data and reflect the primary decision areas highlighted consistently by solution providers. Each category is directly linked to the specific sourcing complexities identified earlier, aligning the empirical findings with previous analyses. Each type is linked to a specific technology cluster and the form of visibility (informational, physical, or both) that these tools enhance.

The categories were established by identifying the common decision-making challenges providers aimed to resolve, as expressed during interviews. By grouping technologies based on their main functionality and contribution to supply chain visibility, four distinct decision-making clusters emerged (Table 9).

Table 9: Support Decision-Making Proces in Global Sourcing

Type of Decision-Making Supported by Technology	Technological Support	Visibility focus
Risk Identification & Preventive Action	***AI-based Risk Monitoring & Alert Systems:*** *Enables real-time alerts, supplier risk detection, and early warning mechanisms*	*Informational*
Compliance & ESG-related Decision-Making	***ESG Performance & Compliance Scoring Platforms*** *and* ***Contract Lifecycle Management (CLM) Tools:*** *Standardised ESG scores, automated compliance tracking, contract monitoring and alerts*	*Informational compliance, reduced monitoring workload*
Strategic Procurement & supplier Selection Decisions	***Algorithmic Supplier Selection & Marketplace Tools*** *and* ***AI-based Procurement Data Optimisation Tools:*** *Comparative supplier dashboards, carbon analytics, spend data classification*	*Informational*
Operational & Tactical Supply Chain Planning Decisions	***Scenario-based Supply Chain Planning Tools*** *and* ***RFID-based Solutions:*** *Simulation, inventory insights, item-level traceability*	*Both*

These four clusters underline how technological solutions concretely address informational and physical visibility challenges, contributing directly to improved decision-making quality and efficiency. Risk identification and preventive action solutions enhance proactive responses by providing timely and accurate risk information, aligning closely with the complexity of managing supply chain disruptions. Compliance and ESG-related decision-making technologies specifically target regulatory complexities by standardising reporting and automating compliance tracking.

Strategic supplier selection decisions benefit from improved data quality and structured supplier information, addressing challenges related to benchmarking and supplier diversity. Operational and tactical planning solutions uniquely bridge both informational and physical visibility, supporting decision-making through detailed simulations and precise item-level tracking, directly responding to inventory management complexities. Overall, these decision-making categories offer a structured, empirically grounded view of how digital technologies practically enable organisations to manage complexity in global sourcing. This analysis sets the stage for the theoretical and practical implications discussed in the following chapter.

5. Discussion: Managing global sourcing complexity through modular digital solutions and evolving procurement practices

This chapter interprets the empirical findings presented in Chapter 4 through the lens of the TOE–TAM model, which serves as the theoretical foundation of this study. By doing so, the chapter answers the central research question: *"How to mitigate the increasing complexity in global sourcing activities with the support of technology?"*. Section 5.1 discusses the findings in relation to the TOE–TAM model. Sections 5.2 and 5.3 then reflect on the broader theoretical and practical implications, based on the insights derived from this integrated framework.

5.1 Linking empirical findings to the integrated TOE–TAM model

Based on the model shown in Figure 5, the next section links the empirical findings to the relationships between the TOE and TAM variables.[112]

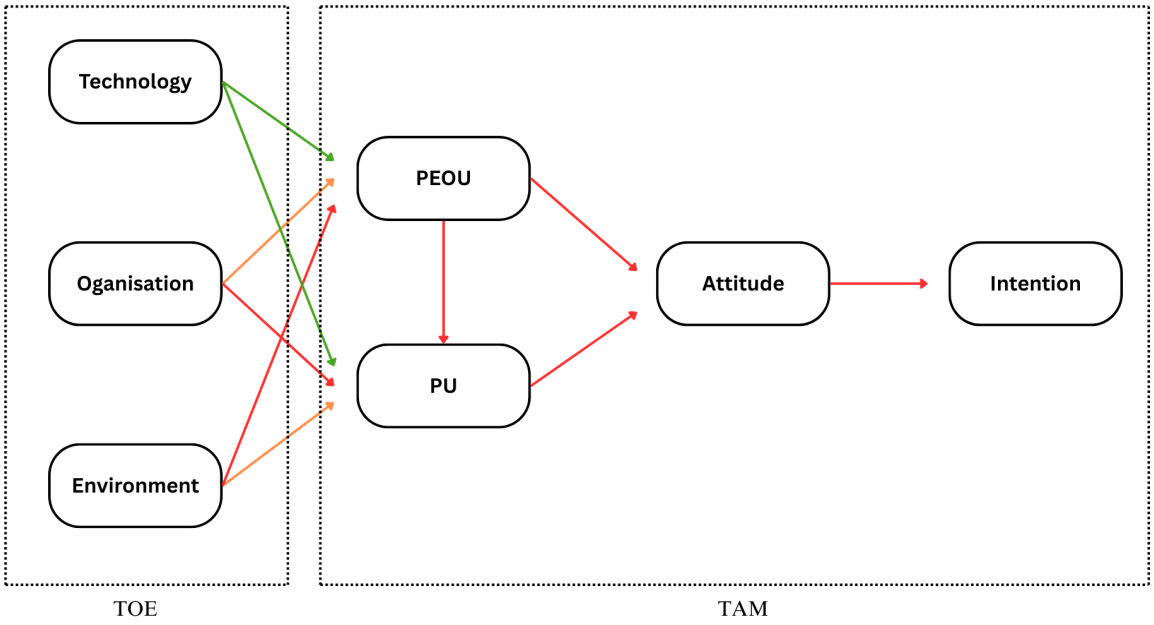

Figure 7: TOE + TAM Model

The empirical findings show that certain technology characteristics are clearly linked to the TAM constructs PU and PEOU, although the strength of these relationships varies. Interoperability and system complexity were consistently associated with PEOU, especially in cases where solutions offered intuitive dashboards, easy ERP integration, or required minimal configuration. These features reduced the effort needed to use the technology.

[112] See Marangunić and Granić (2015, p. 87); Na et al. (2022, pp. 4-6); Oliveira and Martins (2011, p. 112)

Modularity, in contrast, was primarily linked to PU. Several cases showed that companies benefit from tools that can be tailored to specific sourcing challenges, such as ESG reporting, risk scoring, or supplier onboarding. This modularity allows organisations to implement only what they need, thereby increasing the relevance and strategic value of the technology. In some cases, modular designs also supported PEOU, for example when features could be easily activated or deactivated by end-users without technical support. This indicates that modularity contributes primarily to PU but may also support PEOU depending on the implementation.

Organisational factors have a limited and context-dependent impact on PEOU. When technologies require project teams, procurement experts, or ESG specialists, organisational readiness can lower the barrier to effective use. In those cases, having sufficient internal capacity and skills helps users adopt the technology more easily. However, for technologies that are user-friendly, standardised, or designed for SMEs, organisational factors have little or no influence on PEOU. In these situations, PEOU is almost fully determined by the technology itself.

There is no evidence of a direct link between organisational factors and PU. Whether a technology is perceived as useful depends on its core functionalities, not on organisational conditions. This is supported by Jo and Bang (2023, p. 3),who conclude that organisational factors mainly influence the intention to continue using technology, but not PU. Na et al. (2022, p. 12) also report that organisational support can improve PEOU but does not consistently affect PU. Qin et al. (2020, p. 272) confirm that organisational factors have no significant direct effect on PU. Organisational factors may help users work effectively with the technology, but they do not determine whether the technology is considered valuable.

The empirical findings show that environmental factors, particularly regulatory pressure from frameworks, influence PU. Solution providers consistently stated that their technologies become more useful when they help customers manage complex compliance requirements. Without these external drivers, the perceived value of the technology would often be lower. This is supported by Na et al. (2022, p. 12), who report that external pressures such as regulation and competition can significantly impact PU.

However, this relationship may not be purely causal. It is likely that the link between regulatory pressure and PU is a spurious relationship. In many cases, the technology becomes useful

because external factors make it necessary. Without regulatory obligations, some of these technologies might not be perceived as useful at all. This means the relationship between environmental factors and PU should be interpreted with caution.

There is no evidence that environmental factors influence PEOU. The ease of using a technology is consistently driven by its system design and implementation complexity. Although regulatory pressures may encourage providers to develop more user-friendly tools, this does not directly affect users' experience of PEOU. This finding is consistent with Na et al. (2022, p. 12), Jo and Bang (2023, p. 4), Qin et al. (2020, p. 272) who all report that environmental factors are linked to PU but not to PEOU.

Solution providers frequently stated that intuitive design and low implementation barriers help users quickly recognise the value of a technology. This suggests that PEOU may influence PU. Qin et al. (2020, p. 272) empirically confirm this relationship. However, this relationship was not empirically tested in this study and should be treated with caution, as the solution provider perspective may be commercially biased. Therefore, this link remains theoretical.

It is essential to acknowledge that the entire TAM structure in this study is viewed exclusively through the lens of solution providers. Providers can explain how their technologies are designed and how they expect them to reduce complexity, but they cannot reliably speak for actual user experiences, attitudes, or adoption intentions.

Solution providers consistently indicated that customer attitudes towards using the technology generally improved as the technology became embedded in daily workflows. However, this is an indirect observation. Providers cannot fully assess real user attitudes or internal decision-making processes. According to Roh et al. (2013, p. 2), supplier-based studies can provide valuable insights when the unit of analysis is clearly bounded at the supplier side. Hüttinger et al. (2014, p. 713) similarly confirm that supplier perspectives can meaningfully contribute to understanding buyer-supplier dynamics, especially regarding observable adoption behaviour.

Based on these studies, solution providers can give reliable input about observable market behaviour but cannot confirm how individual users experience or adopt technologies. This also applies to intention to use. Solution providers often described that the use of technology is triggered by specific sourcing challenges, such as compliance requirements, risk exposure or

operational inefficiencies. These findings align with the broader observation that technologies are applied in a modular and problem-driven manner, rather than adopted for general strategic motivations. Without end-user data, the actual role of attitude in shaping intention to use cannot be confirmed. This study therefore recognises that conclusions about attitude towards using and intention to use are limited and should be treated with caution.

5.2 Theoretical implications of technology adoption in complex sourcing environments

Building on the relationships outlined in Section 5.1, this section reflects on how the empirical findings contribute to theory on technology adoption in complex sourcing environments. It explores how digital technologies help organisations navigate complexity, not by eliminating it, but by improving visibility. These insights contribute to answering the central research question by offering theoretical clarity on how and why technology functions as an enabler in global sourcing processes.

The results confirm the view of Monczka et al. (2021, pp. 378-385) that global sourcing complexity is driven by multiple factors. In line with this, the study shows that organisations adopt technologies in a targeted and phased manner, selecting modular platforms or combining specialised tools from different providers to address distinct sourcing challenges, rather than relying on one all-encompassing solution. For example, AI-based tools are used to improve visibility and resilience through risk monitoring and predictive insights, while RFID technologies are applied for item-level traceability. This confirms that sourcing complexity is best addressed by using different technologies for different complexities. Whether through modular platforms or by combining tools from multiple providers.

The findings also support and extend the ABCDE visibility framework by Kalaiarasan et al. (2022, pp. 7-8), which stresses the importance of supply chain visibility in managing complexity. A clear distinction emerged between physical visibility and informational visibility. This distinction is not explicitly present in the original ABCDE framework and can therefore be seen as a valuable refinement provided by this study. By systematically categorising sourcing complexities based on the required type of visibility, this research provides a practical extension to the ABCDE model. This distinction aligns with Sunny et al. (2020, p. 3),who define transparency as an integrated view of the supply chain. Informational visibility complements physical visibility by improving the accuracy and reliability of

procurement decisions. The results show that most complexities in global sourcing can be traced back to informational visibility gaps rather than physical gaps, highlighting the importance of clean, structured, and accessible procurement data in modern sourcing environments. The results confirm that visibility is a layered concept, supporting operational control while also playing a key role in strategic risk management and compliance.

The findings show that improved visibility of information plays a central role in strengthening decision-making processes in global procurement. Technologies improve the structure, availability and accuracy of global sourcing information. By consolidating relevant internal and external data, such as supplier performance, compliance scores and risk signals, these tools enable organisations to assess situations more effectively and react faster. As a result, global sourcing decisions become more data-driven, consistent and aligned with strategic and regulatory objectives.

The study also confirms the relationships described by Hallikas et al. (2021, p. 633), who argue that digital procurement capabilities help translate data into improved supply chain performance. The results show that technologies combine internal procurement data with external risk information (such as ESG scores or geopolitical signals), providing real-time alerts and predictive insights. AI- and ML-based tools contribute to more proactive risk management by enabling procurement teams to act before disruptions escalate. This shift towards predictive and prescriptive decision-making is also supported by Althabatah et al. (2023, pp. 33-34), who highlight the role of AI and ML in building supply chain resilience.

Finally, the findings provide nuance to the framework of Colombo et al. (2023, pp. 11-12), which describes how digitalisation improves efficiency and decision autonomy in procurement. The study confirms that digitalisation does indeed streamline routine tasks and data flows. However, it also shows that this shift leads to a redefinition of procurement roles. As data handling becomes more automated, procurement professionals increasingly take on analytical and strategic responsibilities, such as evaluating supplier risks and interpreting complex data outputs. Successful implementation therefore requires not only technological integration, but also adjustments in workflows, team skills, and role expectations.

5.3 Practical implications: Practical recommendations for companies and solution providers

5.3.1 Recommendations for companies adopting digital sourcing technologies

Based on the empirical evidence and its theoretical interpretation in the previous sections, this section provides practical recommendations for companies and technology providers. These recommendations aim to operationalise the central research question by translating insights on complexity reduction through technology into actionable guidance.

Organisations benefit most from a focused and flexible adoption approach. Rather than seeking a one-size-fits-all solution, companies should select modular tools or combine technologies across providers to match specific sourcing complexities. whether regulatory pressure, transparency gaps, or supplier risk. For example, AI-based tools can support risk monitoring, while data structuring technologies enhance informational visibility. Each challenge requires a distinct technological response.

A key implication is that visibility should not be viewed purely in physical terms. While item-level tracking is helpful in certain industries, informational visibility, through clean, structured procurement data, is equally critical. It enables transparent, auditable, and strategic decision-making. Investment in digital tools must therefore be accompanied by improvements in the data environment that feeds them.

Digital tools also support better sourcing decisions by integrating internal performance and external risk data. Yet, their value depends on the user's ability to interpret results effectively. Training and onboarding play a key role here. In several cases, the impact of technology only became visible after customisation and feedback loops were in place, allowing the tool to evolve in line with organisational needs.

As digitalisation reshapes procurement roles, professionals are expected to take on more strategic responsibilities, such as interpreting indicators or managing supplier performance. This transformation requires skills development, clear processes and organisational commitment. Solution providers can support this shift, not only by offering functional tools, but also by actively facilitating change management through training, onboarding and guidance.

5.3.2 Recommendations for solution providers supporting technology adoption

Across the cases, it became clear that successful adoption is not only about technical functionality, but also about how a tool is introduced, supported, and communicated to the customer. Several providers already offer onboarding programmes, tutorials, or demo environments. These are valuable in reducing uncertainty, especially in the early stages of use.

A key insight from the data is that customer attitudes often follow a curve: initial enthusiasm may give way to disappointment if expectations are unrealistic. Over time, however, satisfaction tends to stabilise, especially when the tool fits daily workflows and expectations are realigned. This highlights the importance of setting clear expectations from the outset. Providers can prevent early dissatisfaction by openly communicating what the tool can and cannot do.

To improve long-term adoption, providers should also embed feedback mechanisms into their services. These allow users to feel heard and contribute to product development. At the same time, feedback loops help the provider refine the tool in line with changing customer needs.

Finally, some providers are already supporting internal transitions by offering training, implementation guidance, and even consulting services. As digitalisation increasingly reshapes procurement functions, such support becomes a key part of long-term success. Providers that actively guide customers through these changes are better positioned to create lasting value and stronger partnerships.

This chapter has shown how digital technologies contribute to reducing complexity in global sourcing by improving supply chain visibility, supporting data-driven decision-making, and enabling compliance with ESG and regulatory frameworks. The TOE–TAM framework helped to structure these findings and clarify how specific tools address different sourcing challenges. One key insight is that companies do not adopt one single system to manage complexity. Instead, they combine specialised tools, each designed to solve a specific problem such as ESG reporting, risk monitoring, or supplier data management. Some of these tools are part of modular platforms, while others operate independently. This layered, targeted approach reflects the fragmented nature of sourcing complexity and confirms that technology only creates value when it directly matches a clearly defined challenge.

This study identifies six key findings on the role of technology in managing global sourcing complexity:

- *Global sourcing complexity is layered and context specific.* Technology does not eliminate complexity but helps manage it through enhanced visibility.
- *Technologies are applied in modular and problem-driven ways.* Companies either use configurable platforms or combine distinct tools from multiple providers, depending on the specific sourcing challenge they aim to solve (e.g. ESG compliance, risk management, or data quality).
- *Supply chain visibility is the central issue.* A distinction is made between physical visibility (traceability) and informational visibility (transparency).
- *Technology enhances decision-making.* Tools integrate internal performance data with external risk indicators (e.g. compliance scores, ESG ratings), enabling faster, more evidence-based sourcing decisions.
- *Digitalisation is reshaping procurement roles.* As routine tasks are automated, procurement professionals are increasingly engaged in strategic and analytical activities.
- *Environmental pressures influence perceived usefulness, not ease of use.* Regulations and compliance demands drive the perceived value of technology (PU) but have limited effect on how easy the technology is to use (PEOU).

6. Research limitations and opportunities for future sourcing technologies

6.1 Methodological limitations and scope boundaries

While this study provides relevant insights into how technology can reduce complexity in global sourcing, several methodological limitations should be considered. The results are based on twelve case studies, offering analytical depth but limited in breadth. The sample is composed of selected solution providers, which means that the findings may not be generalisable to all organisations or industries. Future studies could include a broader range of companies to assess whether similar patterns emerge across different sectors and regulatory environments.

The study focuses entirely on the perspective of solution providers. This was a deliberate and pragmatic choice due to time constraints and the opportunity to conduct interviews at events such as DPW Amsterdam and Business Days Twente. Solution providers have in-depth knowledge of how their technologies are designed, implemented, and applied across various client contexts. However, they do not represent the buyer or end-user experience. This is

especially relevant for constructs such as perceived usefulness, perceived ease of use, attitude, and intention to use. These variables are interpreted through the lens of solution providers. Although not based on direct user data, these interpretations are grounded in provider experience across multiple client contexts and supported, where possible, by secondary sources. As a result, findings related to user perception or adoption behaviour should be interpreted with caution.

In addition, the application of the TAM framework in this study focuses on the supply side, while the model was originally developed to measure user acceptance. Although this use offers insight into how technologies are positioned and expected to function, it does not allow conclusions about how users actually experience or adopt these technologies.

Interview findings were cross-checked against publicly available materials, such as product documentation and company websites, to increase reliability. However, this verification depends on the availability and quality of external content. In several cases, provider claims could not be independently confirmed. Furthermore, such sources may reflect favourable marketing narratives. These factors limit the strength of validation.

The research focuses on technologies that were present in the interview sample. As a result, other relevant developments such as blockchain or generative AI were not included. These emerging technologies may also impact sourcing processes and should be explored in future research.

Finally, cybersecurity was not addressed in this study. As companies become more dependent on digital tools and data infrastructure, further investigation is needed into the risks and vulnerabilities associated with sourcing technologies.

6.2 Future research directions to enhance sourcing technology adoption and alignment

Besides these limitations, the findings of this study also point to several possibilities for future research. These directions are determined by what could be further developed based on the findings of this study.

Future research could focus on how companies can better align technological solutions with the specific complexities they face in global sourcing. The findings in this study show that different

technologies address different types of complexity, such as regulatory compliance, risk resilience, or data quality. However, companies currently lack structured guidance on how to select modular tools or combine complementary technologies from different providers to match their unique sourcing challenges and industry context. Developing decision frameworks or matching guidelines that systematically link sourcing complexities to suitable technological solutions would provide valuable support for both practitioners and researchers. Future research could also explore how organisations balance the use of modular platforms versus the combination of stand-alone tools, and under which conditions each approach is more effective. This would provide valuable insights into sourcing technology strategies that align with varying degrees of complexity and organisational readiness.

Further studies could investigate how companies can implement and adopt sourcing technologies more effectively. This study indicates that factors such as user-friendliness, onboarding processes, and organisational readiness play a central role in determining the actual impact of technology adoption. Whereas the first opportunity focuses on guiding technology selection, this direction highlights how organisations can successfully embed selected technologies into their day-to-day operations. Future research could contribute by identifying best practices and critical success factors that support the effective and sustainable implementation of sourcing technologies.

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Appendix I – Measurements of the variables

Table 9: Measurements of the variables

Variable	Goal	Item
Technology	Description of the Technology/software.	- *Key function of technology* - *Advantageous/disadvantageous (relative to current practices)* - *Integration other systems* - *Complexity*
Organisation	In which types of organisations will the technology be effective in reducing global sourcing complexity	- *Organisation size* - Digital maturity of the buyer organisation (e.g. existing ERP systems, degree of automation) - *Resources availability (Budget, dedicated staff, IT infrastructure)* - *Customer requirements (e.g. specialist knowledge required within the buyer's team)* - *Type of industry*
Environment	Does the technology ensure compliance with global regulations?	- *Complies with ESG regulations (CSDDD)* - *External factors (sustainability, Competitors, market condition)* - *Suppliers* - *Partnerships*
Perceived Usefulness	The usefulness of the technology/software.	- *Improve Transparency* - *Improve Visibility/Traceability* - *Improve Efficiency in sourcing operations* - *Support decision-making process* - *Improve communication* - *Risk resilience*
Perceived Ease of Use	The ease of use of the technology/software.	- *Implementation process (Time and complexity)* - *Integrates smoothly with existing systems* - *User-friendly* - *Fault sensitivity*
Attitude toward	The attitude of customers towards the technology/software.	- *Customer experiences* - *Attitude over time*
Intention	Primary goal of using the technology/software.	- *Main goal of using technology*

Appendix II – Interview Guide: TOE + TAM Framework

Introduction Introduction of interview moderator
Briefing **Is it possible to record the interview?**
Purpose of research
Purpose of interview
Explain the interview procedure
Question: **Do you have any questions before starting the interview?**

Question 1: **Would you be so kind to briefly introduce yourself and your function.**
Back-up:

- Time period
- **Responsibilities**
- **Experience**

Theme: Technology

Question 2: **Could you please describe the technology your company offers?**
Question 2a**:** **What are the key functions of the technology in global sourcing?**
Question 2b: **How does your technology compare to others in terms of benefits/disadvantages in the industry?**
Question 2c: **How smoothly does your technology integrate with existing systems?**
Question 2d: **In what ways do you consider your technology to be innovative relative to industry standards?**
Question 2e: **How complex would you describe your technology/software? (E.g.) Dashboard or end- 2- end complete software?)**

Back-up:

- Internet of things
- Blockchain technology
- AI
- Big data
- Cloud computing

Theme: Organisation

Question 3: **What does the organisation look like?**
Question 3a**:** **What is the typical size of the company?**
Question 3b: **Does your organisation have sufficient resources to implement the technology with a large number of companies?**
Question 3c: **What do you require from customer to implement the software? (Specialist on staff?/ Incentives/License?)**

Back-up:

Theme: Environmental

Question 4: **Does the technology ensure compliance with global regulations, such as Corporate Sustainability Due Diligence (CSDDD) regulations?**
Question 4a: **In case of yes → In what ways do you support customers in complying with CSDDD regulations through your technology?**
In case of no → Do those new CSDDD regulations play a role in the ongoing development of the technology?

Question 4b: **Are there other external environmental factors affecting the development of your technology?**
- **Competitors awareness**
- **Market condition**
- **Other?**

Question 4c: **How do supplier demand or practices influence the development and adoption of your technology?**

Back-up:
- Sustainability

Theme: Perceived usefulness

Question 5: **How do your customers see the perceived usefulness of the technology in global sourcing?**

Question 5a: **In what way does the technology mitigate the complexity in global sourcing?**

Question 5b: **Does your technology support decision-making processes in global sourcing?**
→ In case of yes: How does the technology support decision-making processes in global sourcing?

Back-up:
- How improve:
  - Improve transparency
  - Improve visibility/traceability
  - Overall efficiency of sourcing operations

Theme: Perceived ease of use

Question 6: **What is the perceived ease of use for your customers to implement and use the technology?**

Question 6a: **How would you characterise the complexity and time required for implementation?**

Question 6b: **How user-friendly is the technology and how do users respond to it?**

Question 6c: **How sensitive is the technology to failures?**

Back-up:
- Implementation process
  - Long/hard
  - Very complex or not at all.
- Integration challenges

Theme: Attitude toward Technology

Question 7: **What is the overall attitude of customers towards your technology?**

Question 7a: **What is the customer experience relative to the technology?**

Question 7b: **Does the attitude towards using the technology change over time?**

Back-up:
- Client feedback
- Initial reactions vs. long-term experiences
- Customer loyalty and repeat usage
- Attitude before and after implementation

Theme: Intention

Question 8: **What is the primary intention for customers of using the technology?**

Back-up:

- Reducing complexity
- Improving visibility
- Improving transparency
- Complying CSDD regulations
- Sustainability
- Other goal

Debriefing	Summarising the main points mentioned during the interview. From my side there are no further questions. Is there anything else you want to bring up before finishing the interview?
Closure	Thank you for participating in the interview.

Appendix III – Detailed table with cases

Table 10: Completed and Detailed Table (TOE)

Case number	Technology	Organisation	Environmental
Case 1	Solution provider leverages NLP-driven risk analysis to monitor public and private data sources in real time, supporting multilingual risk detection. The tool enables companies to efficiently identify and assess supplier risks while ensuring compliance with regulations such as CSDDD. Unlike traditional risk scoring models, it provides auditable, evidence-based insights based on customer-defined criteria. The system is flexibly deployable, available as both a SaaS solution and on-premises, and integrates seamlessly with existing ERP and risk management systems. Confirmed: Solution provider processes multilingual public and private data in real rime and integrates with existing client systems.[113]	The buyer organisation must have clearly defined risk policies and selection criteria. Customers must have a solid understanding of their own risk appetite and assessment focus areas. No specific organisation size, digital maturity, resource requirements, or industry focus was mentioned.	Solution provider is designed to align with CSDDD regulations, offering configurable ESG risk assessments tailored to clients' needs. The company proactively monitors regulatory changes and updates its technology accordingly. With increasing corporate demand for regulatory compliance solutions, solution provider is positioned for future growth, ensuring businesses can stay compliant with evolving sustainability requirements. Confirmed: Solution provider offers ESG risk monitoring adaptable to changing regulations and priorities, supporting compliance at scale.[114]
Case 2	Solution provider provides an AI-driven procurement platform that integrates risk management, ESG analysis, and supplier assessments. It consolidates internal and external data sources to offer a comprehensive risk profile of suppliers, including historical risk trends and ESG compliance. The system enables real-time visibility into procurement risks, automates workflows, and provides customisable risk scoring models. Solution provider supports seamless integration with third-party platforms, allowing businesses to incorporate it into their existing procurement and risk management ecosystems. Confirmed: Solution provider integrates ESG and risk management functionalities and supports ERP integration and customised risk scoring.[115]	Buyer organisations must have procurement and ESG staff available to effectively use the system and drive supplier assessments. No specific organisation size, digital maturity requirements, customer knowledge, or industry focus were mentioned.	Solution provider contributes to supply chain transparency by tracking product-level environmental data, such as composition and carbon footprint. This feature enables suppliers to document and share their sustainability impact with customers. While the platform provides detailed sustainability insights, it does not enforce environmental policies or directly mandate compliance; instead, it allows companies to act on their own sustainability goals and regulatory requirements. Confirmed: The solution supports Scope 3 carbon footprint tracking and offers sustainability documentation tools.[116]
Case 3	Solution provider is a web-based SaaS platform that evaluates the sustainability performance of companies and suppliers. It leverages external data sources, such as country and industry risk databases, alongside self-reported company data, to	Buyer organisations must have a sustainability program manager to manage the tool. The solution is designed to be applicable across more than 200 industries. No specific requirements were mentioned regarding organisation size or customer knowledge.	Solution provider facilitates compliance with global regulations, by offering standardised sustainability assessments and supplier risk evaluations. The platform automates compliance

[113] See Companies website/report
[114] See Companies website/report
[115] See Companies website/report
[116] See Companies website/report

	generate ESG risk scores. The platform integrates with procurement systems via a RESTful API, linking sustainability scores to financial and compliance risks. To structure and analyse data, solution provider, employs a combination of AI-driven analytics and expert validation. AI is used to process and categorise large datasets efficiently, while human analysts review and refine the assessments to ensure accuracy and contextual relevance. This hybrid approach enhances data reliability and provides companies with actionable insights into supplier sustainability performance. Users can export data for further analysis, ensuring flexible integration with existing workflows. Confirmed: Solution provider combines AI-powered analysis with expert validation to generate ESG scores and supports integration through RESTful APIs with procurement systems.[117]		tracking by generating audit-ready reports and enabling companies to monitor ESG performance across their supply chains. With nearly two decades of experience, solution provider continuously refines its assessment methodology to align with evolving regulatory frameworks. The platform supports organisations in meeting ESG certification requirements and streamlining sustainability reporting obligations. Confirmed: Solution provider helps organisations meet ESG certification standards and track supply chain performance through automated audit-ready reports.[118]
Case 4	Solution provider provides a dashboard-based risk monitoring solution that integrates AI and big data to track social media and public domain sources for supplier-related risks. The classification algorithm automatically categorises risks as high, medium, or low based on specific keywords. The technology functions as an early warning system and offers a straightforward, non-complex method for identifying potential disruptions in the supply chain. Confirmed: Solution providers Smart Risk platform utilises AI to continuously monitor supplier risks, providing real-time alerts and categorising risks to enable proactive supply chain management.[119]	The solution does not require specialist knowledge from the buyer organisation.	Solution providers risk monitoring solution supports organisations in proactively identifying and managing supplier-related risks, contributing to enhanced supply chain resilience and compliance with regulatory requirements.[120]
Case 5	Solution provider technology aggregates more than 3 million online sources, including news articles, annual reports, and social media, using natural language processing (NLP) and proprietary large language models (LLMs) to filter out noise and provide highly relevant, targeted insights. The platform is built on advanced AI technology while maintaining a user-friendly interface. It offers both a dashboard for direct interaction and API integration for	The solution does not require specialist knowledge from the buyer organisation. A specific customer example is large payment service providers.	Solution provider supports companies in staying informed about regulatory and compliance developments, including ESG-related news, by filtering and delivering relevant insights. While the platform does not provide ESG compliance solutions directly, it helps clients track regulatory risks and industry trends through its monitoring capabilities. The system continuously

[117] See Companies website/report
[118] See Companies website/report
[119] See Companies website/report
[120] See Companies website/report

	seamless connectivity with existing systems. The system allows companies to monitor external risks efficiently, providing real-time insights that help in risk mitigation and compliance tracking. Confirmed: Solution provider leverages AI and LLMs to monitor over 3 million sources, delivering real-time, contextual risk insights through a user-friendly dashboard and API integration.[121]		adapts to new compliance requirements, ensuring that users remain up to date with evolving environmental and sustainability regulations. Confirmed: Solution provider aids organisations in monitoring ESG-related news and regulatory developments, providing filtered insights to stay abreast of compliance requirements.[122]
Case 6	Solution provider is an AI-driven risk management platform that provides real-time supplier monitoring and early warning alerts for potential disruptions. It collects and analyses publicly available data, including historical supplier risks over the past three years. The platform extends risk visibility beyond direct suppliers to Tier 2 and Tier 3 levels, offering deeper insights into supply chain risks. Solution provider integrates with existing procurement systems through an open REST API, enabling automated data extraction, real-time risk categorisation, and streamlined decision-making. Confirmed: Solution provider provides real-time alerts and risk scoring based on multilingual AI models, integrating seamlessly with procurement systems via REST APIs.[123]	The technology is primarily targeted at large enterprises with complex, global supply chains. Buyer organisations must provide internal supplier data. A contact person is required who understands the supplier data structure. No strict industry limitation was mentioned.	Solution provider supports companies in monitoring compliance risks within their supply chains, aiding ESG-related due diligence efforts. The platform automates risk detection and compliance tracking, allowing organisations to proactively manage regulatory requirements. Although solution provider incorporates ESG risk monitoring, it does not position itself solely as an ESG compliance tool but rather as a comprehensive risk management solution. Confirmed: Solution provider helps companies comply with regulations like the EU Deforestation Regulation and German Supply Chain Act by supporting risk and compliance monitoring.[124]
Case 7	Solution provider offers a cloud-based Contract Lifecycle Management (CLM) platform that automates contract creation, approval, and management using AI-driven workflows. The platform scans contracts, extracts key terms, and tracks obligations, helping organisations manage risk and ensure compliance. It integrates with ERP, CRM, and SAP systems via APIs, providing both standard and customised solutions for seamless compatibility with existing business processes. Additionally, solution provider enables companies to link contracts to legal and compliance documentation, ensuring that regulatory obligations are met. The platform's complexity is configurable, allowing businesses to tailor functionalities from a simple user interface to a comprehensive	The technology is primarily used by large enterprises such as Microsoft, Accenture and JP Morgan. Buyer organisations typically involve project teams and business stakeholders who understand their own contract structures and processes. The solution is particularly relevant for organisations managing complex, international contract structures.	Solution provider helps companies align contracts with sustainability requirements by incorporating relevant clauses, restrictions, and documentation to support compliance. While the platform does not enforce compliance, it enables businesses to structure agreements in accordance with legal frameworks. Additionally, external factors such as evolving ESG regulations and competitive market strategies drive the ongoing development of solution provider technology. Confirmed: The SAP-Icertis partnership supports compliance with

[121] See Companies website/report
[122] See Companies website/report
[123] See Companies website/report
[124] See Companies website/report

	contract management solution, including supplier performance monitoring. Confirmed: The solution provider Contract Intelligence platform connects seamlessly with enterprise systems including Microsoft, SAP, and Salesforce.[125]		ESG regulations through contract intelligence.[126]
Case 8	Solution provider offers an AI-based solution that enhances data quality and classification within procurement and supply chain processes. The technology focuses on identifying, categorising, and structuring unstructured data from purchase orders, invoices, and master data. It supports companies in reducing duplication, optimising procurement decisions, and improving visibility across their supply chains. The platform includes tools such as Spend Analytics, Material and Service Data Management, and Data Assistant Procurement, which help streamline data management and decision-making. While the algorithm is complex, the user interface remains accessible, allowing customers to leverage AI-driven insights without requiring data expertise. The system integrates with ERP platforms and assists in preventing data inconsistencies by combining AI automation with human validation. Confirmed: Solution provider provides three product solutions, Data Quality Management, Spend Analytics, and Data Assistant Procurement, powered by proprietary AI and NLP engines to structure and enrich multilingual procurement data.[127]	The technology is specifically targeted at large multinational enterprises with a minimum turnover of €5 billion, preferably above €10 billion. No specialist knowledge is required from the buyer organisation. The solution is designed for manufacturing companies with complex supply chains. Financial and service industries are not targeted.	Solution provider supports sustainability efforts by enhancing data accuracy in inventory management, which indirectly contributes to lower carbon emissions by reducing unnecessary stock and transportation. While the technology does not directly ensure compliance with CSDDD, it enables companies to align their procurement practices with ESG requirements by providing reliable, structured data. The company closely monitors competitors and market trends to anticipate industry shifts, acknowledging that knowledge-sharing within the sector can drive innovation and improve technological advancements.
Case 9	Solution provider is a B2B e-procurement marketplace focused on indirect procurement, providing a web-based platform that connects suppliers and procurement organisations. The technology offers flexible integration with ERP and e-procurement systems via API and EDI connections, enabling automated purchasing and invoicing processes. Users can compare suppliers at the product level and use optimisation tools to select the best supplier based on price, delivery time, or minimal shipments. Solution provider operates on a margin-based business model and offers the option to host framework agreements. While the web-based version is immediately	The technology is suitable for medium-sized enterprises and large international companies. No specialist knowledge is required for web-only users. The solution is broadly applicable in indirect procurement without a specific industry focus.	Solution provider supports compliance with European sustainability regulations by screening suppliers, product catalogues, and procurement processes. The platform provides tools for tracking sustainability data and monitoring procurement-related carbon footprints, enabling organisations to integrate sustainability considerations into purchasing decisions. As a member of the UN Global Compact and the Sustainable Procurement Initiative, solution provider actively monitors evolving regulations and ensures that

[125] See Companies website/report
[126] See Companies website/report
[127] See Companies website/report

	accessible, integrating with business processes can extend implementation timelines to six to twelve weeks, depending on the customer's digital infrastructure. Confirmed: Solution provider is a B2B e-procurement marketplace. It supports ERP, EDI, and API integration and provides tools to automate procurement processes, including product comparison and digital invoicing.[128]		its platform aligns with sustainability standards. The company maintains a dedicated sustainability department that tracks regulatory developments, market trends, and competitor activities to enhance transparency and compliance readiness. Confirmed: Solution provider actively supports regulatory alignment, monitors evolving sustainability legislation and helps clients integrate ESG into their purchasing choices.[129]
Case 10	Solution provider develops customised supply chain optimisation with mathematical modelling, digital twins and data-driven tools. Technology choice is client dependent. Data integration plays a key role; implementation varies depending on IT infrastructure and existing workflows. Automation supports decision-making, but human control remains crucial. Confirmed: Solution provider offers advanced analytics and optimisation solutions for supply chains, including digital twins and data-driven tools, tailored to customer needs.[130]	The technology is used by both large multinational companies and smaller organisations. Buyer organisations must provide internal project teams, including project managers, product owners, and business stakeholders. These stakeholders must understand their own processes and data structures. The solution is applied across different industries, including complex supply chain environments.	Solution provider complies with international guidelines, including ISO standards and client-specific compliance. Data remains within customer environments and complies with security standards. Technology choices are influenced by market trends and vendor preferences. Solution provider follows developments in low-code, digital twins and AI. Sustainability goals vary by customer. Solution provider supports transparency and compliance without enforcing ESG policies. Confirmed: Solution provider states that it complies with international standards and customer-specific compliance requirements, while supporting transparency without enforcing ESG policies.[131]
Case 11	Solution provider offers RFID (Radio Frequency Identification) technology that gives products a unique identity via radio signals. The technology uses small chips with antennas, enabling rapid identification and simultaneous scanning of many items without the need for direct visual contact. Unlike barcodes, RFID tags are resistant to environmental damage. However, there are limitations in terms of applicability, especially due to interference from liquids or metals. Moreover, the added value of RFID compared to existing tracking solutions depends on the context and industry.	The technology is primarily used by large fashion brands such as Hugo Boss, Under Armour, Lululemon, and Levi's. Buyer organisations must establish a dedicated project team with internal specialists and a project manager. Customers must understand the fundamentals of RFID technology. The solution is especially relevant for complex supply chains in the fashion industry.	RFID adoption is increasingly influenced by wider environmental and market dynamics. The COVID-19 pandemic shook up many organisations by highlighting the vulnerability of global supply chains and creating urgency for better traceability and visibility. This shift in risk perception made companies more willing to invest in such technologies. As a cause-effect situation, economies of scale in the RFID market have significantly depressed tag prices over the past decade, making the technology more financially accessible.

[128] See Companies website/report
[129] See Companies website/report
[130] See Companies website/report
[131] See Companies website/report

	Confirmed: Solution provider states that their RFID technology enables fast and accurate item-level identification without direct vision.[132]		
Case 12	Solution provider offers a modular, cloud-based source-to-pay platform that integrates sourcing, procurement, contract management and supplier management processes. The system provides real-time spend analysis, eco-spend insights and risk analysis via API connections to external data providers such as EcoVadis and IntegrityNext. It connects to ERP systems. It enables customers to efficiently manage targeted sourcing events, tenders and supplier onboarding. The platform supports flexible deployments and provides end-to-end process coverage, from sourcing requests to invoice matching, with customisation options for each stage. Confirmed: Solution provider states that its platform covers the entire source-to-pay process, includes analytics and eco-spend functionalities and is connected via APIs to EcoVadis and IntegrityNext for ESG assessments.[133]	Buyer organisations must involve both finance and procurement teams during implementation to correctly align processes. Customers need to have a good understanding of their internal end-to-end processes. No specific organisation size or industry focus is mentioned.	Solution provider integrates sustainability considerations into sourcing and supplier management workflows by connecting with data sources like Exiobase and the Greenhouse Gas Protocol. It enables customers to track emissions per euro spent and to monitor supplier ESG scores via embedded risk analysis tools. The platform supports customers in aligning sourcing practices with CSDDD and CSRD requirements by enabling supplier selection based on sustainability performance. However, the system primarily provides data visibility and dashboards rather than automated compliance enforcement, leaving the interpretation and action to the users themselves. Confirmed: The platform connects to databases such as Exiobase, calculates emissions per euro, enables ESG scoring and supports CSDDD and CSRD alignment. This makes it easier to meet compliance.[134]

Table 12: Completed and Detailed Table (TAM)

Case Number	Perceived Usefulness	Perceived Ease of Use	Attitude Towards Using	Intention to Use
Case 1	Solution provider enhances risk resilience by automating real-time monitoring and rapid risk analysis, allowing companies to respond proactively to supplier risks. The tool improves transparency by providing verifiable, audit-ready reports on supplier compliance and ESG risks. Its automation capabilities improve overall efficiency by reducing manual workload, streamlining due diligence processes, and accelerating risk	Solution provider is designed for ease of use, with an intuitive interface and a straightforward implementation process. Clients can bulk upload supplier lists and receive detailed risk reports within hours, significantly reducing manual assessments. The platform offers flexible deployment options (on-premises or SaaS) and seamless integration with existing ERP and risk management systems. The risk assessment interface can be customised, ranging		Solution provider is primarily implemented for risk management and regulatory compliance, including adherence to CSDDD. Companies use the platform to automate due diligence, identify risks faster, and improve supply chain transparency. The tool enhances efficiency through large-scale data analysis and real-time monitoring, making it a key enabler of

[132] See Companies website/report
[133] See Companies website/report
[134] See Companies website/report

	identification. Additionally, the platform supports decision-making by consolidating large datasets into clear, actionable insights. Confirmed: Solution provider AI-Enabled technology automates third-party risk intelligence collection, enabling organisations to identify and contextualise opportunities efficiently.[135]	from simple red-green dashboards to in-depth analytics, ensuring usability for both basic and advanced users. Solution provider is low maintenance, with minimal fault sensitivity, as its structured automation reduces reliance on manual interventions. Confirmed: Solution provider solutions, such as smartEYE, provide real-time alerts and are designed to integrate seamlessly with existing systems, enhancing user experience.[136]		compliance and risk mitigation. Confirmed: Solution provider solutions, such as smartEYE, offer perpetual adverse media monitoring, delivering real-time alerts to help organisations act decisively and quickly.[137]
Case 2	Solution provider enhances decision-making in global sourcing through automated risk alerts, structured supplier evaluations, and KPI tracking. The platform improves transparency by granting suppliers instant access to their performance assessments and ensuring procurement teams have real-time visibility over supplier risks. By automating workflows and minimising manual risk assessments, it increases efficiency and reduces administrative workload. The platform also helps companies compare suppliers based on price, risk exposure, compliance, and ESG factors, optimising procurement strategy and sustainability tracking. Confirmed: Solution provider enables structured supplier evaluation, ESG compliance tracking and real-time risk analysis in one platform, significantly improving transparency and strategic sourcing decisions.[138]	Solution provider is designed for rapid implementation, with an initial setup process that allows users to start with simple Excel uploads before expanding to system integrations. The interface resembles familiar business tools like Outlook, ensuring an intuitive user experience. Automation reduces manual effort in risk assessments, and users can customise alerts to track supplier compliance. However, deeper ERP and procurement system integrations may introduce complexity, depending on the organisation's IT structure. Confirmed: Solution provider supports a phased onboarding approach from Excel templates to ERP integration and features a familiar, Outlook-style interface to ensure ease of use and fast adoption.[139]		Solution provider is primarily used to reduce procurement complexity by automating risk management, supplier evaluations, and compliance tracking. The platform enhances supply chain visibility by integrating internal and external risk data into one system. It supports sustainability compliance by providing granular insights into supplier carbon impact and product composition. Additionally, it helps organisations streamline procurement decisions by comparing suppliers based on cost, regulatory alignment, and risk exposure, ultimately improving efficiency and decision-making in procurement activities. Confirmed: The platform supports long-term adoption through integrated ESG, compliance, and supplier management tools that address regulatory pressure

[135] See Companies website/report
[136] See Companies website/report
[137] See Companies website/report
[138] See Companies website/report
[139] See Companies website/report

				and drive decision-making improvements.[140]
Case 3	Solution provider enhances decision-making in global procurement by providing real-time sustainability performance scores and comprehensive supplier risk assessments. The platform supports the pre-selection phase by integrating ESG risk factors alongside financial and compliance data, ensuring procurement teams can make informed, sustainability-driven choices. By automating supplier monitoring and providing dynamic dashboards, solution provider improves transparency, traceability, and operational efficiency, helping companies achieve their ESG and compliance goals. Confirmed: Solution provider delivers real-time ESG risk intelligence and supplier sustainability ratings, enabling informed procurement decisions and enhancing transparency.[141]	Solution provider is a cloud-based SaaS platform that seamlessly integrates with procurement and risk management systems via a RESTful API. The system is designed for ease of use, allowing procurement teams to export data and access supplier insights with minimal technical expertise. While IT specialists find implementation straightforward, non-technical users may require initial training to fully utilise the platform's advanced features. Most organisations achieve full integration within a few months, depending on the complexity of their procurement systems. Confirmed: Solution provider offers seamless integration through its RESTful API, facilitating easy access to sustainability data within existing procurement systems.[142]		Solution provider is primarily used for supplier pre-selection, regulatory compliance, and ongoing sustainability monitoring. The platform enables companies to assess suppliers based on sustainability and financial risks, ensuring alignment with ESG and CSDDD standards. Many organisations use solution provider not only during supplier onboarding but also for continuous monitoring and reporting, making it a key tool in strategic procurement and risk management.
Case 4	Solution provider technology enhances risk resilience by providing early warning signals on potential disruptions, enabling users to proactively manage inventory and communicate with suppliers and internal stakeholders. The tool supports decision-making processes by offering real-time risk insights, allowing organisations to take preventive actions and mitigate supply chain risks effectively. Confirmed: Solution provider SmartRisk platform uses AI-driven alerts to help organisations detect and respond to supplier disruptions in real time.[143]	The risk monitoring technology operates through an intuitive dashboard that requires minimal effort to navigate. The system is lightweight and accessible, allowing users to incorporate it easily into their daily operations. API-based integration ensures connectivity with other systems, enabling fast and efficient implementation without major technical challenges. Confirmed: The system is designed for rapid deployment and seamless integration via APIs, requiring little IT effort and no infrastructure overhaul.[144]		Solution provider technology is primarily used to detect and mitigate supply chain risks at an early stage. Companies leverage the system to proactively monitor potential disruptions, optimise inventory management, and facilitate communication with suppliers and internal stakeholders. The primary goal is to enhance risk resilience and ensure smooth procurement operations. Confirmed: The system enables fast, scalable deployment and real-time

[140] See Companies website/report
[141] See Companies website/report
[142] See Companies website/report
[143] See Companies website/report
[144] See Companies website/report

				insights, making it a strategic tool for risk mitigation and operational continuity.[145]
Case 5	Solution provider technology enhances efficiency and decision-making by filtering large amounts of data and providing targeted alerts on relevant developments. Users can quickly identify risks, track compliance-related news, and proactively respond to emerging issues in their supply chain. By reducing information noise and delivering only critical insights, the platform helps companies improve transparency, streamline risk management efforts, and increase visibility into potential risks. This enables businesses to act more strategically when mitigating risks in global sourcing. Confirmed: Solution provider leverages AI and LLMs to monitor over 3 million sources, delivering real-time, contextual risk insights.[146]	Solution provider platform is designed with usability in mind. Users can set custom alerts and receive email notifications on relevant developments, reducing the need to check the dashboard frequently. The interface is intuitive and requires minimal training, making it easy to implement. API integration ensures seamless connectivity with other platforms, offering flexibility in data access. While the system simplifies complex data by filtering relevant information, the user experience depends on individual preferences and engagement levels. Confirmed: Solution provider dashboard offers an intuitive interface with customisable alerts, and its API allows seamless integration into existing workflows.[147]		Customers primarily use solution provider technology to monitor business partners and stay updated on potential risks. The tool helps organisations identify compliance and regulatory issues by filtering relevant information from extensive data sources. This enables users to improve risk management, increase transparency, and make data-driven decisions in global sourcing. Solution provider is often integrated as part of a broader risk management framework, complementing other procurement and compliance tools. Confirmed: Solution provider platform is utilised by major enterprises for risk monitoring, with configurable alerts.[148]
Case 6	Solution provider enhances risk management by continuously monitoring suppliers and issuing early warnings for potential disruptions. The platform increases supply chain transparency by providing AI-driven insights and extending visibility to Tier 2 and Tier 3 suppliers. By categorising risks and issuing automated alerts, it supports decision-making and enables proactive risk mitigation. Confirmed: Solution provider provides real-time alerts based on AI-driven analysis of supply	Solution provider enhances risk management by continuously monitoring suppliers and issuing early warnings for potential disruptions. The platform increases supply chain transparency by providing AI-driven insights and extending visibility to Tier 2 and Tier 3 suppliers. By categorising risks and issuing automated alerts, it supports decision-making and enables proactive risk mitigation. Confirmed: Solution provider offers technical onboarding support to ensure smooth	Users initially require guidance to fully understand solution provider functionalities. After one or two onboarding sessions with product experts, most users gain familiarity with the platform and integrate it into their workflow. Its automated compliance and risk monitoring features contribute to sustained engagement over time.	Organisations primarily use solution provider to ensure regulatory compliance and automate supply chain risk management. The platform reduces manual compliance efforts by continuously monitoring suppliers for potential risks, helping organisations efficiently meet regulatory and operational requirements. Confirmed: Solution provider is used to support compliance with regulations such as CSDDD, CSRD.[151]

[145] See Companies website/report
[146] See Companies website/report
[147] See Companies website/report
[148] See Companies website/report
[151] See Prewave (n.d.)

	chain risks, supporting proactive decision-making.[149]	integration and usability for enterprises.[150]		
Case 7	Solution provider streamlines contract lifecycle management by automating processes such as contract creation, approvals, and compliance tracking. It improves transparency and efficiency by ensuring that contract details are correctly recorded, categorised, and monitored for key obligations. The collaboration portal facilitates supplier negotiations, enabling third parties to review and manage agreements in real time, improving communication and reducing manual intervention. Automated notifications and alerts support decision-making by reminding users of expiring contracts and key compliance requirements. A major benefit is standardisation, which helps organisations reduce complexity in global procurement by ensuring contract consistency across jurisdictions, contract types, and regulatory frameworks. The ability to automate contract updates and integrate external regulatory data enhances risk management and overall decision-making efficiency. <u>Confirmed</u>: Solution provider automates contract creation, compliance tracking, and obligation management using AI, helping organisations drive transparency, reduce risk, and increase efficiency.[152]	Solution provider is a cloud-based platform, meaning no software installation is required. It integrates flexibly with ERP and CRM systems through an open API approach. Standard integrations with SAP and other enterprise systems ensure compatibility across different environments. The ease of use depends on the level of configuration. While designed to be intuitive, implementation complexity varies based on organisational needs. Some companies become operational within three months, while others continuously refine contract management processes, leading to longer implementation times. Solution provider provides global implementation and support, with partners such as Accenture assisting in deployment. The system requires minimal infrastructure changes but configuring it to align with internal processes may require time and expertise. Advancements in generative AI have reduced training efforts, making adoption easier over time compared to earlier implementations. <u>Confirmed</u>: Solution provider offers easy integrations with SAP. It can be configured to align with internal processes.[153]	Customer attitudes towards solution provider are generally positive, with configurability and strong customer feedback being key strengths. While some users request additional features or customisation, the company actively incorporates feedback to enhance the platform. Low customer churn rates and an annual growth rate of 20-30% suggest that users find continuous value in the platform's features and improvements.	
Case 8	Solution provider technology enhances decision-making in global procurement by improving data quality and visibility. It enables companies to accurately identify suppliers, reduce reliance on	Solution provider technology is designed to be user-friendly despite its underlying complexity. The AI platform processes and categorises procurement data automatically, reducing, but not eliminating	Solution provider technology follow a typical adoption curve, similar to the Gartner Hype Cycle. Initial enthusiasm often leads to high expectations,	Customers primarily use solution provider technology as a data foundation to support various objectives, such as reducing complexity, improving visibility,

[149] See Companies website/report
[150] See Companies website/report
[152] See Companies website/report
[153] See Companies website/report

	intermediaries, and optimise procurement strategies. By preventing duplicate entries and improving categorisation, the system helps reduce inventory levels and free up capital. AI-driven classification ensures precise categorisation within complex taxonomies, streamlining procurement processes. The platform provides real-time insights that support strategic sourcing decisions based on actual consumption patterns. While not directly tracking carbon emissions, the technology contributes to sustainability by enabling more efficient procurement and inventory management. Confirmed: Solution provider offers AI-based solutions that clean, enrich, and classify procurement data to improve visibility, reduce complexity, and support more informed decision-making.[154]	manual intervention. Users do not need to be data experts but require initial training to effectively navigate the system and interpret AI-generated insights. The implementation process typically takes four to six months, depending on data complexity. During this phase, the AI is trained using customer data, supported by human-in-the-loop validation to refine accuracy. The system undergoes periodic updates to adapt to evolving procurement needs. The dashboard provides real-time insights, and seamless ERP integration ensures data accessibility. AI-driven automation streamlines procurement management while maintaining high data accuracy. Confirmed: Tool it described as intuitive and usable without specific data science knowledge. Moreover, it is easy to integrate.[155]	sometimes extending beyond the technology's actual capabilities. When challenges arise, some users experience a phase of disillusionment, especially if they expected the AI to solve broader issues beyond data classification and optimisation. Over time, as users gain a more realistic understanding of the technology's functions and limitations, adoption improves. However, not all companies transition smoothly into full acceptance some require additional education and support to integrate the tool effectively. Managing expectations from the start is crucial to ensuring long-term satisfaction with the technology.	enhancing transparency, and ensuring regulatory compliance. However, the specific priority of these objectives varies per company. Solution provider does not directly ensure compliance or transparency but enables these goals by providing structured, high-quality data. Through accurate identification and categorisation of components, the technology helps companies optimise procurement strategies, eliminate redundancies, and gain deeper insights into their supply chains, supporting more informed decision-making.
Case 9	Solution provider platform optimises indirect procurement by consolidating supplier management into a centralised marketplace with over 100 million items from both large and niche suppliers. It simplifies purchasing operations by offering single-creditor invoicing, reducing administrative costs and ERP complexity. The platform enhances transparency and compliance, ensuring that all suppliers are 100% European and fully vetted. Customers can compare suppliers in real time, considering prices, stock levels, delivery times, and compliance status to make data-driven purchasing decisions. Carbon	Solution provider platform has a low barrier to entry, allowing users to quickly start procurement with basic registration via a web-based interface. It offers multiple integration options, including API and EDI connections to ERP and e-procurement systems, enabling automated ordering and invoicing. The platform itself is user-friendly, with a marketplace-like interface that ensures intuitive navigation. However, complexity increases when integrating with ERP systems, as it involves purchase requisitions, approval workflows, and supplier management. Implementation	Customers generally perceive solution provider platform as user-friendly, with no significant complaints regarding complexity or navigation. The marketplace-like design makes it intuitive for users, especially those familiar with online shopping platforms. User adoption depends on procurement policies within organisations. When strict procurement rules enforce the platform's use, adoption remains stable. However, if policies allow Maverick buying, users may continue sourcing outside	Customers primarily use solution provider platform to combat Maverick procurement, streamline supplier management, and enhance procurement efficiency. The platform's single creditor model simplifies invoicing, reducing administrative overhead and the number of suppliers organisations need to manage. Sustainability goals are also a driver for adoption. Solution provider provides carbon footprint data per item, enabling companies to track emissions and meet procurement sustainability KPIs. Additionally,

[154] See Companies website/report
[155] See Companies website/report

	footprint analytics support sustainability reporting, aligning procurement decisions with environmental goals. The system also mitigates procurement risks and optimises purchasing efficiency through algorithm-driven supplier selection, balancing cost, delivery speed, and shipment efficiency. Confirmed: Solution provider marketplace simplifies indirect procurement by consolidating supplier management and enabling compliant, transparent sourcing decisions.[156]	time varies between six to twelve weeks, depending on the level of customisation and digitisation required. While users do not report major usability issues, ERP integrations require more effort due to the complexities of procurement workflows. Confirmed: With solution provider, users can easily get started via browser-based access, while ERP integrations the via API are also possible.[157]	the platform, affecting long-term engagement.	procurement insights and compliance verification support organisations in making informed and regulation-compliant purchasing decisions. Confirmed: Solution provider is used to streamline supplier management, improve purchasing compliance, and support sustainability tracking, including item-level carbon footprints.[158]
Case 10	Solution provider solutions improve decision-making in supply chain management by using data-driven optimisation, forecasting models and simulation tools. The technology improves transparency, efficiency and risk mitigation by enabling organisations to analyse multiple scenarios and refine decision-making processes. Solution provider supports cost reduction and operational efficiency by helping companies optimise inventory, streamline procurement and improve supply chain visibility. The tools facilitate data-driven decision-making, allowing companies to assess historical and forecast data for strategic planning. Confirmed: Solution provider states that its data-driven optimisation technologies help companies maximise resource utilisation, reduce costs, and make informed decisions.[159]	Solution provider solutions vary in ease of use, depending on the complexity of the project and user requirements. Implementation timelines range from a few weeks to several years, depending on the scope. Some customers require rapid implementation with minimal modifications (smaller businesses), while others are concerned with continuous development and refinement. Integration with existing IT systems is a major challenge, as compatibility with ERP and risk management platforms varies from client to client. User experience differs by target group. Technical users, such as supply chain planners, prefer functionality to aesthetics, while business analysts want a more intuitive and user-friendly interface. Data is often reviewed manually. Confirmed: Solution provider notes that the ease of use and implementation timeline vary significantly based on project size and integration needs,	Solution provider technology is gaining wider acceptance. Employees see how it streamlines processes and increases efficiency. Resistance to change remains a factor, but successful acceptance depends on communication and integration. Solution provider uses feedback loops to improve solutions	Customers adopt solution provider technology primarily to enhance decision-making, optimise supply chains, and improve operational efficiency. Confirmed: Solution provider highlights that its technologies support better decision-making and more efficient supply chain operations.[161]

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		especially around ERP compatibility and user roles.[160]		
Case 11	RFID improves supply chain visibility, traceability and transparency as individual items can be tracked and identified in real time. Traceability allows organisations to identify and analyse bottlenecks or interruptions, enabling more informed decisions. Improved visibility provides the data needed for efficient supplier management, allowing companies to quickly change suppliers or correct logistical errors. RFID technology improves operational workflows by replacing traditional barcodes, allowing faster, simultaneous and contactless scanning. This increases both processing speed and data accuracy in all supply chain activities. How much value it has, however, depends on the industry. Confirmed: Solution provider states that RFID improves process accuracy, enables better decision-making through real-time inventory insights, and helps reduce shrink and operational inefficiencies.[162]	RFID is seen as difficult to implement because of the complexity of large-scale tagging in various supply chains. This includes the challenge of calibrating tags consistently across hundreds of factories and distributors, often resulting in long implementation times. Entry barriers are high and require dedicated project teams and in-house expertise. Confirmed: Solution provider notes that large-scale RFID implementations can face problems due to calibration of tags in different factories and long implementation times requiring internal involvement. Therefore, you have to start small and everything is done in consultation.[163]	Customer attitudes towards RFID technology are generally positive and enthusiastic. However, negative experiences with (previous) consultative service without clear results, have contributed to scepticism. So, while the general attitude is positive, perceptions can vary widely based on historical experiences and previous implementation results.	The main purpose of RFID is to improve supply chain visibility and product integrity. Specific use cases include mitigating grey market risks, ensuring that products reach targeted geographical markets and maintaining brand reputation by verifying product quality in different markets. In addition, RFID helps organisations accurately verify shipments, preventing costly discrepancies and fines associated with incorrect deliveries or contract violations. Confirmed: Solution provider outlines that RFID is used to enhance product availability, prevent lost sales and grey market activity, and ensure compliance and shipment accuracy.[164]
Case 12	Solution provider improves procurement decision-making by enabling customers to integrate compliance and sustainability requirements directly into supplier selection and procurement workflows. The platform supports risk monitoring, expenditure-based emissions tracking, structured tender management, and the prevention of maverick buying by enforcing supplier qualification and approval processes. By combining sourcing, contract, and invoice	Solution provider can be linked to ERP system, but is also web-based. Data on expenses, suppliers and emissions are centrally accessible via a dashboard. Users can customise predefined templates for sourcing events. Confirmed: It can be linked to ERP system. All the data is accessible by a central dashboard.[166]		Customers primarily implement solution provider to reduce procurement complexity, enhance compliance with sustainability regulations, minimise supply chain risks, and automate end-to-end sourcing and procurement processes. Preventing maverick buying through structured supplier selection, spend visibility, eco-spend analysis, and integrated supplier

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	processes in one system, solution provider improves procurement transparency and operational efficiency. With its supplier network and integrated sourcing functionalities, solution provider helps organisations proactively meet regulatory expectations such as CSDDD. Confirmed: Solution provider streamlines supplier management through applications that find, qualify, evaluate, and develop suppliers. Digatalised supplier data can be easily synced with the solution providers network, so there are benefits like risk mitigation, secure supply, and compliance with laws, regulations and sustainability goals.[165]			management are key drivers for adoption.

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