

January 2024

Supply Chain Traceability:
*Where Are We on the Road from
Awareness to Implementation for
Sustainability in Supply Chains?*

Research
Report

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About the Study

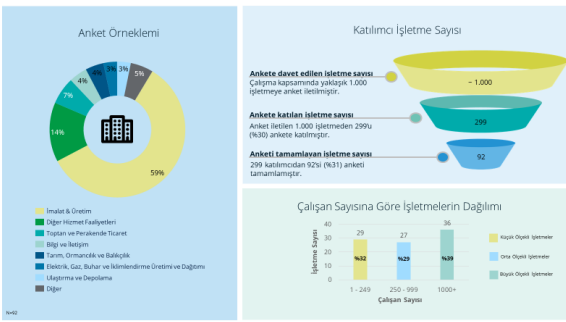
Our Approach

Our Approach

The design and analysis stages of the Traceability Survey in the Supply Chain are summarized below.

Traceability in Supply Chains Survey

- Determination of the appropriate method and technique for research
- Forming the questionnaire
- Distribution of the questionnaire and collection of results



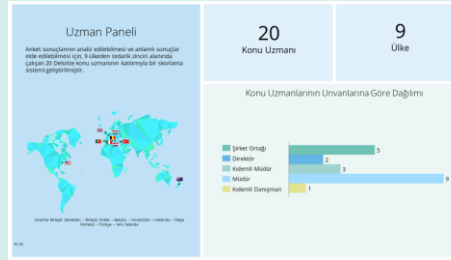
Categorization of Survey Questions

- Sorting the questions in the questionnaire by categories and subcategories



Expert Panel & Scoring

- Laying out the Expert Panel survey
- Distribution of the survey via Deloitte global network of experts
- Establishing the scoring system based on the results



Analysis of Results

- Editing data
- Calculation of categorical and overall scores based on business size
- Performing numerical analyses



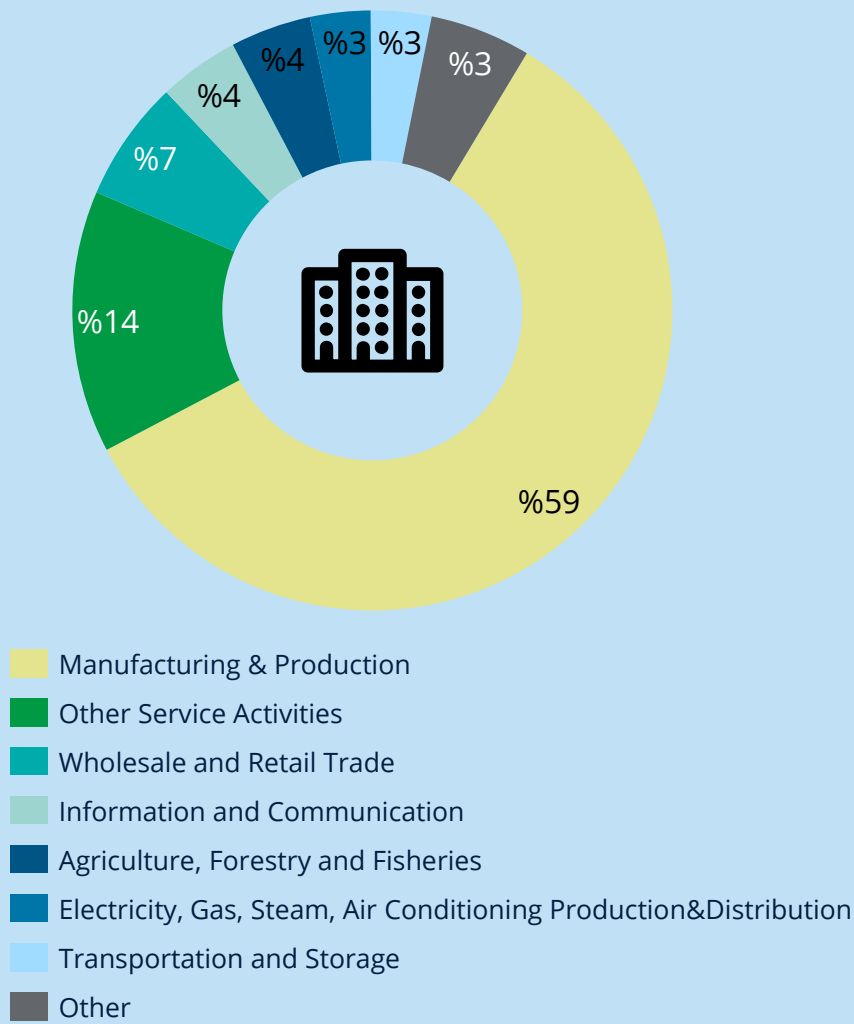
Recommendations

- Development and presentation of recommendations based on research findings, literature review and workshops



Research Sample

Sectoral Distribution of Participating Enterprises



Note: This research was conducted on the Qualtrics XM online survey platform between November 15-December 5 2022, and was distributed by e-mail.

Number of Participating Enterprises

Businesses invited to the survey

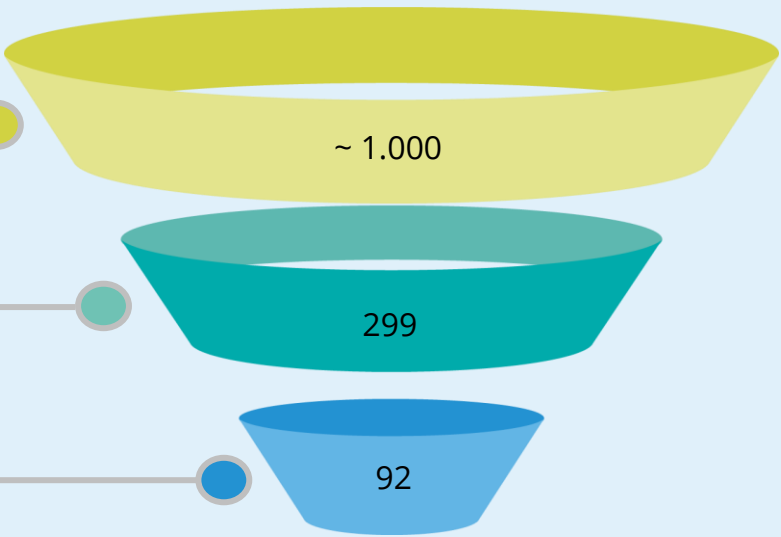
Within the scope of the study, a survey was sent to approximately 1,000 businesses residing in Türkiye.

Number of businesses surveyed

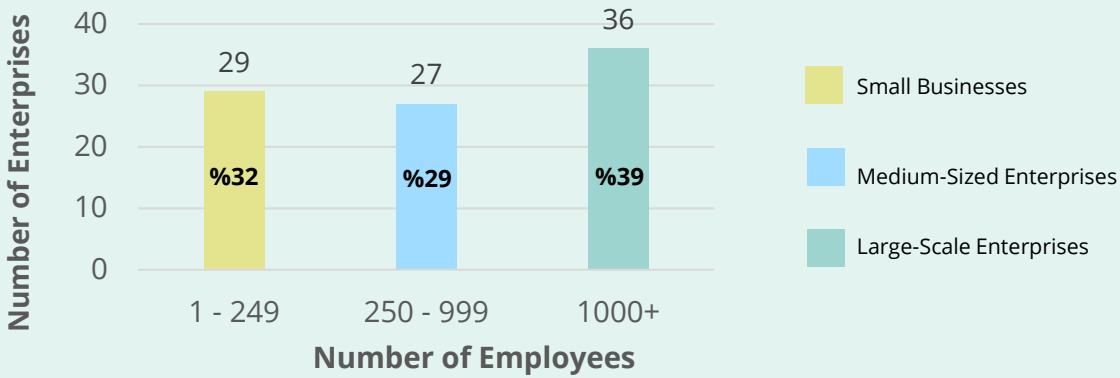
Of the 1,000 businesses, 299 (30%) participated in the survey.

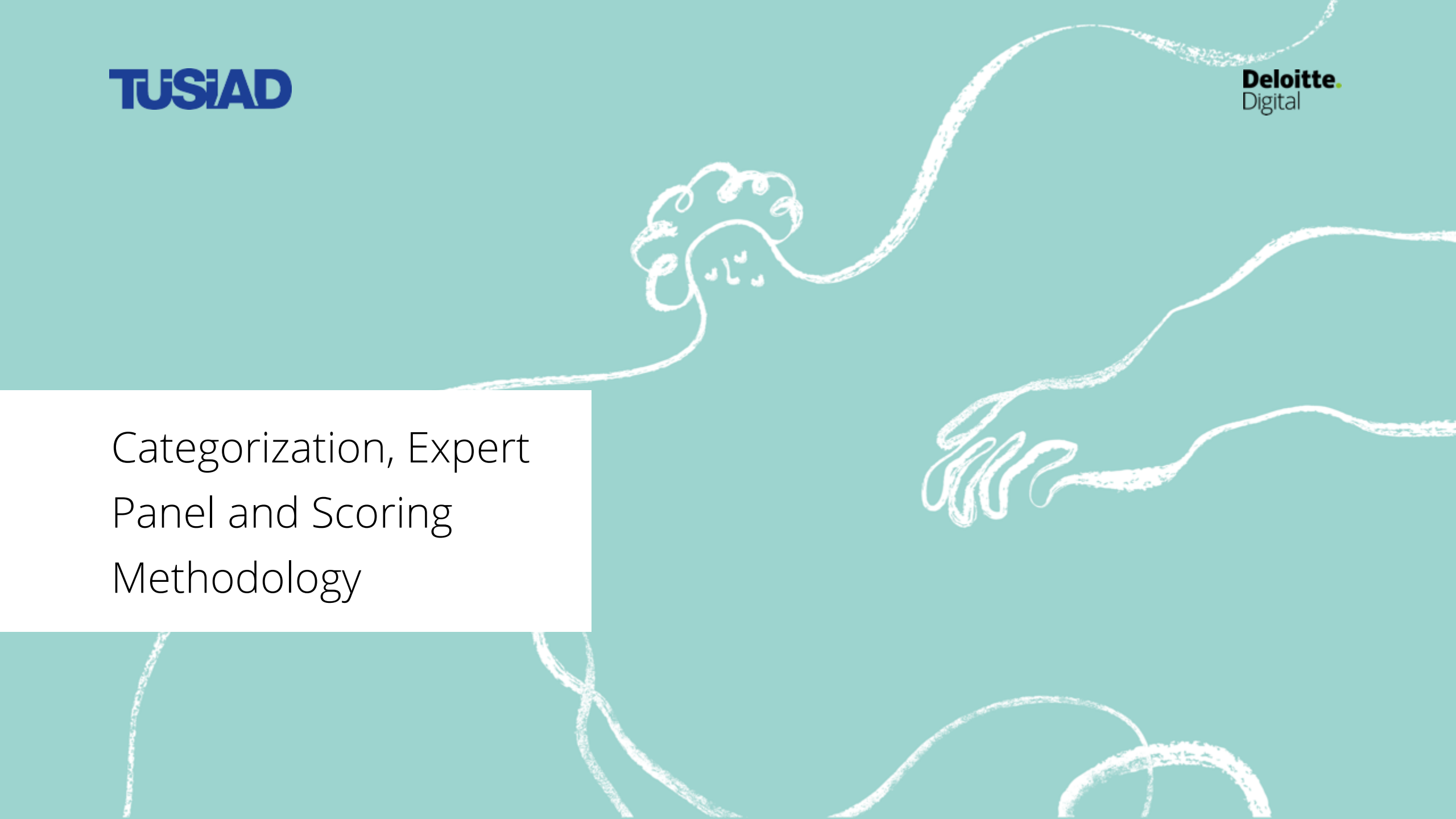
Businesses that completed the survey

Of the 299 participants, 92 (31%) completed the questionnaire.



Distribution of Enterprises by Number of Employees

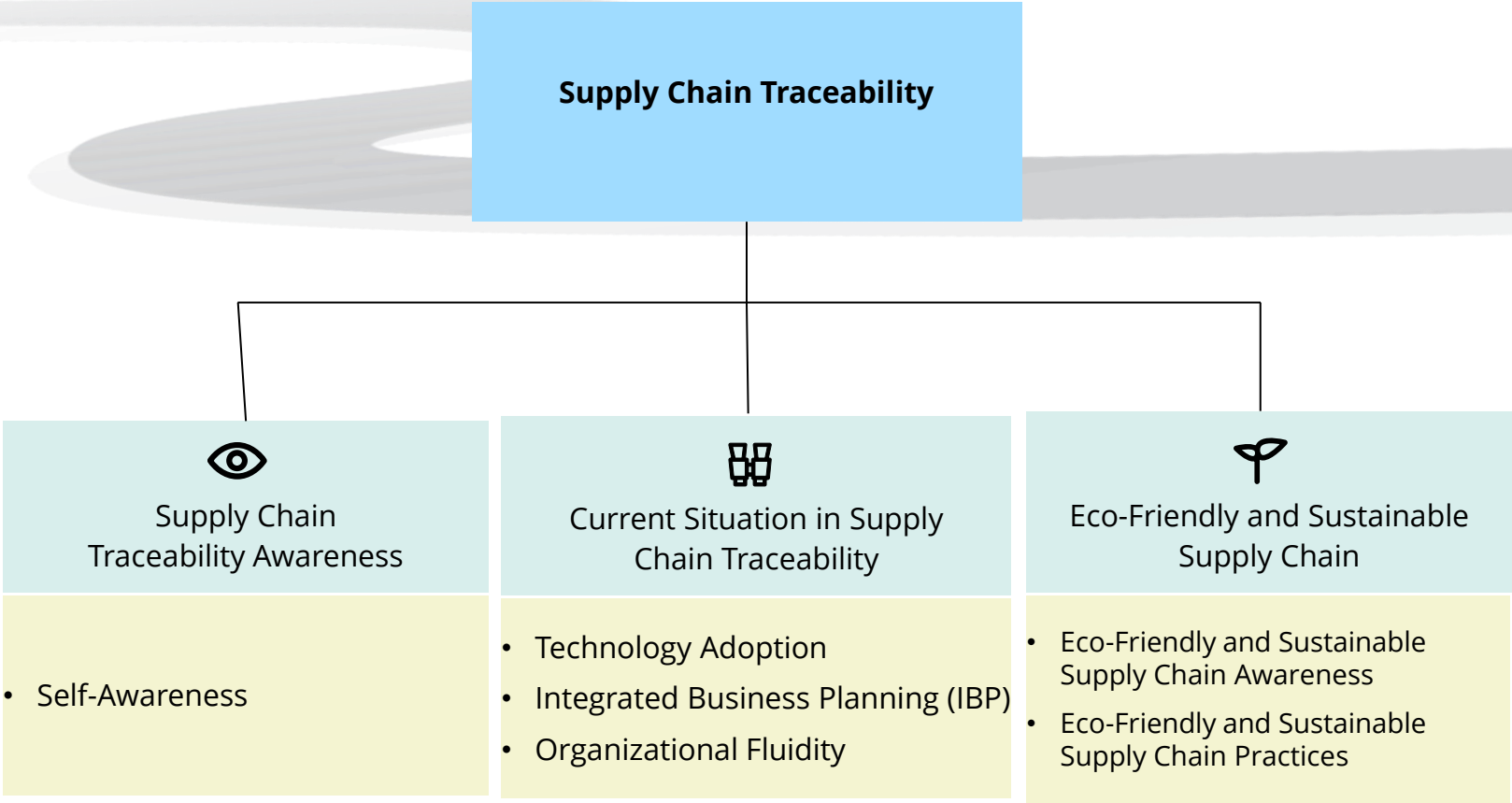


Abstract white line art on a teal background, featuring a large, complex, swirling shape in the upper left and several long, flowing, wavy lines extending across the right side and bottom of the page.

Categorization, Expert Panel and Scoring Methodology

Categorization of Survey Questions

The 24 questions in the questionnaire were classified into three categories and six sub-categories. Thus, the performance of businesses both generally and categorically could be measured, and relationships between categories could be monitored.



¹ Filter questions used to determine demographics were excluded.

Expert Panel

A categorization and scoring system has been developed with the participation of 20 Deloitte experts working in the field of supply chain from 9 countries¹ to analyze the survey results and achieve meaningful results.



¹ United States, United Kingdom, Belgium, Croatia, Netherlands, Italy, Portugal, Türkiye, New Zealand

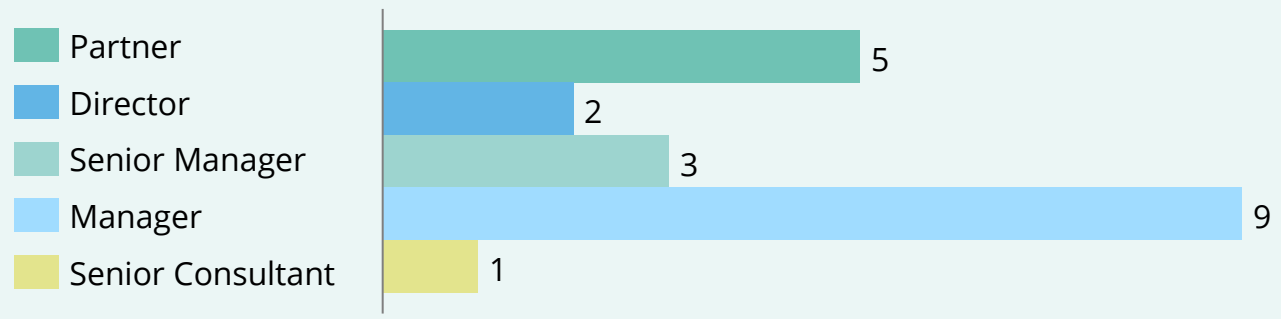
20

Subject Matter Experts

9

Countries

Distribution of Subject Matter Experts by Title



Scoring Methodology

Panel-based scoring with Deloitte's global subject matter experts in the analysis of survey responses and the generation of categorical/overall scores system is used.

Based on the expert panel with Deloitte global subject matter experts;

- Weight of importance for each question asked in the research questionnaire within the relevant subcategories,
- Weight of importance for subcategories within the relevant category
- comparative importance of categories

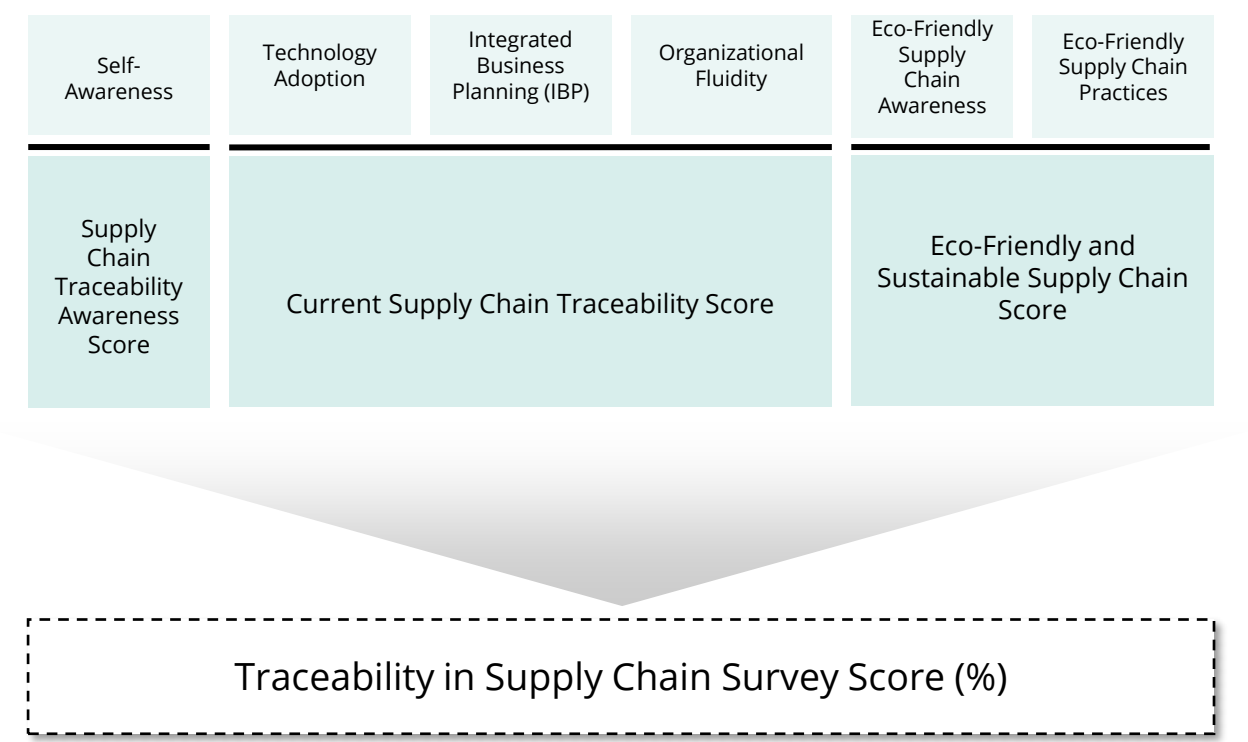
were determined.

Based on the determined weights, on the basis of enterprises;

Traceability in Supply Chain Survey Score

- Supply Chain Traceability Awareness Score
- Current Supply Chain Traceability Score
- Eco-Friendly and Sustainable Supply Chain Score

has been calculated.



Scoring Methodology – Weighting and Categorization

With the scoring system based on the expert panel used in the analysis of the answers obtained from the questionnaire and in obtaining categorical/general scores, relevant scores were obtained by calculating the sub-category and category weights of importance. The table below shows the weights of the relevant questions and subcategories/categories.

	Category Weight	Category	Subcategory Weight	Subcategory	Question Weight	Question
Supply Chain Traceability Survey Score (%)	1,52	Supply Chain Traceability Awareness Score	1	Self Awareness	1	Question 4
	2,95	Current Supply Chain Traceability Score	3,58	Technology Adoption	3,95	Question 5
					1,99	Question 10
			2,7	Integrated Business Planning (IBP)	2,89	Question 6
					1,58	Question 7
					3,3	Question 8
					1,52	Question 11
					2,52	Question 15
					2,89	Question 16
					3,3	Question 8
					1,95	Question 9
			1,64	Organizational Fluidity	1,58	Question 12
					2,39	Question 13
					2,27	Question 14
	2,58	Eco-Friendly and Sustainable Supply Chain Score	3,2	Eco-Friendly Supply Chain Awareness	2,45	Question 17
					1,77	Question 22
					2,77	Question 23
					2,27	Question 24
					1,77	Question 25
					0,7	Question 26
			4,2	Eco-Friendly Supply Chain Practices	3,64	Question 18
					3,02	Question 19
					2,77	Question 20
					1,83	Question 21
					2,58	Question 27



Current Situation in Supply Chain Traceability



The background of the slide is a solid light green color. Overlaid on this background are several thin, white, hand-drawn style lines. These lines form abstract shapes, including a large, flowing line that curves across the upper right, and several smaller, more geometric shapes like a vertical line with a horizontal bar and some scribbles at the bottom right.

Supply Chain Traceability Awareness

Traceability Awareness in Supply Chains

Participating enterprises were asked to evaluate their self-awareness on the traceability of supply chains. Based on their given answers, the level of awareness of different scales of enterprises are shown below.

Enterprises By Their Scales



N=92

Question 4: How would you evaluate the level of awareness in your company about traceability in supply chains?

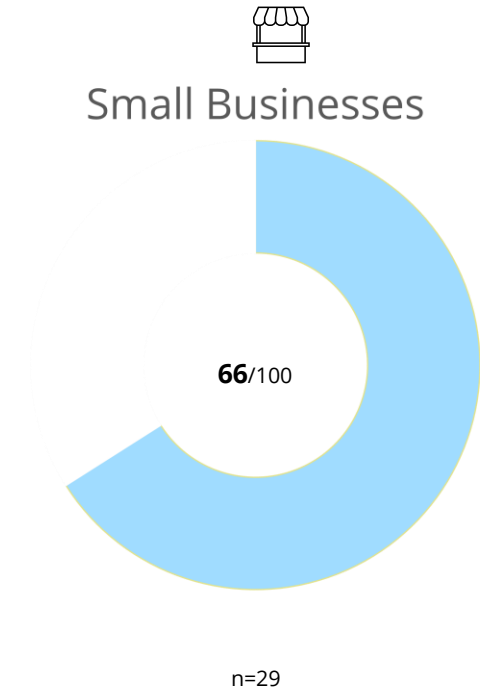
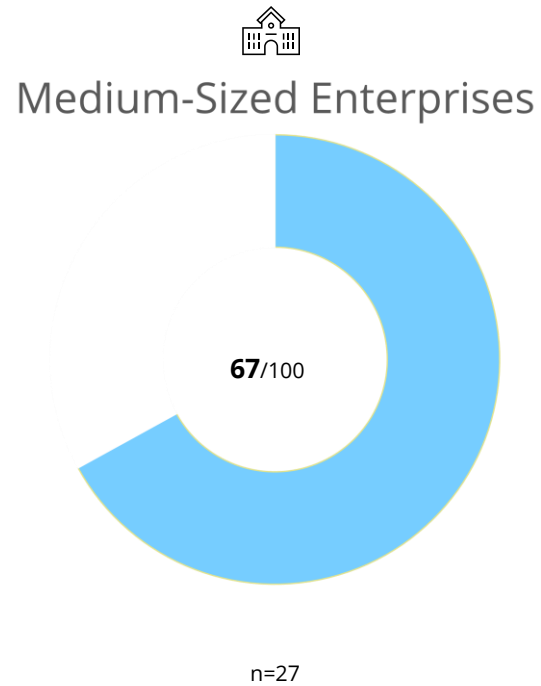
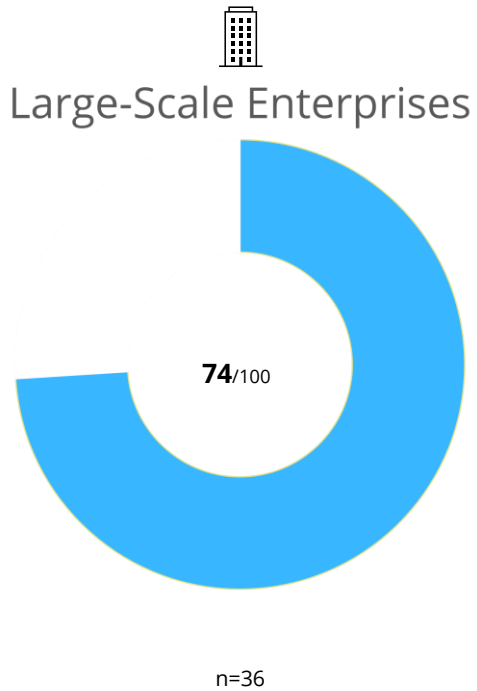
* The Supply Chain Traceability Awareness Score was created based on the answer given by the businesses to the relevant question. The level of awareness expressed may not fully reflect the current situation of the businesses concerned.

Technology Adoption

Technology Adoption

It was measured to **what extent the participating enterprises adopted supply chain management technologies in their supply chain processes.**

According to the answers given, the "Technology Adoption Score" of the enterprises was determined, and the average scores of the enterprises in different scales are shown below.



N=92

Question 5: My company can see the supply chain end-to-end in real time with an integrated platform for analytical simulations and alerts.

Question 10: My company has real-time inventory visibility in storage areas.

Integrated Business Planning (IBP)



Integrated Business Planning (IBP)

The integrated business planning competencies of the participating enterprises were measured by six different questions. According to the answers given, enterprises' "Integrated Business Planning Competence Score" was created.

Procurement Plan Generation

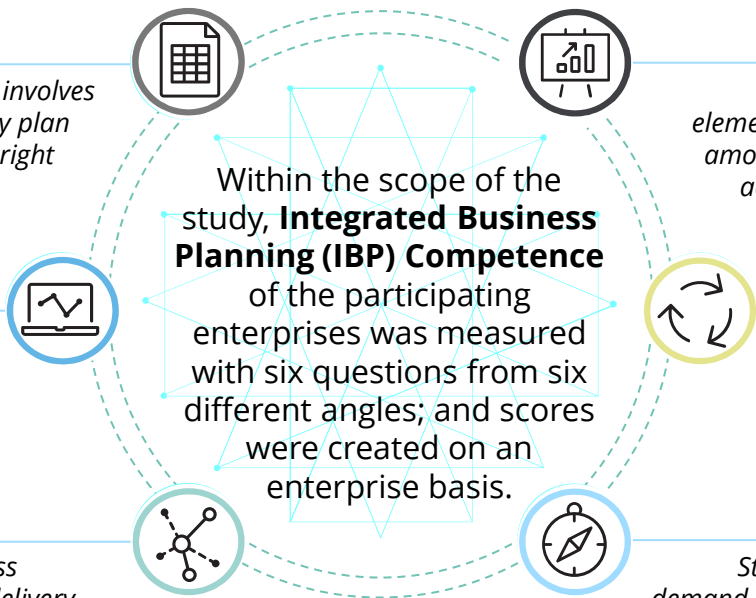
Procurement plan generation is a multifaceted process that involves demand forecasting and production planning. A good supply plan ensures that the right amount of product is available at the right time.

Utilization of Analytical Methods

Analytical methods in supply chain management ensure data-driven decision making, enabling businesses to manage their supply chain in an insight-driven, efficient, and cost-effective manner.

Logistics Planning & Optimization

Logistics planning and optimization is a fundamental process necessary to increase efficiency, reduce costs and improve delivery times.



Sales and Operations Planning (S&OP)

Designing and managing the S&OP process is one of the key elements of IBP competence. It creates harmony and coordination among sales (demand) forecasts and production plan with other activities of the business, ensuring cooperation and increasing total efficiency.

Dynamic Demand Planning

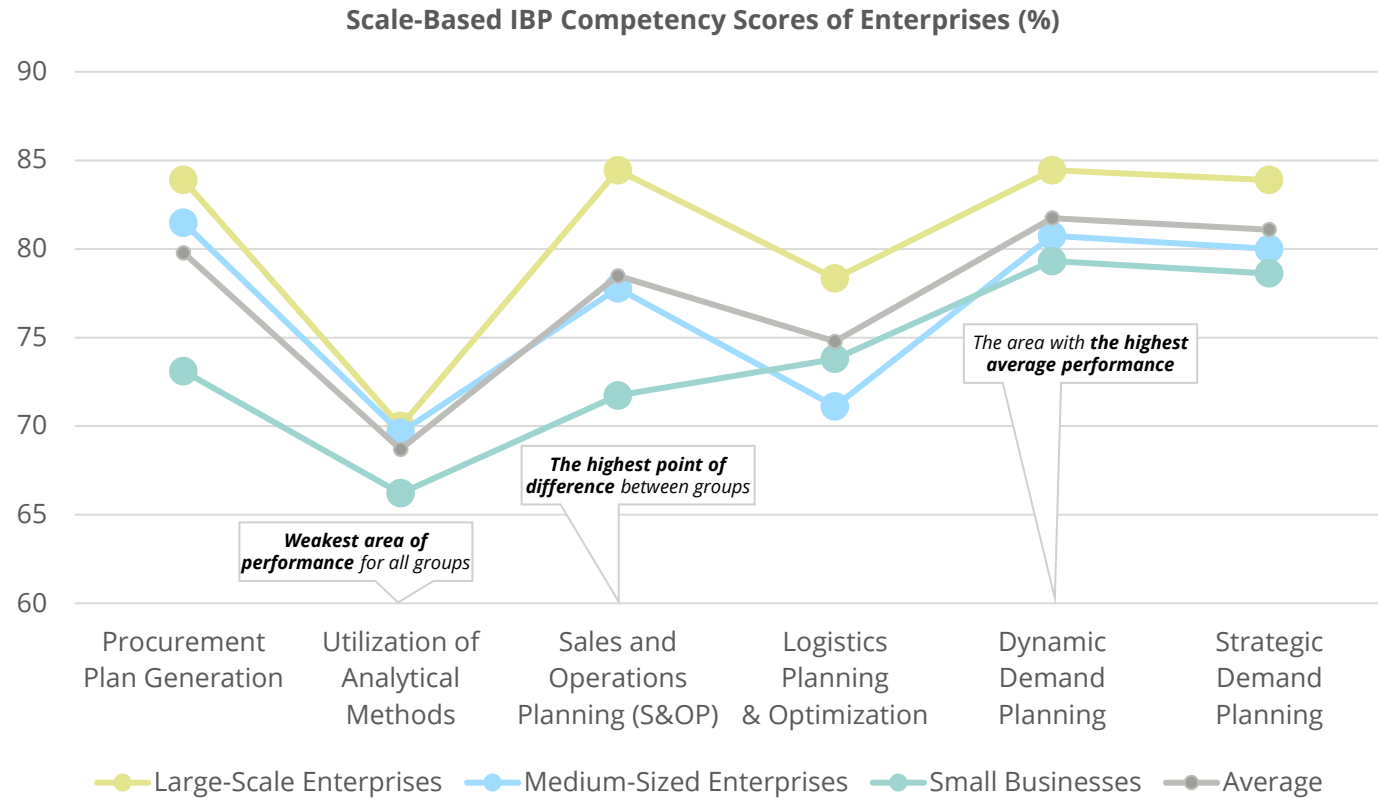
Dynamic demand planning ensures that demand is continuously monitored and supply chain activities are executed based on real-time demand.

Strategic Demand Planning

Strategic demand planning enables the forecasting of long-term demand and the creation of a business strategy based on this demand.

Integrated Business Planning (IBP) Competency

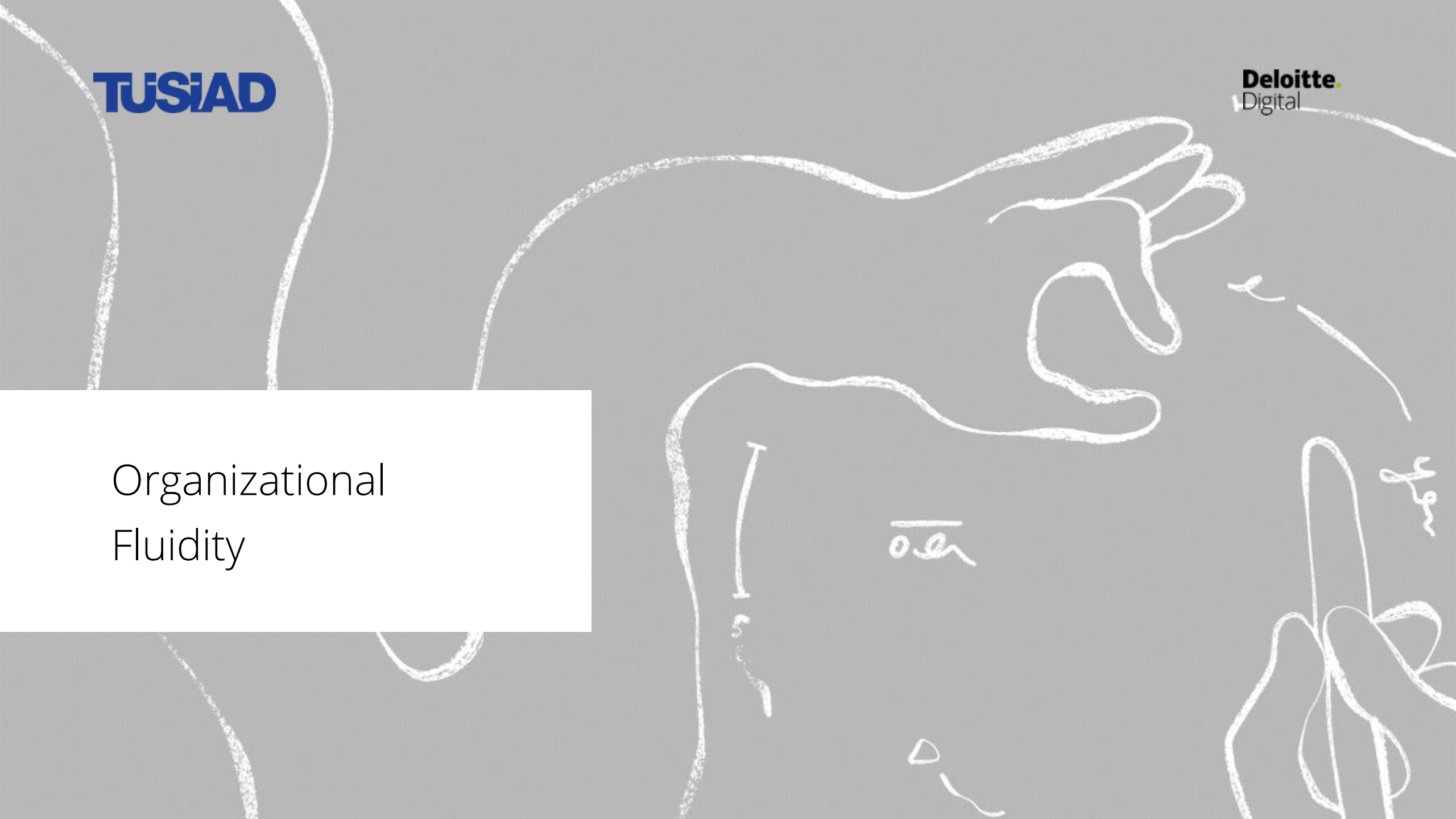
In the IBP competence subcategory, large enterprises performed better compared to medium-sized enterprises and medium-sized enterprises performed better compared to small enterprises. The nuanced results are shown on the graph.



N=92

Question 6: My company produces the procurement plan taking into account operational constraints - manages capacity and supplies over the network.
Question 7: My company has the capability of what-if modeling to evaluate multiple procurement planning scenarios during the day and create an optimized plan.
Question 8: My company has a Sales and Operations Planning (S&OP) process in which all units are input, followed up with regular meetings and the responsibilities of the process owners are determined in order to align their strategic, financial, sales and operational goals.
Question 11: My company has real-time shipping planning and optimization.
Question 15: My company ensures the right size of stock and product flow in the supply chain and replenishes stocks based on demand.
Question 16: My company can see the forecasted demands as short, medium and long term and create an optimized demand plan.

Organizational Fluidity



Organizational Fluidity

Participating enterprises were asked five questions in the **"Organizational Fluidity"** sub-category, and according to the answers given, the scores of enterprises in different scales are shown.

Sales and Operations Planning (S&OP)

Purchasing

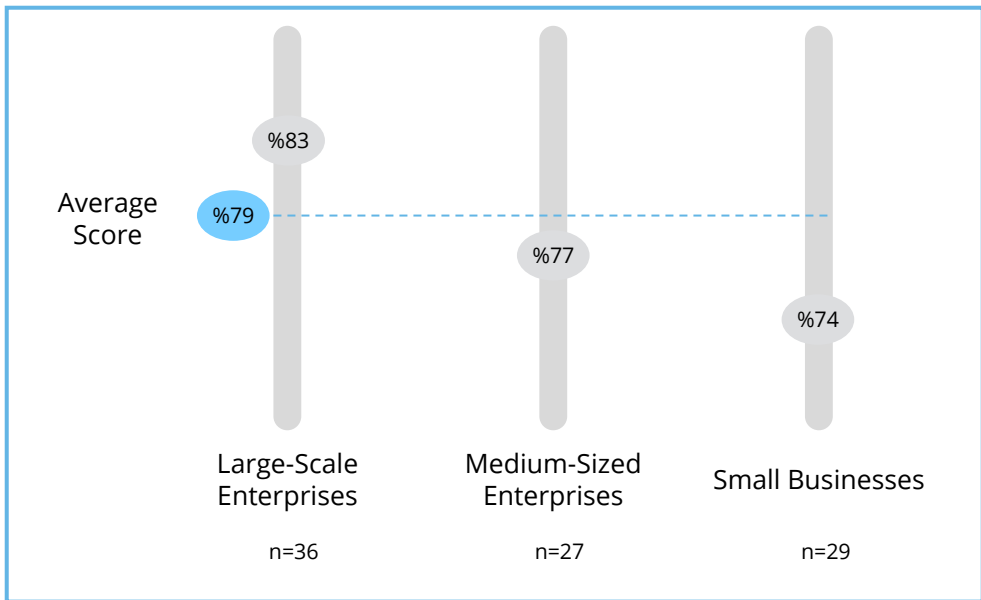
Resource Management



Logistics and Storage

R&D

Organizational Fluidity: An organization's ability to adapt quickly and effectively to changing market conditions. Organizational fluidity requires a flexible and dynamic approach to decision-making, resource allocation, and communication. Teams collaborate to achieve the goals of the organization and can change what exists when necessary. This agility enables companies to remain competitive in changing market conditions, find innovative solutions to problems, and respond quickly and effectively to challenges.



N = 92

Question 8: My company has a Sales and Operations Planning (S&OP) process in which all units are input, followed up with regular meetings and the responsibilities of the process owners are determined in order to align their strategic, financial, sales and operational goals.

Question 9: My company has multiple alternatives and a regular distribution logistics process to optimize its warehousing operations.

Question 12: My company's purchasing department facilitates information sharing and collaboration from suppliers on product design/development and process innovation.

Question 13: My company has advanced sourcing competencies integrated with product development, production and R&D processes.

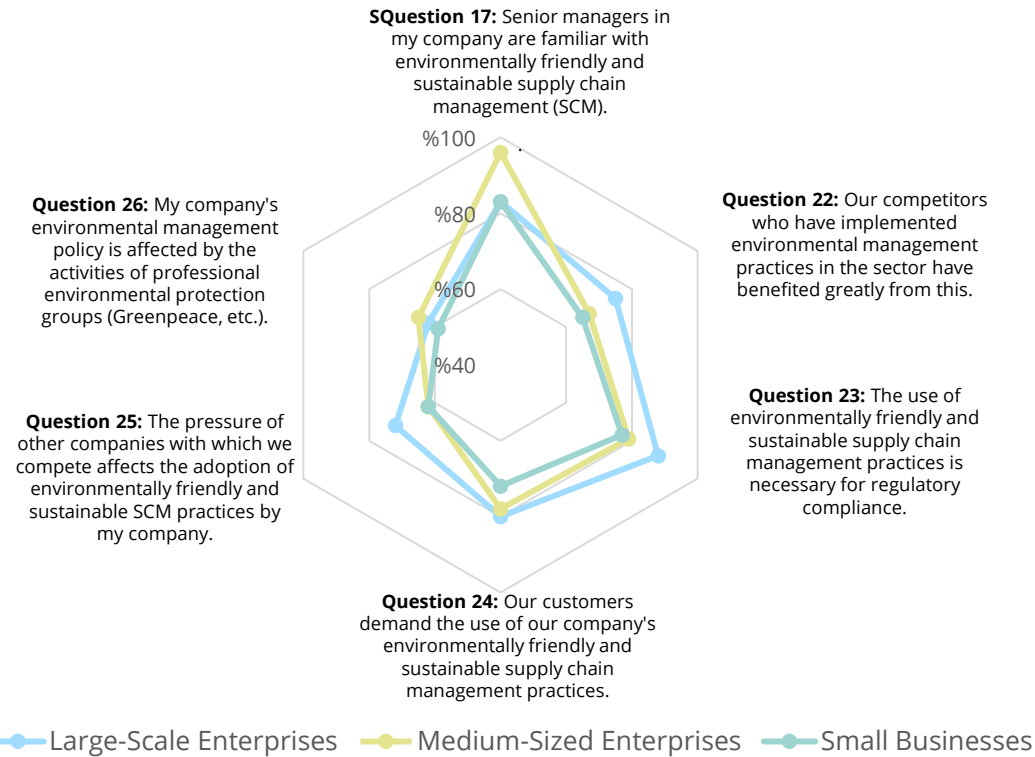
Question 14: My company can work in integration with suppliers in the sourcing process.

Towards an Environmentally Friendly and Sustainable Supply Chain

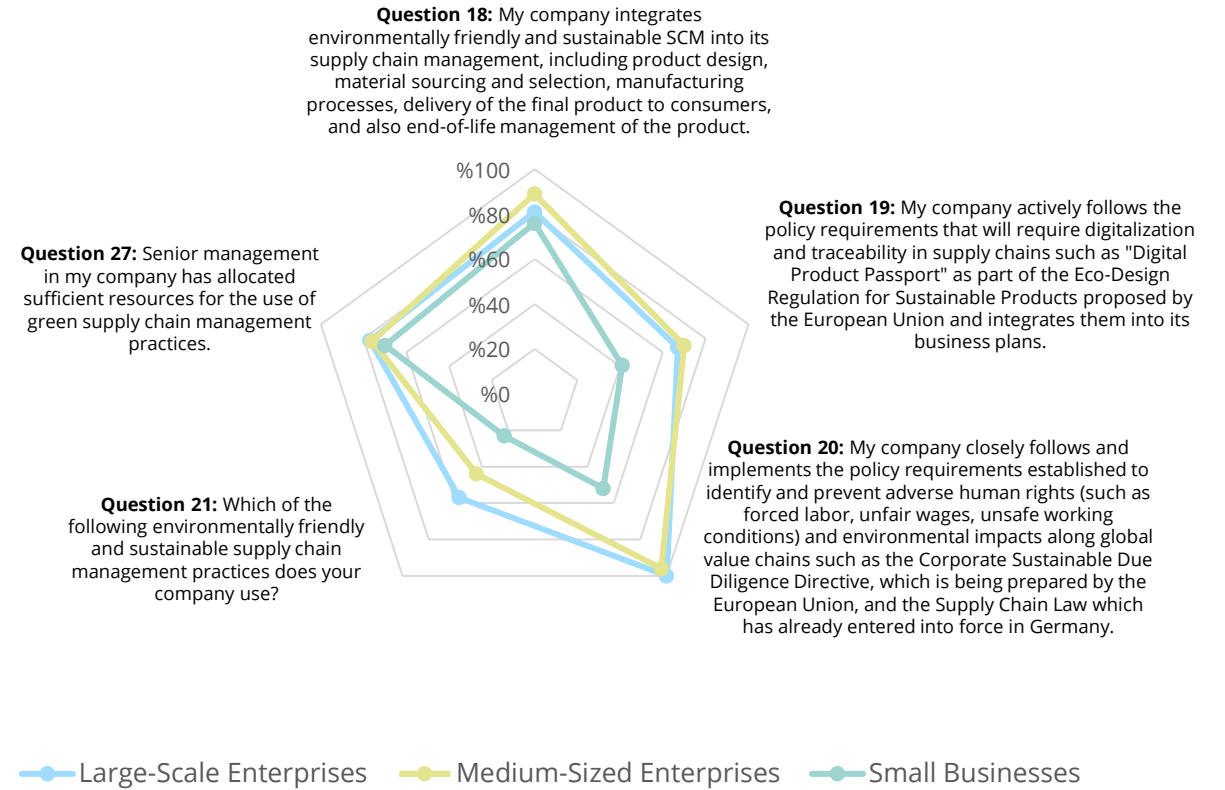
Environmentally Friendly and Sustainable Supply Chain

In the environmentally friendly and sustainable supply chain awareness subcategory, while the high level of awareness of company executives stands out, it is noteworthy that medium and large-sized enterprises follow the relevant legislation of the EU.

Environmentally Friendly and Sustainable Supply Chain Awareness

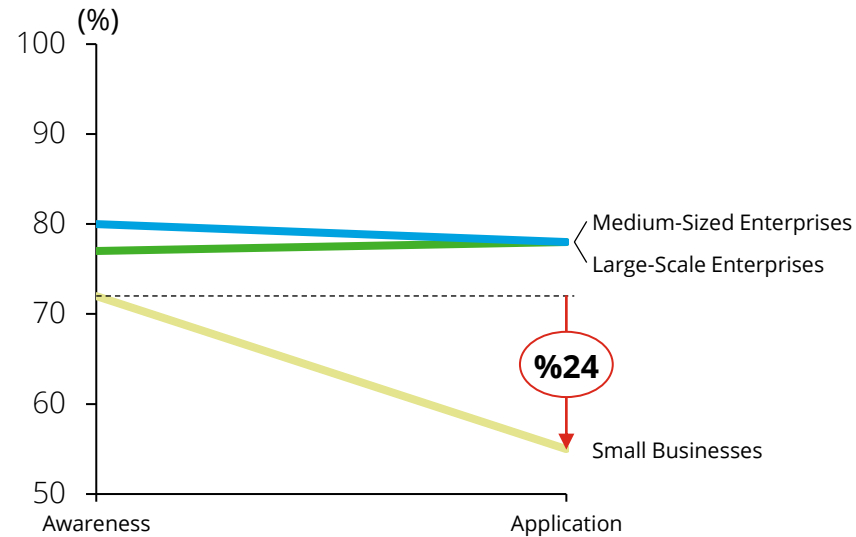


Environmentally Friendly and Sustainable Supply Chain Practices



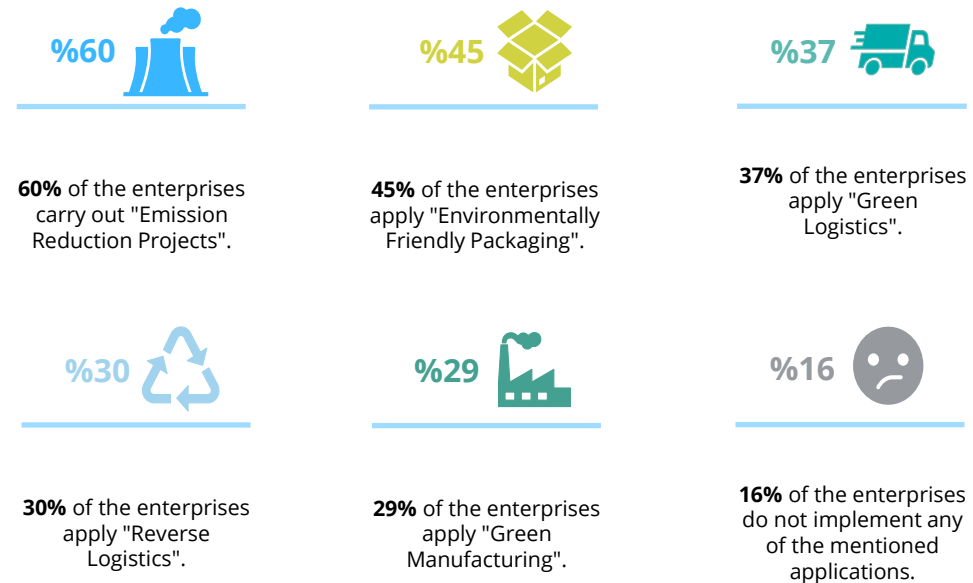
Environmentally Friendly Supply Chain *Practices*

Implementing environmentally friendly supply chain practices: The gap between “Awareness” and “Application” is a prominent phenomenon in small businesses.

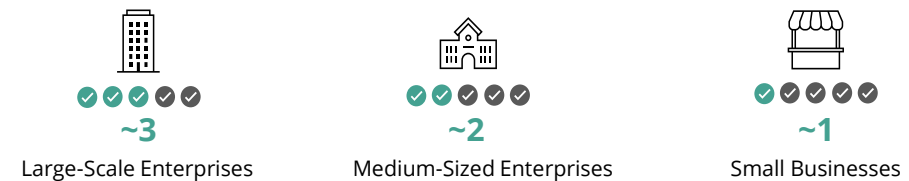


Despite their not-so-low level of awareness, small businesses cannot adequately implement environmentally friendly supply chain practices compared to medium and large-scale businesses in the benchmark group. Possible causes of negative deviation here:

- Limited resources: human resources, financial resources, etc.
- Lack of “know how”
- Limited supply network.



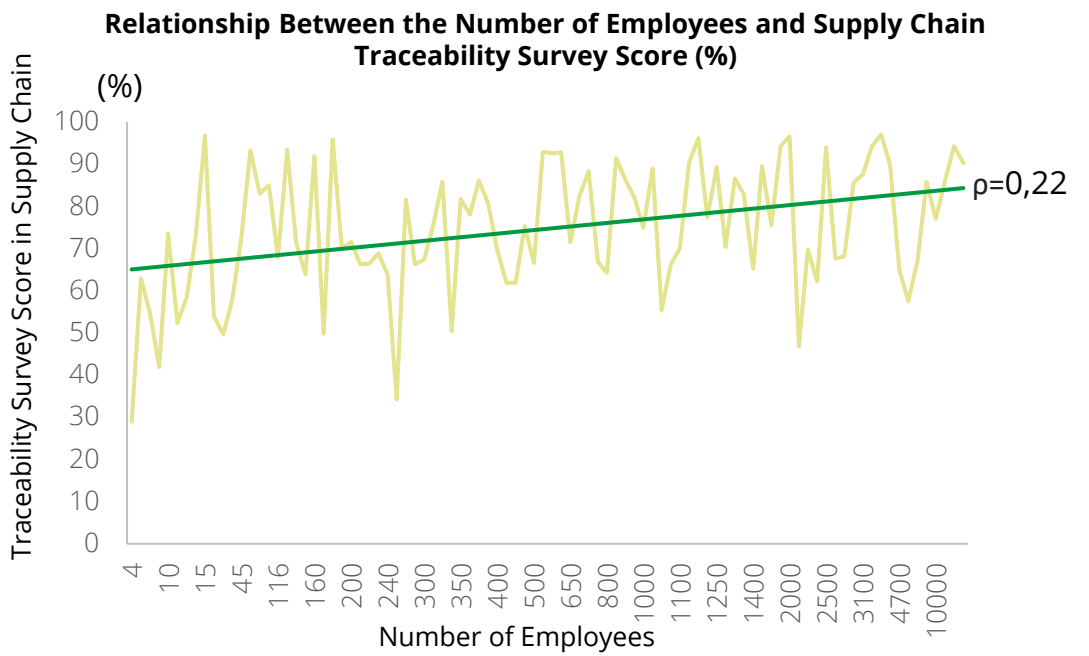
Below is shown how different sized enterprises benefit from environmentally friendly supply chain applications:



Conclusion

Observations

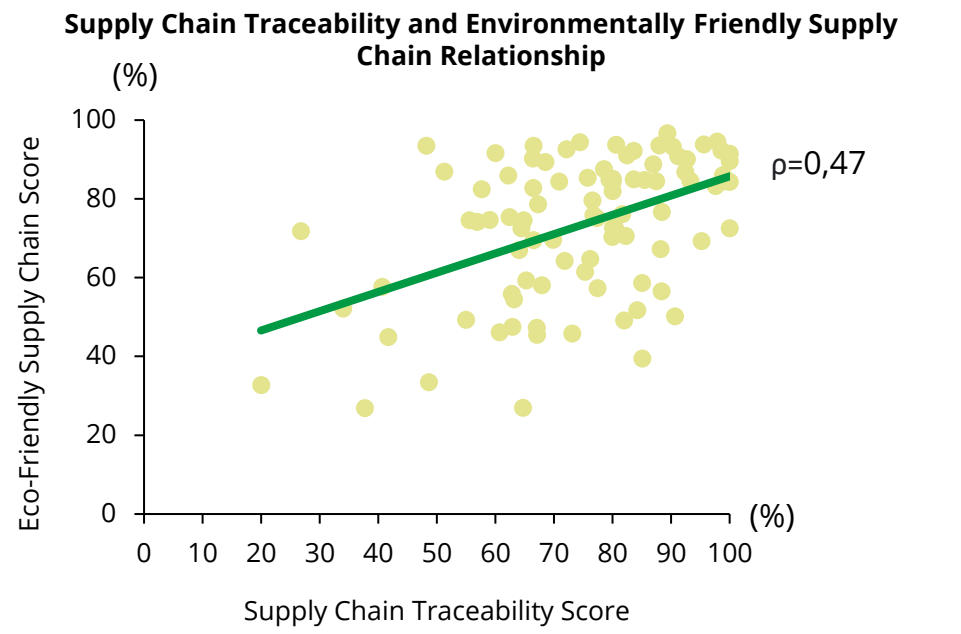
When we look at traceability in the supply chain as a whole, it is not a nuanced phenomenon that can be explained solely by the scale of the enterprise (number of employees); category-based analyses reveal that the path to an environmentally friendly supply chain starts from traceability.



Business Size Alone Not Enough to Explain Traceability in Supply Chain

Although it was observed that there was a very limited positive linear relationship between business size (number of employees) and survey score, it was observed that business size alone was not a determining factor, and businesses of similar scale could perform at different levels.

N=92
 p : Correlation coefficient



Traceable Supply Chain: The Key to Environmentally Friendly Supply Chain

A measured positive correlation was observed between Supply Chain Traceability Score and Environmentally Friendly Supply Chain Score. A traceable supply chain is considered to be a prerequisite for an environmentally friendly and sustainable supply chain.

Key Development Areas

Development areas of businesses in Supply Chain Traceability and Environmentally Friendly Supply Chain vary **based on business size and subcategories**. The following priority development areas have been determined with the data obtained as a result of the study.

Category	Subcategory	Small Businesses	Medium-Sized Enterprises	Large-Scale Enterprises	Average
Supply Chain Traceability Awareness	Self-Assessment	0,73	0,77	0,82	0,78
Current Situation in the Supply Chain Traceability	Technology Adoption	0,66	0,67	0,74	0,70
	Integrated Business Planning	0,74	0,78	0,82	0,78
	Organizational Fluidity	0,74	0,77	0,83	0,79
Environmentally Friendly and Sustainable Supply Chain	Environmentally Friendly and Sustainable Supply Chain Awareness	0,72	0,77	0,80	0,77
	Environmentally Friendly and Sustainable Supply Chain Practices	0,55	0,78	0,78	0,71



- The weakest relative performance of **medium and large-sized enterprises** within the scope of the research stands out as the adoption of insight (analytics)-based technologies that enable instant monitoring and decision-making in supply chain processes. This subcategory is also **the second area where small-scale businesses perform the lowest**.
- The most prominent area of development in **small businesses** is the use of environmentally friendly supply chain practices. Businesses' ability to make progress in this field depend on increasing and generalizing their access to environmentally friendly supply chain practices.

N=92

Suggestions

Suggestions (1/5)

The findings of this research report have been discussed in workshops with the participation of industry and subject matter experts¹. Suggestions have been developed pluralistically and enriched with open source research and presented under the table below.




Title	Summary Description	Impact	Applicability
Awareness, capacity development, mentoring and acceleration programs	<ul style="list-style-type: none">It is important to design and implement practical training programs focused on sharing knowledge and experience in order to support the capacity building activities of small and medium-sized enterprises (SMEs).In order to support (small-scale) businesses with relatively low rates of use of sustainable and environmentally friendly practices in the supply chain, the implementation of mentoring/coaching programs where businesses with experience in relevant practices can transfer their experience strengthen the cooperation in the ecosystem. In order to make the concrete benefits of traceability practices visible in the supply chain, organizing exploratory visits, such as field visits to ecosystem actors who stand out with good practice examples, has the potential to increase awareness in the focus of experience with a "show not tell" leadership approach.It is critical to organize meetings where businesses in need of technological solutions can interact with companies that can be their "solution partners".<ul style="list-style-type: none">For example, TÜSİAD Digital Transformation in the Industry (TÜSİAD SD²) Platform, which has been bringing together technology user companies and technology supplier companies within the framework of technology needs since 2018, contributes to the development of digitalization-oriented collaborations.The creation of multi-stakeholder (main and sub-industry, academia, NGOs and public institutions) acceleration programs can act as a catalyst in the ecosystem so that businesses that are aware of their needs for transformation can access financial and technical support.		

 High  Low

¹ A full list of relevant workshop participants is available in the appendices to this report.
Note: Solution proposals are ranked from high to relatively low on the applicability scale.

Suggestions (2/5)

The findings of this research report have been discussed in workshops with the participation of industry and subject matter experts¹. Suggestions have been developed pluralistically and enriched with open source research and presented under the table below.

Title	Summary Description	Impact	Applicability
<i>Maturity assessment and roadmap development programs and tools</i>	<ul style="list-style-type: none">Within the scope of conceptual design studies to increase traceability and sustainability in the supply chain, it is of great importance to carry out a needs analysis suitable for the scale of the enterprises, to reveal the digitalization and analytical current situation assessment in this field by comparing it with the industry average for the enterprises at a similar scale, and to design programs that will include the processes of determining the target status on an enterprise basis and determining the competency and resource requirements in accordance with the targets within the scope of this evaluation.<ul style="list-style-type: none">In this context, SIRI (Smart Industry Readiness Index) -like tools that evaluate the industrial digital maturity of enterprises stand out as applications that will make the digitalization journey of companies more insight-oriented with their metric-based structure.Preparing supply chain digitalization roadmaps for companies in need can help businesses to address, measure, evaluate and plan their digitalization activities in this field within a structural framework.		
<i>Main industry sustainability policies and commitments</i>	<ul style="list-style-type: none">The fact that large-scale enterprises determine and manifest their own supply chain policies (e.g., monitoring and reporting Scope-III emissions) can contribute to the relative awareness of other stakeholders in the supply chain on sustainability and to their eagerness to put awareness into action.Within the scope of these policies, the main industrial enterprises may request audit and reporting practices from their suppliers (sub-industry enterprises) where they produce common value for the end user along a chain in the market..Thus, for suppliers, the economic return of investing in sustainability practices that they will commission and/or improve to respond to the demands of main industrial enterprises can be more easily calculated; these practices can spread more quickly among SMEs.		

¹ A full list of relevant workshop participants is available in the appendices to this report.
Note: Solution proposals are ranked from high to relatively low on the applicability scale.

Suggestions (3/5)

The findings of this research report have been discussed in workshops with the participation of industry and subject matter experts¹. Suggestions have been developed pluralistically and enriched with open source research and presented under the table below.

Title	Summary Description	Impact	Applicability
<i>Incentive and support programs specific to sectoral needs</i>	<ul style="list-style-type: none">• Customization of incentive and support programs on a sectoral basis allows the development of programs for the variable needs and priorities of the sectors and the adaptation of the existing ones.<ul style="list-style-type: none">◦ For example, a project focused on the green transformation of the supply chain was carried out on carbon emission calculation of 100 companies operating in the metal sector by MEXT Technology Center in cooperation with the Danish Confederation and the Turkish Confederation of Employers' Unions (TISK), providing online and in-class basic sustainability trainings. In line with the achievements of this sectoral project, the second phase of the project will be implemented in the textile sector.• Evaluating the practices privatized on a sectoral basis relative to international benchmark groups allows Turkey's public incentive/support programs to be compared with similar programs in other countries based on criteria such as scope/inclusion, effectiveness and purpose/goal. In this way, it may be possible for improvement areas to become more visible and focused in order to increase the effectiveness of the programs.		
<i>Integration schemes/mechanisms among main- and sub-industry enterprises</i>	<ul style="list-style-type: none">• Fully enabling traceability in complex supply chains (Tier-1, Tier-n) that accommodate a large number of suppliers in key industrial enterprises can only be achieved by working integrately with these suppliers (relevant sub-industry enterprises).• In this context, by establishing strategic partnerships with the main industry and supplier enterprises, establishing and operating real-time or near-real-time modern integration setups (e.g. with solutions such as ETL, ELT, API, RPA, etc.), including issues such as information/data sharing in the contract processes, designing inclusive integration setups in accordance with the relevant laws and regulations from the design onwards can provide traceability in the supply chain in a real sense and can be one of the most important prerequisites for sustainability in supply chains.		

¹ A full list of relevant workshop participants is available in the appendices to this report.
Note: Solution proposals are ranked from high to relatively low on the applicability scale.

Suggestions (4/5)



The findings of this research report have been discussed in workshops with the participation of industry and subject matter experts¹. Suggestions have been developed pluralistically and enriched with open source research and presented under the table below.

Title	Summary Description	Impact	Applicability
<i>Supply chain traceability technology applications / tools</i>	<ul style="list-style-type: none">Traceability technology applications / tools can be developed in the supply chain that can serve the different needs and priorities of the sectors with the cooperation of universities, innovation interfaces offered by universities (technoparks and academic entrepreneurship) and non-governmental organizations.These tools can help improve the traceability of products and services throughout the supply chain, ensuring and maintaining efficiency and sustainability by identifying relevant performance indicators.Evaluating the implementation incentives and support mechanisms of public institutions and organizations in accordance with the performance indicators of the enterprises using these tools can be considered as an important step that will encourage the access and use of these tools by the enterprises		
<i>New generation of regulations and standards</i>	<ul style="list-style-type: none">The stakeholder capitalism approach is critical for sustainability practices that can be put on the agenda throughout the supply chain. In this context, businesses should act in an inclusive manner, taking into account the involvement of all stakeholders in the supply chain.Considering the latest developments in the world by policy makers, it is important to put forward a set of legislation and standards that can run local market needs in sync with international norms.		

¹ A full list of relevant workshop participants is available in the appendices to this report.
Note: Solution proposals are ranked from high to relatively low on the applicability scale.

Suggestions (5/5)

The findings of this research report have been discussed in workshops with the participation of industry and subject matter experts¹. Suggestions have been developed pluralistically and enriched with open source research and presented under the table below.

Title	Summary Description	Impact	Applicability
Co-purchase (win-win) platforms	<ul style="list-style-type: none">• Joint procurement practices that can be implemented through sectoral collaborations can facilitate SMEs' access to technology applications that will ensure sustainability in the supply chain by enabling traceability and sustainability-oriented practices to become affordable costs for small and medium-sized enterprises.<ul style="list-style-type: none">○ Through the Common Purchase (ORDER) platform designed for the use of members of the Turkish Employers' Association of Metal Industries (MESS) and ecosystem companies, services under supply chain, sustainability and digital solutions can be purchased at a discount; an important process efficiency is provided in tactical expenditures such as queue expenditures. There are eighteen different categories of products within the platform around the focus areas of green energy certificates, energy supply, consolidation of logistics operations, supply of packaging products and office needs.○ For another example, Association of Automotive Parts and Components Manufacturers (TAYSAD) has an agreement with a service provider that measures the carbon emissions of its member enterprises at a discount.• By underlining the concepts of "joint competition" or "coopetition", it is stated in the literature that market participants can remain inactive with initial costs that can be considered high when a person undertakes, but with the introduction of "distributed costs" that will decrease when shared, it may be more possible to prevent the collective action problem and platforms can be designed that can enable the all-around development of sectors.		

 High  Low

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¹ A full list of relevant workshop participants is available in the appendices to this report.
Note: Solution proposals are ranked from high to relatively low on the applicability scale.

Good Practices



Supply Chain Planning and Optimization

COMPANY PROFILE

Grupas Technology is an applied professional management consultancy and training organization that has been providing software training, commissioning and implementation consultancy services in various disciplines of the digital transformation journey of the companies and transferring its knowledge to the developed and developing organizations of Turkey with its 35 years of industry and production experience and expert consultants of its founding partners since 2010. It operates in Europe, the Middle East and Asia, especially in Turkey.

SOLUTION APPROACH

Grupas Technology provides the following services to facilitate processes in companies:

- **Supply Chain Planning and Optimization:** Optimizes supply chain processes to improve the inventory management of businesses and respond faster to demands.
- **Digital Transformation and Industry 4.0 Solutions:** In line with the principles of Industry 4.0, it uses pioneering technologies to accelerate the digitalization processes of businesses. These solutions offer a smart and connected approach to production and business processes.
- **Scheduling:** Grupas Technology, which provides detailed scheduling services to optimize the production and planning processes of enterprises, provides more effective planning in areas such as resource management, production processes and delivery schedules.
- **Data Process Structure Analysis and Consultancy:** Grupas Technology conducts detailed analyzes to optimize the data management and analysis processes of enterprises and provides consultancy services on data process structure.
- **MRP Selection Consultancy:** Guides businesses to choose customizable and efficient solutions for their demands in Material Requirement Planning (MRP).
- **MES and MOM Selection Consultancy:** It guides businesses to choose solutions suitable for their specific needs regarding the Production Execution System (MES) and Production Management System (MOM).
- **Digital Twin, Simulation, Robot, Design, Prototype, Layout Software:** Grupas Technology offers advanced technology solutions such as digital twins, simulations, robot technologies, design, prototyping and layout software to improve the production processes of enterprises, thus making production processes faster and more efficient.



<https://www.inventanalytics.com>

Retail Inventory and Discount Optimization

COMPANY PROFILE

Invent Analytics helps retailers make supply chain planning profitable with AI-powered omnichannel inventory and price optimization solutions. These solutions help both increase sales and reduce costs by refining demand forecasts and optimizing inventory stock. Serving leading global retailers, cited as one of the leading supply chain solution providers in the 2022 Gartner® Market Guide, the company is working to increase profitability in the multi-channel retailing of the future, based on its innovative engineering and academic origins.

SOLUTION APPROACH

- **Versatile Network Design:** Optimizes supply chain design and fulfillment network configuration, leading customers to omnichannel success.
- **AI-Assisted Demand Forecasting:** Achieves the highest demand forecasting accuracy in the omnichannel world.
- **Store and DC Renewal Optimization:** Maximizes stock returns and availability with profit-optimized stock renewal decisions.
- **Initial and In-Season Allocation Optimization:** Allocates inventory by anticipating multi-channel demand that can be met from every possible source.
- **Imaginary Inventory:** Inventory levels are based on accurate data to make informed decisions about pricing and promotions.
- **Optimized Return Positioning:** Optimizing return management in the modern retail environment is not only a strategy; it is the cornerstone of being successful in the ever-changing consumer market.
- **Transfer Optimization:** Increases omnichannel customer profitability by rebalancing inventory across locations.
- **Discount Optimization:** Accelerates margin growth by optimizing discounts throughout the product lifecycle.
- **Product Diversity Optimization:** Creates customer-focused product assortments and maximizes profits through localized product selection and dedicated shelf space.
- **Dynamic and Competitive Price Optimization:** Makes informed, profit-oriented optimal pricing decisions for each product.





<https://www.navlungo.com>

End-to-End Support in E-Export Logistics

COMPANY PROFILE

Navlungo is a platform designed to facilitate the international shipping and logistics processes of its customers. It offers fast and effective cargo offers to more than 130 countries, enabling businesses and individuals to operate effectively on a global scale. By offering its users a variety of cargo options, Navlungo manages its e-export logistics processes and international logistics operations end-to-end, helping them to optimize their logistics processes, saving time and cost while helping them discover the power of global trade.

SOLUTION APPROACH

Navlungo stands out in the fields of logistics and international cargo shipping with the following solution approaches:

- **Advanced Data Integration and Automation:** It automates order and shipping processes by integrating with e-commerce platforms and global marketplaces. This integration is powered by big data analytics, making users' order management smarter and more efficient.
- **Various Shipping Options:** It offers users various shipping service options such as Eco, Express and PTT Mail. In this way, flexible solutions are provided for every budget and need.
- **Wide International Transportation:** A wide range of services with air, land and sea transportation options make it possible to receive appropriate and competitive quotations for all kinds of cargoes.
- **Advanced Tracking System:** It allows users to manage their shipments effectively with real-time cargo tracking and detailed reporting features.
- **Cost and Time Savings:** Helps users save both time and cost by simplifying shipping processes and providing optimal quotes.
- **Fulfillment and Storage Services:** Provides e-commerce logistics and fulfillment services covering processes such as storage, packaging and shipping of products.
- **Reliable Payment Methods:** It provides users with secure and flexible payment options with various payment options.
- **Customer-Oriented Service:** An uninterrupted and reliable service to users with continuous customer support and instant operation monitoring experience.



Next Generation Route Optimization

COMPANY PROFILE

Optiyol develops next generation planning and optimization solutions for logistics, retail, food and beverage, fast consumption, field operations and passenger transportation sectors in distribution network design and route optimization in order to improve the operations of its customers and enable them to work more efficiently. Optiol solutions can save 15-25% in fuel costs and 5-10% in the number of trips, while increasing on-time delivery rates by 20-30%.

SOLUTION APPROACH

With cloud-based "Intercity Macro Transport and In-City Micro Collection and Distribution" optimization software to ensure uninterrupted logistics operations, Optiyol provides the following services:

- **Correct Fleet Selection:** In delivery processes, sometimes only certain types of vehicles are allowed to carry some orders (e.g. chemicals), or there may be upper limits on the size of vehicles at some customer locations. Optiol recommends the right vehicle type for each route, taking all these constraints into account.
- **Order Allocation:** Suggests a sufficient number of vehicles with the right specifications to meet distribution and collection requests in a timely manner. Orders are assigned to eligible vehicles to minimize both fleet and mileage costs.
- **Capacity Limits:** Optiol users can define multiple capacity limits for each vehicle, such as weight, volume, box, pallet or maximum number of stops, and automate order assignment within capacity limits.
- **Live Order Tracking:** The Optiyol Driver App helps drivers seamlessly track scheduled routes and update their order status to track which orders have been completed, are on the way, or have been canceled.
- **Time Ranges:** Optiyol considers the earliest and latest distribution or collection times for each customer to increase the timely service rate. When assigning orders, it takes into account the preferred working hours for each driver and vehicle.
- **Field Sales:** Each customer is planned to be visited at the desired weekly or monthly visit frequency. To minimize total costs, the best group of days for multiple visits within a week or a month is selected for each customer.
- **Home Care Services:** It can help caregivers, nurses or doctors make more visits in a day by shortening travel times with better routes.

High-Speed Supply Chain Platform

COMPANY PROFILE

Project 44 is a technology company established in Chicago, USA in 2014 to contribute to the digital transformation of the logistics and transportation industry by increasing efficiency and transparency. Known for its innovative solutions in the field of supply chain management, the company makes the supply chains of enterprises, especially SMEs, more efficient, faster and transparent with its innovative solutions in areas such as data integration and analysis, real-time tracking and visibility, and supply chain optimization, thus helping them gain a competitive advantage.

SOLUTION APPROACH

Project 44 is specifically focused on providing solutions to the following business problems:

- **Data Access and Integration:** The transportation and logistics sector has to process large amounts of data from various data sources. Project 44 enables integration between different systems and data formats, facilitating data access and optimizing data usage.
- **Data-Driven Decision Making:** By analyzing the data it collects, the platform provides businesses with valuable insights into supply chain operations. These analyses allow businesses to make more informed, insight-driven, and efficient decisions.
- **Supply Chain Effectiveness:** It enables these processes to be more efficient and effective by automating complex and time-consuming supply chain processes and providing analytical tools.
- **Operational Efficiency:** By automating manual operations and streamlining processes, businesses save time and resources. This is a big advantage, especially for small businesses with limited resources.
- **Enhanced Visibility and Tracking:** It enables effective management of companies' inventories by providing real-time tracking and visibility in the transportation sector, where it is essential to know where the goods are and when they will be delivered, thus enabling more effective planning.
- **Cost Optimization:** Transportation costs can be difficult to control, especially today due to volatile fuel prices and the complexity of routes. Project 44 helps reduce costs by optimizing routes and loads.
- **Risk Management:** The ability to anticipate and react quickly to supply chain disruptions helps businesses mitigate risks. This is a significant benefit, especially in managing unexpected situations and crises.
- **Customer Satisfaction:** It helps to increase customer satisfaction and loyalty by accelerating delivery processes and providing more accurate information to customers in today's economy, where providing faster and reliable service to the end user is the basic requirement.



<https://www.sap.com>



Sustainable and Flexible Transformation in the Supply Chain

COMPANY PROFILE

Founded in Germany in 1972, SAP is a pioneering software company in the fields of enterprise resource planning (ERP) and data processing. Offering integrated software solutions to automate various business processes and increase efficiency, SAP's software covers a wide range from finance to human resources, from supply chain management to customer relationship management. SAP, known for its continuous innovative approaches and leadership in the industry and a strong player in the global market, is a technology business partner of choice for many large, medium and small companies.

SOLUTION APPROACH

1. **Connecting All Processes:** It is applied in the supply chain and throughout the business.
2. **Contextualization of Decisions Made:** The interconnection of real-time operational and business data throughout the business process.
3. **Cooperation with the Ecosystem:** The creation of digital connections with business partners.

SAP solutions provide end-to-end traceability from design to operations management:

- **Design:** In demanding markets, market demands are anticipated. Time to market is accelerated for new products, where 25% of projects are managed through a documented process with all steps from conceptual design to product launch.
- **Planning:** By making the planning days in seconds, a 16% shorter order fulfillment lead time is achieved, in which the constraint-based supply planning process is run at regular intervals.
- **Production:** 22% higher capacity utilization rate is achieved by digitally accelerating production for organizations that use two-way paperless communication between planning and shop floor operations for the production plan, orders and status.
- **Delivery:** 55% savings on shipping spend for organizations providing optimized shipping services through strategic freight management features with the delivery of the exact one to each delivery.
- **Operation:** 40% lower cost of asset care (percentage of revenue) with predictable maintenance and service is used to connect assets using IoT technologies and gain insights and optimize asset management.
- **Collaboration:** Expanding the ERP platform with the firm's commercial partners saves \$40 million for every \$1 billion in procurement spend.



Open Collaboration for Digital Supply Networks

PROBLEM

Increased cost of change and innovation, increased compliance and sustainability requirements, and geopolitical developments are reshaping the global competitive environment in production. Today, supply chains with unequal digital capabilities-especially with inadequate supply of small businesses-are vulnerable and fragile to disruptions that urgently need a flexible and adaptive approach based on collaboration, traceability, transparency, and trust.

SOLUTION

SCOPE Fusion is a next-generation supply chain collaboration platform that offers capabilities above and beyond the current industry paradigm. Created with digital twin at its core and integrating domain ontologies, industry standards and the latest digital trust technologies, the platform enhances operational decision-making and customer confidence by providing clear visibility throughout the entire product lifecycle, and ultimately promotes resilient, adaptive, and intelligent value chain ecosystems.

IMPACT

SCOPE Fusion harmonizes fragmented and often siloed elements of the supply chain, providing cohesive ecosystems where all stakeholders gain actionable insights. It enhances trust and accountability at every step of production and delivers precise real-time data that supports advanced analytics and traceability to ensure product integrity and operational transparency.

- **Compliance, Traceability and Transparency:** The platform provides seamless communication and collaboration, increasing traceability and transparency throughout the entire production chain. It creates a unified digital twin and thread, enabling a continuous digital representation that connects every step from raw material sourcing to finished product.
- **Authenticity and Integrity:** The platform leverages digital trust to enable digital product passports, allowing for rigorous tracking down to the track level. The history of each item, supported by the comprehensive digital twin and digital thread, becomes verifiable from production to distribution, and authenticity and integrity are established at each step.
- **Flexible Ecosystems:** Provides predictive analytics and interoperable supply network infrastructure to improve the ability to withstand and quickly recover from outages.
- **Better Products, Satisfied Customers:** Rich data insights and collaboration, innovation and quality among participants lead to cost-effective products that exceed market and consumer expectations by encouraging their improvement.



<https://www.shipentegra.com>

Platform Facilitating E-Export

COMPANY PROFILE

ShipEntegra is a technology-oriented Turkish logistics technologies company serving in the fields of e-commerce logistics and e-export. It facilitates the cross-border trade of businesses with the services it offers to reach global marketplaces, manage orders on a single screen and find logistics solutions. ShipEntegra makes it possible to manage all processes from order management to logistics planning more quickly and easily. With a successful delivery rate of 99.5%, ShipEntegra has more than 60,000 customers and has shipped to more than 220 countries. In addition, it operates in Turkey and the US with a total of 8 centers.

SOLUTION APPROACH

ShipEntegra offers the following services to facilitate e-export processes:

- **Marketplace Integrations:** ShipEntegra enables its customers to manage their e-commerce platforms through a single control panel. This integration reduces the manual processing load, reducing the margin of error to a level close to zero.
- **Logistics Management:** Provides logistics solutions at competitive prices. It allows you to calculate shipping costs in advance with the shipping price calculation tool.
- **Fulfilment Services:** ShipEntegra receives, packages and ships the products of its customers. This service provides significant time and cost savings particularly for small and medium-sized businesses.
- **Special Services for Amazon FBA and Other Marketplaces:** Provides special services for platforms such as Amazon, Etsy and eBay. These services optimize customers' sales processes and increase end-user satisfaction.
- **Improved Visibility and Tracking:** ShipEntegra allows its customers to track their shipments through a single panel, so that the status of shipments can be displayed instantly.
- **IOSS Service:** Provides IOSS service that facilitates VAT management for shipments to the European Union (EU). This service reduces bureaucratic procedures in shipments to the EU and ensures fast delivery.
- **Customer Satisfaction:** ShipEntegra offers fast and reliable delivery options to increase customer satisfaction.

SiGREEN - Carbon Footprint Management

COMPANY PROFILE

Siemens has been an effective company focusing on electrification, automation and digitalization for 176 years in the world and 167 years in Turkey, with more than 311,000 employees globally. Siemens, one of the world's leading companies in the production of energy efficiency and resource-saving technologies, is also among the leading companies in the supply of systems used in energy production, energy transmission and medical diagnosis.

As a leading technology company, Siemens empowers its customers to overcome the challenges of the time, while aiming to serve its customers and markets in the best possible way thanks to the freedom of enterprise, a structure aimed at delivering ultimate values to its businesses and local organizations. The SiGREEN initiative is an application launched at the Digital Industries factory automation products factory in Amberg to meet the need for carbon footprint tracking in the supply chains of a group of Siemens employees, from where it has been made available to other needy people.

SOLUTION APPROACH

Market trends and regulations require a transparent presentation of the carbon footprint of industrial products. SiGREEN provides a scalable, accurate and reliable platform to collect, manage and share carbon footprint data. Collecting PCF (Product Carbon Footprint) data where emissions occur and ensuring data flow throughout the supply chain allows dynamic updating of PCF data. By converting PCFs into dynamically updated product specifications, it provides the ability to set specific targets per material and per supplier. This allows you to prove and reduce the carbon footprint of your products. The main features of SiGREEN are:

- **Carbon Footprint Management:** 90% of the emissions of products in the industry are caused by complex and dispersed supply chains. SiGREEN allows companies to collect and manage their own emissions, directly and indirectly, as well as their supply chain emissions from Tier-1 to Tier-n suppliers.
- **Open Ecosystem and Standards:** SiGREEN enables the exchange of PCF data across the supply chain at different standards. Since data exchange in the supply chain usually covers different industries, Catena-X works with initiatives that set standards such as Catena-X for automotive, World Business Council for Sustainable Development for consumer products or Together for Sustainability for the chemical industry.
- **Data Reliability:** The innovative verifiable identity mechanism provides transparency in the emission data of supply chains. Without the need for suppliers to disclose their sensitive information, customers can check the given values with the identity mechanism that provides verification on SiGREEN's "IDUnion Blockchain" platform.
- **API¹ Integration Solutions:** As a SiGREEN "SaaS" application, it allows companies to reliably request, collect and share PCF data across the entire supply chain. With the SiGREEN X-Link API option, product, supplier and material data can be easily obtained from ERP (Enterprise Resource Planning Platform), PLM (Product Life Cycle Management) systems. With the SiGREEN Connect option, automatic data integration from the OT level is possible.

¹API: Application Programming Interface





<https://www.smartopt.com.tr>

Import-Export Logistics, End-to-End Monitoring and Control

COMPANY PROFILE

SmartOpt is a deep technology company that produces solutions focused on providing end-to-end efficiency with machine learning, artificial intelligence and optimization technologies in supply chain management. SmartOpt, which was established in October 2020 and made a difference with the innovative solutions it developed, was selected as one of the 5 most innovative companies in the world among 654 companies in the evaluation made by StartUs Insights in 2021. As the Best Artificial Intelligence Based Supply Chain Optimization company of the Middle East Region in 2022, it received the "Artificial Intelligence Awards" as the Best Artificial Intelligence Based Supply Chain Optimization company of the Europe-MiddleEast-Africa Region in 2023. Again in 2023, he received the B/S/H/Start/Up Kitchen The People's Choice award with the traceability and visibility project for supply chain optimization.

SOLUTION APPROACH

- **Integration with Central Systems:** Provides integration easily with existing Enterprise Resource Planning Platforms (ERP) and similar central systems.
- **Integration with External and Environmental Systems:** It facilitates the tracking of materials and products by providing full integration with automation systems such as camera reading systems, warehouse tracking systems, customs consultancies. In this way, it helps to transfer control from intermediate service providers to the main body and customers in logistics operations.
- **Visibility and Tracking:** It makes it possible to track all the steps of the loads in detail from the order stage to the delivery end point.
- **Automation and Operational Efficiency:** It provides a transition from manually managed logistics operations over e-mail to an automatically managed logistics operation from a single place.
- **Cost Optimization:** Minimizes warehousing and demurrage costs through full control and visibility.
- **Inventory Management:** Facilitates the management of material and finished product inventories in accordance with production and cost needs.
- **Risk Management and Transparency:** Makes urgent needs shareable with all stakeholders with one click.
- **Key Performance Indicator (KPI) Determination:** It makes it possible to determine new and advanced KPIs in logistics operations customized to your own business processes thanks to full visibility and automation.
- **Advanced Reporting:** Allows reporting and analysis of all supply chain and logistics operations based on real data through modern interfaces.





<https://www.solvoyo.com>

TUSIAD

Intelligent Supply Chain Planning Platform

COMPANY PROFILE

Solvoyo is a software-as-a-service (SaaS) company specializing in supply chain planning and decision automation. Founded in 2005, the company is headquartered in Boston and has offices in Istanbul, Ankara, and Athens. Solvoyo cloud-based platforms aim to automate supply chains with artificial intelligence (AI) integration. Intelligent analytics and self-learning algorithms generate insights and feedback for continuous improvement of both customer operations and user acceptance rates. The platform automates end-to-end supply chain decisions without human intervention.

SOLUTION APPROACH

Solvoyo offers the following solutions for its customers:

- **Demand Planning:** Effective supply chain planning begins with reliable demand forecasting. It detects market demand changes by combining internal and external data, allowing action to be taken to achieve goals by examining applicable insights driven by AI.
- **Procurement Planning:** With the cloud-based integrated procurement planning platform, Solvoyo users have the potential to achieve measurable business results within 3-6 months, such as increasing inventory efficiency, reducing out-of-stock and non-order realization, increasing supplier OTIF (On-Time and Full) rates, and increasing planner efficiency.
- **Production Planning:** Production planning aims to use the available capacity in an optimal way, to produce the right product mix, in the right amount, at the right time. Solvoyo's DDMRP solution integrates and automates demand planning, stock optimization, production planning, and MRP. With the DDMRP solution, actions can be taken against predictable (opening/closing of factories, seasonality, promotions) and unpredictable (sudden changes in demand, failures in production sources) events, exogenous shocks.
- **Inventory Planning:** Inventory planning includes decisions regarding the level, location, and product mix of inventory. They should be tightly integrated with demand and supply planning because they share common planning parameters and influence each other.
- **Sales and Operations Planning (S&OP):** Sales and operations planning are a periodic multifunctional process and accompanying tools to adjust demand, stock and supply at the aggregate level and maintain an integrated business plan. The strength of Solvoyo's S&OP solution is in its simultaneous optimization method, which allows users to eliminate horizontal alignment in their demand, stock, production, supply, and transportation planning decisions.
- **Control Tower:** Solvoyo makes it easy to get answers to complex supply chain questions by quickly evaluating multiple possible scenarios with its supply chain analytics and visibility solution. Thus, instead of spending time planning their operations, companies reduce manual work and speed up reaction time with automatic diagnostics.

YOLDA.COM

<https://www.yolda.com>

Logistics Starts in Digital, Ends in Digital.

COMPANY PROFILE

Founded in 2020, logistics technology start-up Yolda.com develops sharing economy-oriented solutions for complete and partial transportation needs between businesses. By trying to evaluate the resources and idle capacities in the existing road transportation sector in the most efficient way, it offers new business opportunities to suppliers by developing digitalizing the road transportation processes of enterprises and location-based services, and contributes to the reduction of carbon emissions while helping to increase efficiency in the sector with algorithmic load/vehicle matching and dynamic pricing developments.

Yolda.com, which continues its transportation processes all over Europe, with its main activity countries being Germany and Turkey, aims to expand its cross-border trade volume, invest in artificial intelligence-based load optimization and sustainability areas. With a total investment of USD 8 million in pre-seed, seed and bridge investment tours, it generates an annual turnover of approximately EUR 13 million with its 60 employees.

SOLUTION APPROACH

Yolda.com responds to structural problems such as Turkey and Europe road transportation, capacity bottlenecks and idle capacity by developing technology and efficiency-oriented solutions and applications:

- **Efficiency with Artificial Intelligence (AI) Based Freight Shipment:** Yolda.com, which cleverly connects freight owners and vehicle owners on its platform and solves two main problems in road transportation (capacity bottlenecks and idle capacity), matches customer loads with the most accurate vehicle by using vehicle capacities in the best way with the help of artificial intelligence-based technology.
- **CO2 Calculation and Green Logistics Solutions:** The initiative, which aims to use Yolda.com to monitor the carbon footprints created by all companies aiming to reduce their carbon footprint in their logistics processes and to take action towards their targets, offers transportation-based carbon emission reports to user companies through the calculation application, and allows them to prevent unnecessary carbon emissions by consolidating their transportation with AI-based load/vehicle matching suggestions.
- **API¹ Integration and Automation Solutions:** Customers can manage logistics operations from a single screen by integrating Yolda.com into existing supply chain management systems, while increasing the efficiency of their operations and reducing possible coordination problems. In particular, industry players who need to respond to demand changes in real time can integrate Yolda.com into their warehouse systems and automatically adjust the transportation through the system to meet the demand.
- **Rising Customer Satisfaction with Guaranteed Capacity:** Yolda.com provides convenient and reliable capacity free from seasonal fluctuations. With more than 50,000 reliable suppliers in the system, companies can plan safely without being affected by seasonal effects and ensure consistent customer satisfaction during peak periods.

¹API: Application Programming Interface

Annexes

Workshop Participants (1/2)

The list of participants of the workshops dated 09.05.2023 and 20.09.2023, where NGOs and private sector representatives related to the members of the TÜSİAD Next Generation Industry Working Group and the Supply Chain Traceability Sub-Working Group came together and discussed with the design thinking methodologies, is presented below. We would like to thank them for their participation in the workshop and for their various contributions during the creation of this report.

#	Name and Surname	Organization	Title
1	Ahmet Tayfun Elgün	Vestel	Spare Part Planning and Procurement Supervisor
2	Alpöge Çamlıbel	TAYSAD	Working Group Member
3	Arda Onkök	Arçelik	Senior Lead-Trade Policies
4	Ata Kaan Doğan	TÜRKONFED	Project Assistant Specialist
5	Aylin Tarhan	Baymak/BDR Therma Group	Process Development Engineer
6	Berk Kocaman	Deloitte Consulting	Senior Manager
7	Berkay Kekül	TÜSİAD	Expert
8	Cansu Otu	OnO Technology	Sales Specialist
9	Çenker Erdamar	Yıldız Holding	Group Operational Excellence Director
10	Ece Akın Armutak	MEXT	Technology Manager
11	Efe Erdem	TÜSİAD	Head of Next Generation Industry Working Group
12	Fatmanur Uçan	TAYSAD	Supply Chain & Incentives Manager
13	Fuçin Ermurat	İMSAD	Member Relations Manager
14	Güner Demirural	Ford Otosan	Growth and Commercialization CoE Lead
15	Hakan Akkoç	Smart Solar	Vice Chairman of the Board of Directors
16	Hazal İnce	TÜSİAD	Director
17	İhsan Özcan	Nokia Network	Tech Leader
18	İlkay Tuluk	Cevher Döküm	Project Supervisor
19	İrem Baçdar	OSD	Economic Research and Corporate Communication Coordinator
20	İzlem Tekin Bayrak	Arçelik	Technical Leader

Workshop Participants (2/2)

The list of participants of the workshops dated 09.05.2023 and 20.09.2023, where NGOs and private sector representatives related to the members of the TÜSİAD Next Generation Industry Working Group and the Supply Chain Traceability Sub-Working Group came together and discussed with the design thinking methodologies, is presented below. We would like to thank them for their participation in the workshop and for their various contributions during the creation of this report.

#	Name and Surname	Organization	Title
21	Kerim Oal	TÜSİAD	Head of Supply Chain Traceability Sub-Working Group
22	Mehveş Erdem	Erdem&Erdem Law Firm	Senior Lawyer
23	Melih Çamlıoğlu	SAP	Solution Manager and Business Architect
24	Melih Kocaman	OnO Technology	Co-Founder
25	Merve Kerse	Eczacıbaşı Holding	Information Technology Manager
26	Nurşen Numanoğlu	TÜSİAD	Deputy Secretary General
27	Orhan Topbaş	Dow Turkey	Factory Manager
28	Ömer Faruk Özer	Arçelik	Supplier Development and Digital Transformation Director
29	Ömer Kaya	AKDER	Board Member
30	Prof. Dr. Mehmet Tanyaş	LODER	Vice President
31	Seçkin Mengül	TOFAŞ	Supplier Quality Manager
32	Selçuk Ayyıldız	TÜDÖKSAD	Board Member
33	Süheyla Er Aksoy	Coca Cola	Supply Chain Digital Technology Leader
34	Tansel Cavit Kulak	SAMİB	Board Member
35	Tuğrul Bozdemir	Çalık Holding	Purchasing Director
36	Tunçağ Şen	TÜDÖKSAD	Secretary General
37	Türker Türkeköle	Deloitte Consulting	Director
38	Umut Pehlivan	Siemens	Supply Chain Management Director
39	Yeşim Duraloğlu	Vestel	Spare Parts Planning and Procurement Manager
40	Yunus Buğra Akgün	Deloitte Consulting	Business Analyst
41	Yunus Teksan	Teksan Jeneratör	Board Member

Thank you.

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Thank you

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