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A New Organizational Agility Assessment Approach Applied in the Logistics Industry

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ABSTRACT

Purpose – Today, the variable and numerous demands from customers, changing market conditions and the depletion of resources have made agile working methods more necessary than in the past. In this study, it is aimed to increase the awareness of the concept of agility in companies and to accelerate the agile transformation processes.

Design/Methodology/Approach – In this research study, a new measurement scale is developed to assess the current agility levels of the companies operating in logistics sector. The new instrument measures the agility levels of seven business processes for eight components of agility and an aggregated level for company agility score is identified. The detailed questionnaire, which is composed of 51 questions, is applied to 4 companies operating in the logistics sector, differing in size and structure, and their current agility level is evaluated. The weights for business processes and agility component are also defined sector based via Analytic Hierarchy Process (AHP) during the calculation of the final agility score. Due to the detailed structure of the tool, the results gave opportunity for a detailed analysis of the strengths and weaknesses of the business processes. Hence, custom recommendations could be made in order to improve the agility level of the company.

Findings – It is seen that there are common elements like technology and innovation, that are highly effective on agility for every company studied, as well as there are prior elements to be focused that differ with the size and structure of the company. It is also concluded that companies need to be more agile as their operation size increases and they can meet these needs with managers who have an innovative perspective.

Discussion – This study has developed its own methodology, its own research tool and recommendations, unlike previous studies in the field of agility. Aiming to bring a new link to the academic chain with these features, this project can shed light on more diverse studies in the field of agility.

1. INTRODUCTION

Agility can simply be defined as a company's reaction to changing and unexpected situations. It is a management approach that generates stronger companies in the market operating more responsive to customer requests. Agile companies are better prepared for unpredictable situations, can adapt to changes more easily, and manage business processes more successfully. Today, agile approach has become vital for companies due to the increasing competition and necessity for efficient use of resources. Academic research confirm that adaptation of agile management provides efficient production, timely service, cost reduction and profit increase (Glenn, 2009; Inman et al. 2011; Vickery et al., 2010; Mishra et al. 2014; Wang et al., 2014). Hence, adopting strategies to enhance the agility of the organization became important. That brought the topic to the requirement of identifying the current agility level of the company in order to generate effective strategies. However, the ability to measure agility has remained elusive (Geiger et al., 2020). It is difficult to come up with a measure that is general enough to apply to multiple industries, yet specific enough to capture the fundamental nature of a specific sector (Erande & Verma, 2008). Upon his extensive literature research,

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Wendler (2013) concluded that available approaches for agility assessments have limitations regarding their applicability to determine the level of overall organizational agility due to either focusing on a specific process and not able to reflect the interaction of people, structures, process, and technologies, or using complex methods that are not practical for management. He also highlights that most of the approaches do not support management in suggesting further actions for improvement. Hence, studies to bridge the gap are still required to fit the purpose.

With this motivation, a novel questionnaire is developed to collect data and a scale is proposed to assess the overall agility level of the company considering all business processes. Detailed process-based analysis provides the feasibility to define custom requirements for improving agility of the company. The scale can be modified and enhanced according to the essence of the selected industry. Logistics sector is selected for the cases studied in this paper, and four companies are examined thoroughly. The current agility levels of companies are determined, and custom recommendations are given to companies considering their weak processes, capacities and compatibilities.

Within the scope of the study, initially, relevant literature is analyzed for agility measurement scales and studies implemented in logistics sector. Based on the structure of measuring the agility and the identified gap, this research led to the construct of the proposed scale which is composed of eight agility dimensions and seven business processes. Then, the questionnaire is developed and customized questions for logistics sector is added. Detailed information for identifying the weights of the agility components and aggregating the outputs to calculate the overall agility level is presented under the methodology section. Finally, results and custom recommendations for improving agility of each organization assessed are provided. This study aims to contribute to the literature with a new agility assessment scale together with four real-world implementation examples from logistics sector.

2. LITERATURE REVIEW

Agility is first mentioned by Brown and Agnew (1982) as ''the capacity to react quickly to rapidly changing circumstances' though quoted rarely. The concept drew the attention of the researchers with the growth competition in the beginning of 1990s, and organizational agility is introduced as a strategic solution. (Walter, 2021). Throughout history, many definitions revealing different components that enable agility have been made. Kidd (1994) mentions the involvement of technology and defines the construct as 'The synthesized use of developed technologies and methods that are mutually compatible'. Gupta and Mittal (1996) also mention the technology while they declare the integration and the importance of people in their definition as 'a business concept that integrates organizations, people and technology into a meaningful unit by deploying advanced information technologies'. Gartner (2006) mentioned the efficiency and defines agility as 'the ability of an organization to sense or create environmental change and respond efficiently and effectively to that change.' According to Erande and Verma (2008) agility is 'the ability to respond quickly to unforeseen changes.' Where they underline the speed. Charles, Lauras and Wassenhove (2010) and Swafford et al. (2006) also emphasize the speed and timeliness by defining the concept as 'the ability to respond to unexpected situations' and 'ability to adapt or respond in a speedy manner to changing market conditions'. Teece et al. (2016) grouped OA under dynamic capabilities of an organization and defined as 'the capacity of an organization to efficiently and effectively redeploy its resources as internal and external circumstances warrant'. In addition, Nejatian et al. (2018) focused on the timeliness and defined the concept as 'the ability of an enterprise to survive and prosper in a competitive and unpredictable environment by responding quickly and effectively to any kind of change and due time'. From these definitions we conclude that organizational agility is the set of some capabilities of the organization through the application of various methods related with people and processes. Generally, these capabilities are grouped under four categories in the previous research as 'responsiveness, speed, flexibility and competency', and the methods are called as providers or enablers that vary according to the sector and the processes. Commonly accepted methods are 'adopting the new technology, implementing continuous improvement methods, empowering the workforce and achieving collaboration as well as achieving the full integration of the system' (Gunasekaran, 1998; Kuruppalil, 2018; Sharifi and Zhang, 2001; Yusuf et al., 1999). Consequently, we formed a unified definition to identify the scope of the developed scale for agility assessment, such as "Agile organizations achieve efficiency, by fast response and adaptation to changes and serve timely, through the implementation of new technologies and continuous improvement, as well as the collaboration and integration achieved.".

Evaluation of the studies attempting to measure the agility reveal that researchers usually prefer to evaluate either the level of four main capabilities (Sharifi & Zhang, 1999; Houshmand & Lotfi, 2015), or the efficiency or effect of the methods implemented for individual cases (Khan & Wisner, 2019; Kumar & Suresh, 2021; Sreenivasa et al. 2012; Suresh & Patri, 2017). Furthermore, agility level is usually measured from the scope of supply chain (Al-Zabidi et al., 2021; Azevedo et al., 2012; Boubaker et al., 2019; Charles, Lauras and Wassenhove, 2010; Halvachi-Zadeh et al., 2011). Considerable research studies exist on the assesment agility for information technologies and approches are widespread for evaluating the agilty levels (Bahsani et al., 2015; Baker, et al., 2018; Benefield, 2010; Patel & Ramachandran, 2009; Proulx, 2010; Yin et al., 2011; Wendler, 2014) . Schweigert et al. (2014) also reports that 84.4% of agility assesment models are for systems and software engineering and only 4.8 % consider process capability. Furthermore, an assessment approach from the perspective of business processes is scarce and usually limited with the manufacturing processes (Hernaus et al. 2020; Khoshsima, 2003; Raj & Vinodh, 2014; Saleeshya et al., 2020; Sreenivasa et al. 2012; Vinodh et al. 2010; Yauch, 2011).

This paper aims to contribute to the literature with the diverse approach for measuring overall corporate agility level by considering seven business processes that are evaluated in detail for each of the eight dimensions that constitute the agility construct. Furthermore, the questionnaire is subject to customization by adding sector specific questions. Hence, with the four case studies, it is an additional ring to the chain of agile measurement studies for logistics sector.

3. METHODOLOGY

In the proposed methodology, overall organizational agility is assessed by considering seven business processes from the perspective of eight components of the agility construct. The conceptual framework is given in Figure 1. A custom questionnaire is developed to collect data and AHP analysis is implemented to assign the weights to the components and business processes. Details of the methodology steps are provided in the following subsections.

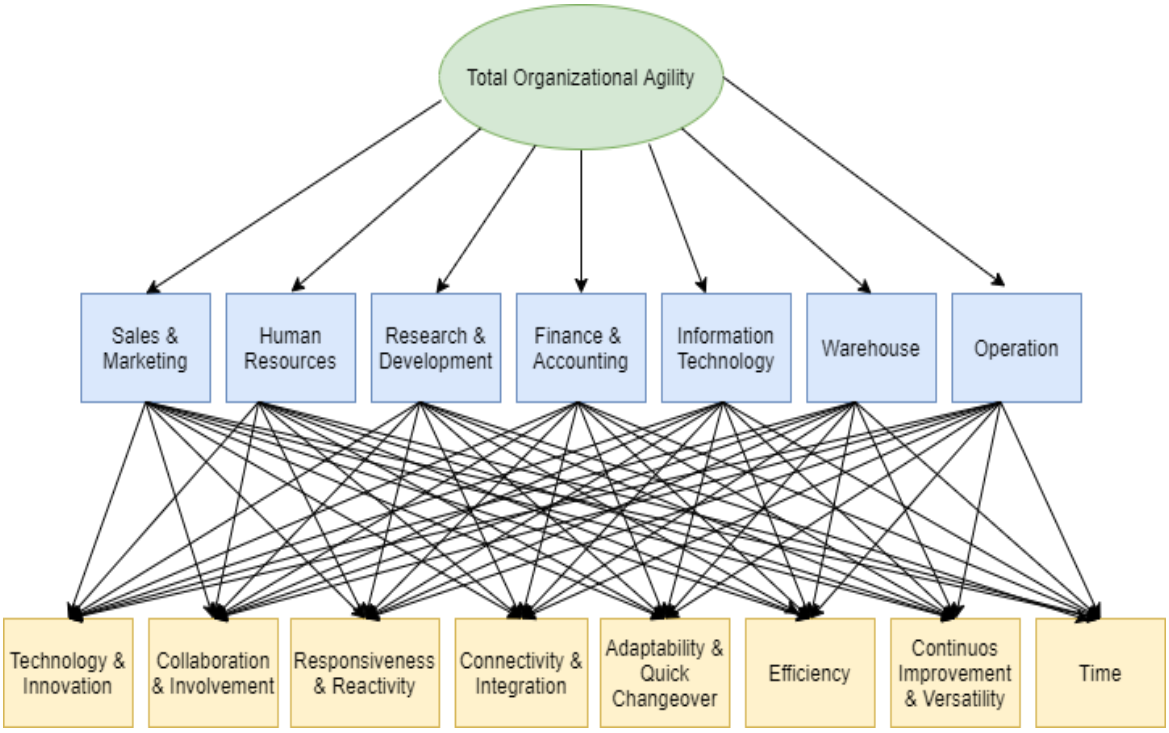

Figure 1. The conceptual framework of this study

3.1. Development of the Questionnaire

A custom questionnaire to assess agility status for companies operating in logistics sector is developed, and validated with the evaluations of academicians and experts from the sector. The questionnaire is composed of 51 questions in total that are grouped under 8 categories in parallel with the constructs that define the agility. Detailed explanations of the categories and the relations with the questions are provided in the following

sections. In addition to 22 common questions under these categories, there are also additional questions designed specific to processes and contributes to these categories. Accordingly, Sales and Marketing department responded to 27 questions whereas Human Resources answered 26. The structure is given in Table 1. Detailed explanations of the design and the questions are given in the following subsections. Moreover, an example of implementation in Google Forms is given in Appendix. There are common questions for every process and there are also process-specific questions for every component of the agility construct (given in *italic* format). Moreover, some specific questions are added to customize the tool for the case studies implemented in logistics companies. These custom questions are marked with a star (*) and also given in italic fonts. Answers are generally given in a 1-5 Likert scale or as 'Yes/No' answers. In such case, 'Yes' answers are scored as 5 and 'No' answers are scored as 1.

Table 1. The structure of the questionnaire

	T&I	C&I	R&R	Con & Int.	A&Q	Ef	CI &V	Ti	TOTAL
COMMON	3	4	3	2	3	3	2	2	**22**
SALES & MARKETING (S&M)	2		2	1					**5**
HUMAN RESOURCES (HR)				1			3		**4**
INFORMATION TECH. (IT)	2						2		**4**
RESEARCH AND DEVELOPMENT (R&D)		1					2		**3**
WAREHOUSE (W)					1	3			**4**
OPERATIONS (Op)	2			1				4	**7**
FINANCE & ACCOUNTING (F&A)		1	1						**2**
TOTAL	**9**	**6**	**6**	**5**	**4**	**6**	**9**	**6**	**51**

3.1.1. Technology and Innovation (T&I)

Companies become more agile with in-house innovations. Hence, nine questions asked under this component receive information about the extent to which companies incorporate technology into their business processes.

1. What is the percentage of your department's usage of internal online communication channels? (Skype, Slack, MS Teams...)
2. What is the percentage of paperwork used tasks?
3. Evaluate the ease of use of the module of your department of the ERP system used in your company.
4. *What is the percentage of digital channels used in marketing activities?*
5. *What is the percentage of sales made in digital platforms?*
6. *Is there any project you have realized as a result of IT activities in your company in the last year?*
7. *What is the % of investment Increase to IT department from Past Year?*
8. *Is there any ERP program you use to process documents?*
9. **Is there any computer program you use to create disposition?*

3.1.2. Collaboration and Involvement (C & I)

The level of collaboration between departments in the company can give an idea about the agility level of that company. In addition, the level of employees' involvement in the company's business processes is another component that contributes to the total agility of the organization. The collaboration and the level of involvement of employees in decision-making processes are examined for both inter-employee and interdepartmental level with six questions.

1. How often are cross departmental meetings held?
2. What is the employee participation rate in decision making processes?
3. How confident are you in expressing new and different ideas?
4. Do employees in the department work in more than one team?
5. *What is the percentage of R&D projects with interdepartmental collaboration realized in year?*
6. *How much do you get involved in the company's investment decision-making processes?*

3.1.3. Responsiveness and Reactivity (R&R)

Being responsive increases the success of companies in meeting customer demands, thus increasing the sales potential. Also, when companies are more reactive, decision-making process will be faster. Furthermore, the reaction time is reduced in unexpected situations and the reaction given becomes more efficient. There are

three common questions asked to all processes and three additional questions answered by sales and finance processes to assess this component.

1. What is the speed of decision making in the process of determining the change in strategy?
2. What is the speed of taking action in an unexpected situation?
3. What is the response time to requests from different departments?
4. *Do you apply customer satisfaction research?*
5. *What is the external customer satisfaction index on the scale of 1-5?*
6. *What is your reaction speed against currency and market changes?*

3.1.4. Connectivity and Integration (Con. & Int.)

A company that places emphasis on connectivity and integration establish a solid relationship between employees, thereby finding opportunities to work more agile. Under this category, there are five questions for evaluating the employees' loyalty to the company and each other, the integration level of the company's business processes and the satisfaction levels of the employees in the company.

1. Evaluate the level of commitment of the employees in your department to the vision and mission of the company?
2. Has your department provided any solution or improvement suggestions to the company's senior management regarding a problem or issue related to the company?
3. *What is the rate of employees working on a customer specific basis?*
4. *What is the internal customer satisfaction index on the scale of 1-5?*
5. **Do you have a YYS* certificate?*

3.1.5. Adaptability and Quick Changeover (A&Q)

A company with a high level of adaptability stand out by adapting to changing conditions more easily than its competitors. In addition, thanks to its high compatibility and quick changeover feature, success levels will increase in reaching results in the face of critical problems. In the questions of the questionnaire regarding this component, critical problems faced by the company, strategy changes and compliance with business processes are questioned with four questions.

1. What is the percentage of quick changeover issues successfully handled in past 1 year?
2. What is the number of critical problems faced and solved in past 1 year?
3. Evaluate the speed of your employees keeping up with the strategy changes in the department.
4. **How many different types of trailer module loading your warehouse is suitable for? (container, swap-body, trailer)*

3.1.6. Efficiency (Ef)

With six questions asked under this component that contributes to agility in many dimensions, issues such as the productivity of the employees, the ability of the company to do more than one job at the same time, and the reduction of costs with in-house solutions instead of outsourcing are examined.

1. What is percentage of work completion during remote work?
2. Evaluate the level of self-discipline of the employees in your department.
3. What is the percentage of incomplete jobs that require overtime work per week?
4. **Is barcoding system used in storage activities?*
5. **How many trucks can your warehouse load at the same time? How many ramps does your warehouse have?*
6. **Can the company repair the trucks itself?*

3.1.7. Continuous Improvement and Versatility (CI & V)

The continuous improvement of both the company and its employees, learning new things and increasing the level of expertise in the field creates a more agile working environment. Employees will become even more versatile thanks to the trainings given and additional responsibilities assigned. Nine questions are developed for this component.

1. Do you apply any project implemented to improve department processes?

2. What is the number of employees who can work multi-functional in the department? What is the number of employees work in your department?
3. *Do you have an annual training program for the career development of employees?*
4. *Did you inform company employees about agility? (Conference, meeting, brochure etc.)*
5. *Do you regularly organize talent programs? (Internship, talent camp, workshop)*
6. *Do you have continuous improvement programs implemented for IT staff?*
7. *How many of the following IT activities does your company carried out internally? (Hardware support, software support, software product development)*
8. *Are there any projects carried out as a result of R&D studies in your company in the last year?*
9. *What is the percentage of investment increase to R&D department from past year?*

3.1.8. Timeliness (Ti)

Although the time component is related to many other components of agility, six questions asked under this component directly question the concept of timing in business processes. Thus, interdepartmental work delivery processes, the time to solve the problems experienced and the time issues in the key business processes of the company are addressed.

1. What is the percentage of early work delivery?
2. What is the percentage of late work delivery?
3. **How long does it take to intervene in the problems encountered by trucks during the expedition?*
4. **What is the frequency of the documents coming to the operations department being processed into the system?*
5. **How long does it take to complete the customs clearance of a truck on average?*
6. **What is the average time until the truck is loaded in the warehouse and depart?*

A pilot implementation is conducted in a medium-sized logistics firm to test the questions with the aim to determine the comprehensibility of the questions, to understand whether the questions reflect the realities of the industry, to check if there are any logical errors in the questions, and to examine whether the interview gave a consistent result. Hence the validity is tested and the questions are shaped according to the dynamics of the sector. In addition, questions about time in some processes of the company are revised in line with the feedback received from logistics experts and made more compatible with logistics activities. Apart from the revised questions, some questions are completely removed from the survey. The influencing factor in excluding these questions from the survey is the opinions of the logistics experts.

3.2. Identification of Weights with Analytical Hierarchy Process (AHP)

The main purpose of AHP is not ranking or scoring, but prioritizing the components by comparing the pairs. The alternatives are ranked using the scale provided in Table 2. and the weights are calculated following the formula given.

Table 2. Scale of relative importance intensity

Score of Importance	Definition
1.0	Equal Importance
2.0	Intermediate value
3.0	Moderate Importance
4.0	Intermediate value
5.0	Strong Importance
6.0	Intermediate value
7.0	Demonstrated Importance
8.0	Intermediate value
9.0	Extreme Importance

$$a'_{ij} = \frac{a_{ij}}{\sum_{i=1}^{n} a_{ij}}, \quad \text{i,j=1,2,…,n} \qquad (1)$$

$$w_i = \left(\frac{1}{n}\right) \sum_{i=1}^{n} a'_{ij}, \qquad \text{i,j=1,2,…,n,} \qquad (2)$$

$$CI = \frac{(\lambda_{max}) - n}{n-1} \qquad (3)$$

$$CR = \frac{CI}{RI} \qquad (4)$$

$$\lambda_{max} = \frac{1}{n} \sum_{i=1}^{n} \left(\frac{\sum_{J=1}^{n} a_{ij} w_j}{w_i} \right) \qquad (5)$$

Where;
i : criteria index
j: alternative index
a_{ij}*:* the score of alternative *j* for criteria *i*
a'_{ij}*:* the normalized score of alternative *j* for criteria *i*
w_i*:* the weight of *i*
l_{max}*:* maximum eigenvalue
CI: consistency index
RI: random consistency index (constant values)
CR : consistency ratio

The Consistency Ratio (CR) is calculated to determine the credibility of the decision maker's judgments. The CR is calculated by dividing the index for the matrix corresponding to the Consistency Index for the set of judgments. If the CR is less than 0.1, the reliability of the judgment will be high.

Based on the idea that as the sector that the company operate changes, every agility component and every process have a different impact on being agile. Consequently, sector specific weights are identified. AHP is implemented twice in order to find the weights of the components and the weights of the company processes specific for logistics sector. First, the general manager of a logistics company who is experienced in the sector for 25 Years is selected as the decision maker for weighing the processes. Secondly, a project manager who is experienced for 8 years in agility has interviewed to provide input for computing the weights of the components. The results for the weights of agility components in Table 3 display that Technology and Innovation component of agility is identified as most important for logistics sector with its 33 % score, and it is followed by Responsiveness and Reactivity with a weight of 16 %. The results for the weights of business processes in Table 4 revealed that Sales and Marketing and Operations processes, with the equal weights of 27 % each, are the main processes that contribute to agility for logistics sector companies.

Table 3. Weights of Agility components

Agility Components	**weights**
Technology and Innovation (T&I)	0.33
Collaboration and Involvement (C&I)	0.14
Responsiveness and Reactivity (R&R)	0.16
Connectivity and Integration (Con & Int.)	0.10
Adaptability and Quick Changeover (A&Q)	0.12
Efficiency (Ef)	0.07
Continuous Improvement and Versatility (CI &V)	0.05
Timeliness (Ti)	0.03
TOTAL	1.00

CR: 0.096

Table 4. Weights of Busines processes

Processes	**weights**
Sales & Marketing (S&M)	0.27
Human Resources (Hr)	0.14
Information Tech. (It)	0.06
Research And Development (R&D)	0.06
Warehouse (W)	0.08
Operations (Op)	0.27
Finance & Accounting (F&A)	0.12
TOTAL	1.00

CR: 0.044

3.3. Calculation of Agility Index

The responses to the questions are collected with a 1-5 Likert scale and the final agility score of the company is calculated as follows;

Step 1. The agility scores for processes are calculated using the questionnaire outputs and the component weights

$$PS_l = \sum_{k=1}^{8} w_k . score_{kl} \quad (6)$$

Step 2. The company agility score is calculated using the process scores and process weights

$$CS = \sum_{l=1}^{7} wp_l . PS_l \quad (7)$$

Step 3. A final assessment for performance is calculated as the company agility index to find the distance to a possible maximum score (Max possible score = 5)

$$Company\ Agility\ Index = \frac{CS}{5} \quad (8)$$

Step 4. Individual process performance is calculated to find the processes that perform below the company performance for agility.

$$Process\ Performance\ Index = \frac{PS}{5} \quad (9)$$

Where;

k= 1,..., 8 (agility component indices)
l = 1,..., 7 (company process indices)
$score_{kl}$ = Score of component k for process l
w_k = Weight of agility component k
wp_l = Weight of process l
PS_l = Process Agility Score of process l

CS = Company Agility Score

4. FINDINGS

This study is applied in 4 different companies of different sizes operating in the logistics sector. The data is collected with interviews to authorized people who took part in certain processes in the companies. Thus, seven department managers are interviewed in each company. Company names are not shared due to confidentiality concerns and the company names are coded with letters, such as A, B, C and D.

The response for each question is graded on a scale of 1-5, and the average score for each agility component of each process is calculated. Hence, the maximum possible agility scores for processes and the company agility score are 5. For the ease of interpretation of the results, the scores of the processes are divided by 5, the max score, and the performance index of the processes are given in the tables displaying the results. In addition, the total agility score computed by the aggregated process agility scores, is also converted to company agility index, and the agility performances of the companies are interpreted.

4.1. Agility Assessment of Company A

Company A is established in Istanbul in 2019, operating in 120 cities of Europe. The company has 120 trucks and 130 trailers. Working with many different customers, Company A has 3 warehouses and provides services in many types of transportation such as intermodal, refrigerated, minivan. Company A, which is in a rapid growth trend, has 150 employees in total at home and abroad.

As displayed in Table 5, which gives the results for Company A, overall agility score is 3.589 out of 5, and company agility index of 72% is determined. When the agility levels in the process are examined, it is seen that 2 different processes have lower agility when compared to Company A's overall level. These processes are "Sales and Marketing" and "Research and Development". This finding yields the custom improvement proposals for these processes based on the low scores coming from the questionnaire.

Table 5. Total agility assessment of Company A

Agility Component	Component Weight w_k	Process (l)						
		S&M	HR	R & D	F&A	IT	Op.	W
T&I	0.33	4.00	4.00	3.00	3.67	4.20	3.20	3.67
C&I	0.14	4.25	2.25	3.00	2.60	3.00	4.50	3.25
R&R	0.16	3.00	4.00	2.33	4.25	4.00	3.33	4.00
Con. & Int.	0.10	1.67	4.50	4.00	4.50	4.50	3.33	4.50
A&Q	0.12	3.33	3.67	2.00	4.00	3.00	4.33	3.50
Ef.	0.07	4.00	3.67	3.33	3.67	4.00	3.67	3.17
CI & V	0.05	3.50	2.40	4.00	4.00	3.00	3.50	5.00
Ti	0.03	3.00	4.00	2.50	4.00	3.50	3.17	3.50
Process Agility Score (PS_l)		3.507	3.662	2.931	3.762	3.791	3.598	3.753
Process Weight (wp_l)		0.26	0.14	0.06	0.13	0.06	0.27	0.08
Weighted Agility Score	**3.589**	0.912	0.513	0.176	0.489	0.227	0.972	0.300
Process Performance Index		**0.70**	**0.73**	**0.59**	**0.75**	**0.76**	**0.72**	**0.75**

For 'Sales and Marketing' process, a significant low score (1.67) is observed in the agility score of the "Connectivity and Integration" component compared to the other components. (These details are coming from the questionnaire outputs which cannot be provided in the paper due to page limits). Based on the low scored questions, the proposed actions to improve the agility of this process are as follows;

- Encouraging employees to submit improvement suggestions by the company management and evaluating their ideas may lead to various improvements at this point.
- Performing customer-oriented studies in the company's 'Sales and Marketing' processes can positively affect the image of the company. In addition, from an agile perspective, if an employee

specializes in a customer specific and closely follows the processes related to that customer, these processes may become more agile.

When Research and Development is examined, low scores are observed in most components. Although the "Adaptability & Quick changeover", "Responsiveness & Reactivity" and "Timeliness" scores seem low (2.0, 2.33, 2.50), the other components also reduce the agility score at least as much as these components due to their high weight. The suggestions for R&D process of Company A are designed as follows;

- Performing the work in the department using digital platforms instead of paper documents.
- Improving the communication of R&D employees with other departments.
- Training of R&D employees on transformation and change.
- Organizing training programs to raise awareness of employees about time management.

4.2. Agility Assessment of Company B

Company B is established in 2014 in Bursa, Turkey and operating in more than a hundred cities in Europe. The company is one of the leading companies in cold chain transportation in Turkey. The company, which carries out its operations with 160 employees, has minivan, express transportation and normal semi-trailer transportation services in addition to refrigerated transportation. The company also provides its customers warehousing and customs services.

The results given with Table 6 reveal that the total agility level of the company is 80% coming from its high score of 3,999 out of 5. The agility level of 'sales and marketing' processes are very agile with 94% agility level. However, 'human resources' process is the least agile processes of the company with 60% agility performance. When the process agility values that contribute to the total agility of the company are examined, it is seen that two processes have noticeably less agility than the total agility level of the company. These processes are "Human Resources" and "Finance and Accounting".

Table 6. Total agility assessment of Company B

Agility Component	Component Weight w_k	Process (l)						
		S&M	HR	R & D	F&A	IT	Op.	W
T&I	0.33	4.40	2.00	3.67	2.00	4.20	3.80	4.33
C&I	0.14	5.00	2.25	4.75	4.00	3.00	3.75	3.75
R&R	0.16	4.80	4.00	5.00	3.75	4.33	4.67	4.00
Con. & Int.	0.10	4.33	2.75	4.50	4.50	4.50	3.33	4.50
A&Q	0.12	5.00	4.00	4.67	4.67	4.00	4.67	4.00
Ef.	0.07	5.00	4.33	4.33	4.33	4.00	4.67	4.33
CI & V	0.05	5.00	3.40	5.00	4.00	3.50	2.00	4.50
Ti	0.03	4.50	4.50	5.00	5.00	3.50	4.17	4.50
Process Agility Score (PS_l)		4.688	2.978	4.390	3.484	3.989	3.972	4.187
Process Weight (wp_l)		0.26	0.14	0.06	0.13	0.06	0.27	0.08
Weighted Agility Score	**3.999**	**1.219**	**0.417**	**0.263**	**0.453**	**0.239**	**1.072**	**0.335**
Process Specific Performance		**0.94**	**0.60**	**0.88**	**0.70**	**0.80**	**0.79**	**0.84**

When the 'Human Resources' process outputs are examined in detail, the low scores of the components "Technology and Innovation", "Collaboration and Involvement" and "Connectivity and Integration" are striking. Among these components, especially the 'Technology and Innovation' component has a score of (2.0) and as the weight of this component is 33%, it seriously affects the agility of the process negatively. Improvement suggestions for the Human Resources process are as follows;

- Using online communication channels within the company more actively and transferring most of the work to digital platforms.
- Increasing collaborations with other departments including Human Resources employees in different teams and supporting them to play more active roles in decision-making processes.
- Implementing a satisfaction survey within the department.
- Arranging trainings for the continuous improvement and informing employees about agility can accelerate the agile transformation process of the company.

When the 'Finance and Accounting' process is examined, the low score of the "Technology and Innovation" component is noteworthy with (2.0) points. Due to the 33% weight of this component, it seriously affects the agility of the process adversely. The suggestions provided for the 'Finance and Accounting' process are as follows;

- Using online communication channels within the company more actively and and transferring most of the work to digital platforms.
- Making the relevant modules of the ERP system required in Finance and Accounting processes easier for use.

4.3. Agility Assessment of Company C

Company C is established in 1998 in Istanbul and operating in Balkan countries. The company carries out its operations with 100 employees. Company B has 130 trucks in its fleet and also provides express service to its customers with 15 minivans. The company also provides its customers warehousing and customs services.

When Table 7 is examined, it is seen that the agility index of the company is 66% due to the overall score of 3.314. As the processes that affect the agility level of the company are inspected, the process that scored noticeably lower score than the overall agility level of the company is 'IT' with the 49% performance of agility index.

Table 7. Total agility assessment of Company C

Agility Component	Component Weight w_k	Process (l)						
		S&M	HR	R & D	F&A	IT	Op.	W
T&I	0.33	3.60	3.00	3.67	2.67	2.00	3.60	2.33
C&I	0.14	3.75	3.00	2.25	2.60	2.50	1.75	1.25
R&R	0.16	4.20	4.33	3.00	5.00	2.67	3.67	4.33
Cın. & Int.	0.10	4.33	2.50	2.50	4.50	1.50	3.00	4.00
A&Q	0.12	3.67	3.67	3.00	4.33	3.00	4.00	4.00
Ef.	0.07	4.67	3.33	4.33	4.00	4.33	4.00	3.83
CI & V	0.05	2.00	1.80	1.50	2.00	2.50	1.50	2.00
Ti	0.03	1.00	3.00	1.00	3.00	3.00	2.83	4.50
Process Agility Score (PS_l)		3.715	3.206	3.024	3.485	2.465	3.240	3.020
Process Weight (wp_l)		0.26	0.14	0.06	0.13	0.06	0.27	0.08
Weighted Agility Score	**3.314**	**0.966**	**0.449**	**0.181**	**0.453**	**0.148**	**0.875**	**0.242**
Process Specific Performance		**0.74**	**0.64**	**0.60**	**0.70**	**0.49**	**0.65**	**0.60**

The scores of the agility components in 'IT' process are quite low. Moreover, it is observed that the scores of the "Technology and Innovation" component for other business processes are also quite low. Assuming that the problem may be caused by troubles in the IT department, general suggestions for increasing the agility level of the company are as follows:

- Developing an ERP system in company's own infrastructure or investment in the existing system.
- Planning periodic trainings to get more efficiency from the employees.
- Encouraging employees to develop projects in their fields, to strengthen their ties with senior management and supporting them to establish a healthy communication.
- Holding meetings between departments more frequently, and strengthening the connection between processes.
- Taking actions to make employees feel valuable by organizing satisfaction surveys for company employees.
- Starting continuous improvement programs for all departments, starting with increasing the existing trainings.
- Improving the connection between employees using communication and technology and raising awareness of employees about time management.

4.4. Agility Assessment of Company D

Company D is a global firm which is established in 1983 in Vienna, and operating with over 3000 employees, Company D is offering a comprehensive portfolio of air, sea, land transport and storage services. The company has 130 offices in 40 countries. Company D can be named as one of the world giants in the logistics industry with its many features. In this study, Company D's unit operating in Turkey was examined.

Table 8 contains Company D's total agility rating. Considering the process and component agility that make up this picture, it is determined that Company D's total agility level is 79% due to the company agility score of 3.97. The processes below the general agility level of the company are "IT", "Sales and Marketing" and "R&D". When these company processes are examined closely, problems in terms of agility can be observed in many different components. Improvement suggestions for those processes with low scores are as follows;

Table 8. Total agility assessment of Company D

Agility Component	Component Weight w_k	Process (l)						
		S&M	HR	R & D	F&A	IT	Op.	W
T&I	0.33	3.80	3.00	3.67	4.67	4.20	4.80	3.67
C&I	0.14	4.50	4.75	2.50	4.80	3.75	2.50	4.00
R&R	0.16	4.40	3.00	3.33	4.25	4.00	3.67	4.00
Con. & Int.	0.10	4.33	4.25	5.00	4.00	2.00	3.00	4.50
A&Q	0.12	4.00	4.00	4.33	4.00	3.33	4.33	4.25
Ef.	0.07	4.67	4.33	3.67	3.67	4.00	4.33	4.17
CI & V	0.05	4.50	3.40	4.50	3.00	4.50	5.00	4.50
Ti	0.03	1.50	3.00	2.00	2.50	3.00	3.67	4.50
Process Agility Score (PS_l)		4.098	3.603	3.655	4.255	3.746	4.004	4.023
Process Weight (wp_l)		0.26	0.14	0.06	0.13	0.06	0.27	0.08
Weighted Agility Score	**3.970**	**1.065**	**0.504**	**0.219**	**0.553**	**0.225**	**1.081**	**0.322**
Process Specific Performance		**0.82**	**0.72**	**0.73**	**0.85**	**0.75**	**0.80**	**0.80**

When the IT process of Company D is examined, lower scores are observed in the "Connectivity and Integration" and "Time" components compared to other components and the following actions are proposed;

- Providing an environment for IT process employees to express themselves more comfortably and encouraging employees to deal with the problems of the company by senior management.
- The company should not consider the current situation in terms of delivery times sufficient and should take advantage of early delivery opportunities by improving the connection between the employees.

When the Research and Development process of Company D is examined, low scores in "Collaboration and Involvement" and "Time" components stand out, and the following actions are proposed;

- Creating an agile working environment by the employees involved in the process, specializing in more subjects by being included in different teams and contributing to different subjects.
- Reducing the number of late submissions by improving the connection between employees using communication and technology.

Detailed examination on the outputs for Human Resources process of Company D reveals that the agility level is lower in "Technology and Involvement", "Responsiveness and Reactivity" and "Time" components. Suggestions for increasing the level of agility in this process are as follows:

- Integration of digital solutions that can reduce the use of paper documents as far as the Human Resources process allows.
- Maintaining employees more prepared for changing conditions by gaining agile working discipline.
- Increasing the proportion of jobs that are delivered early, with the agile working mentality embedded in process employees.

4.5. Comparative Results

The general characteristics and agility indexes of the companies that have been analyzed in detail in the above sections is displayed in Table 9 for comparative analysis. Four companies are classified under three categories - small, medium, large – in order to discuss the different index results. Two of the companies studied, A & B were classified as 'medium' scale companies with their employee size greater than 100, whereas Company C is classified as 'small' due to its relatively smaller size with 100 employees. Similarly, the service scope of Company C is considerably narrower than A & B; Company C only operates in Balkan Companies while A & B are operating in more than 110 cities of Europe. On the other hand, Company D is classified as 'large' due to its 3000 employees and wide scale of transportation services via air, sea, and land as well as storage services.

The agility scores of the companies A, B, C and D are all satisfying with values that are greater than 3. The highest score is found for Company B with 3.999. Company D has a very close score with 3.970. Company A is following D with a score of 3.589. Finally, Company C has the lowest score of 3.314.

Table 9. Comparative results

	SIZE & STRUCTURE	AGILITY SCORE	INDEX	S&M	HR	R&D	F&A	IT	Op.	W
				0.26	0.14	0.06	0.13	0.06	0.27	0.08
A	Medium_ operating in 120 EU cities 120 trucks and 130 trailers 150 employees	**3.589**	**0.72**	0.70	0.73	0.59	0.75	0.76	0.72	0.75
B	Medium_ operating in more than a hundred EU cities 110 trucks and 110 trailers 160 employees	**3.999**	**0.80**	0.94	0.60	0.88	0.70	0.80	0.79	0.84
C	Small_ operating in Balkan countries 130 trucks and 15 minivans. 100 employees	**3.314**	**0.66**	0.74	0.64	0.60	0.70	0.49	0.65	0.60
D	Large_ air, sea, land transport and storage services 3000 employees	**3.970**	**0.79**	0.82	0.72	0.73	0.85	0.75	0.80	0.80

When two medium-sized companies, Company A and Company B, are examined, it is observed that there is a significant difference in the overall agility indexes, and the principal factor that creates this difference is the

better score for sales and marketing processes together with the effect of the large weight assigned to these processes. Company B took the lead in these processes because it performed better especially in connectivity and integration. Based on the observations of the researchers and the outputs, it is stated that this is due to its employee commitment and contribution. In addition, the success in the operations and warehousing processes can also be considered in this high performance since these processes are major processes in the logistics industry. In these areas, Company B stands out with its versatile employees and the adaptation of technological solutions. Regarding the analysis for Company C and Company D, it can be concluded that, as the scale of the company grows, as the company matures and the corporate culture develops, higher agility is exposed. Although these factors are effective in the agile transformation of companies, many factors play a role in the agility indexes of Company C and Company D. At Company C's low agility level, the company's overall disregard for continuous improvement and technological solutions is quite effective. Despite being such a large organization, the main factors behind Company D's ability to achieve agile transformation are its strong corporate culture as well as its strong management connection with employees and its application of technological solutions in the field of activity.

5. DISCUSSION

Agility assessment approaches in the literature are criticized for their limitations on (1) their applicability to determine the level of overall organizational agility since most of them focus on specific processes, and (2) not supporting management in further actions for improvement. These methods are generally focusing on a specific process and do not consider the interaction of people, structures, process, and technologies. It is observed that researchers usually preferred to evaluate either the level of four main capabilities of organizational agility, such as 'responsiveness, speed, flexibility and competency' (Sharifi & Zhang, 1999; Houshmand & Lotfi, 2015), or they measured the efficiency or effect of the methods implemented, such as fast response, adaptation to changes and timeliness of service (Khan & Wisner, 2019; Kumar & Suresh, 2021; Sreenivasa et al. 2012; Suresh & Patri, 2017). The methods applied in the previous research focus on general assessment and an approach from the perspective of business processes is scarce. These processes are usually limited with the manufacturing processes (Hernaus et al. 2020; Khoshsima, 2003; Raj & Vinodh, 2014; Saleeshya et al., 2020; Sreenivasa et al. 2012; Vinodh et al. 2010; Yauch, 2011). Furthermore, some are using complex methods that are not practical for management.

With this motivation, this study serves to assess the overall agility level of the company considering not only a focused process but all business processes. Also, agility construct is decomposed under eight components for a more detailed approach to the measurement. A novel questionnaire is developed to collect data and a scale is proposed for analyzing these components. With the diverse approach for measuring overall corporate agility level, seven business processes are considered and each of the eight dimensions that constitute the agility construct are evaluated for these processes. This detailed process-based analysis provides the feasibility to define custom requirements for improving agility of the company. Another contribution of the proposed scale is that the questionnaire is subject to customization both by adding sector specific questions and also varying the weights of the 7 processes and 8 components. Hence, it can be modified and enhanced according to the essence of the selected industry

In the case implementations for this study, agility levels are evaluated for logistics companies, and 4 companies at different scales are examined. 10 sector specific questions are added to the questionnaire, and totally 51 questions are used to measure the agility of 7 business processes with respect to 8 dimensions of the construct. Considering the difference of sectors, both the question weights and the weights of the business processes are defined with AHP by logistics sector experts, before the computations of the agility scores.

Detailed agility scores for business processes and the aggregate overall agility score are computed via the individual scores obtained from the responses to the questionnaire. The comparative results display that all companies show satisfying results with agility scores that are greater than 3. However, differentiation can be observed with detailed analysis. As differentiated from the previous research, detailed structure of the method provides custom conclusions and improvement proposals for the companies studied. Consequently, it can be concluded that companies with high employee commitment and contribution performed better due to high scores from connectivity and integration component. Furthermore, companies with stronger corporate culture and working with more conscious managers about technological transformation have higher agility levels

than others. High adaptability of the employees and application of technology to the processes result in more agile organizations while disregard for continuous improvement reduce the agility performance. In addition, it has been determined that as the operational scale of a company grows, the need for agility increases and the adoption of an agile perspective from management to all units contributes positively to sustainable growth.

It can be concluded that, business processes that attach importance to technology and innovation concepts outperformed other processes in terms of agility. On the other hand, some legal regulations, dependency on external institutions such as customs, agents and customers are also factors that limit the agility level of the company in some processes. In addition, it was realized that the most important factor in maintaining an agile organization is the existence of a professional team and the perspectives of managers on agile transformation. However, the size of the company which enables the strength of its human resources and financial situation also play an important role in the agile transformation.

In this study, since the total agility level of the companies has been computed by starting from the agility performance of business processes, custom proposals for improvement are given for individual companies and processes. Among all the proposed improvement actions reported in the article, the leading are showing the requirements on empowering the employees and improving the communications and collaboration between them. Additionally, the recommendations for the adaptation of technological solutions can also be mentioned here.

Although this study has made a comprehensive assessment of agility in the field of logistics, new studies may arise by adapting the methodology applied in this study to different sectors. Moreover, the questionnaire can be applied to a larger group of respondents and more diverse results can be obtained. The agile transformation process of many companies may have been initiated or accelerated by the implementation of this study in different sectors and the implementation of the output recommendations.

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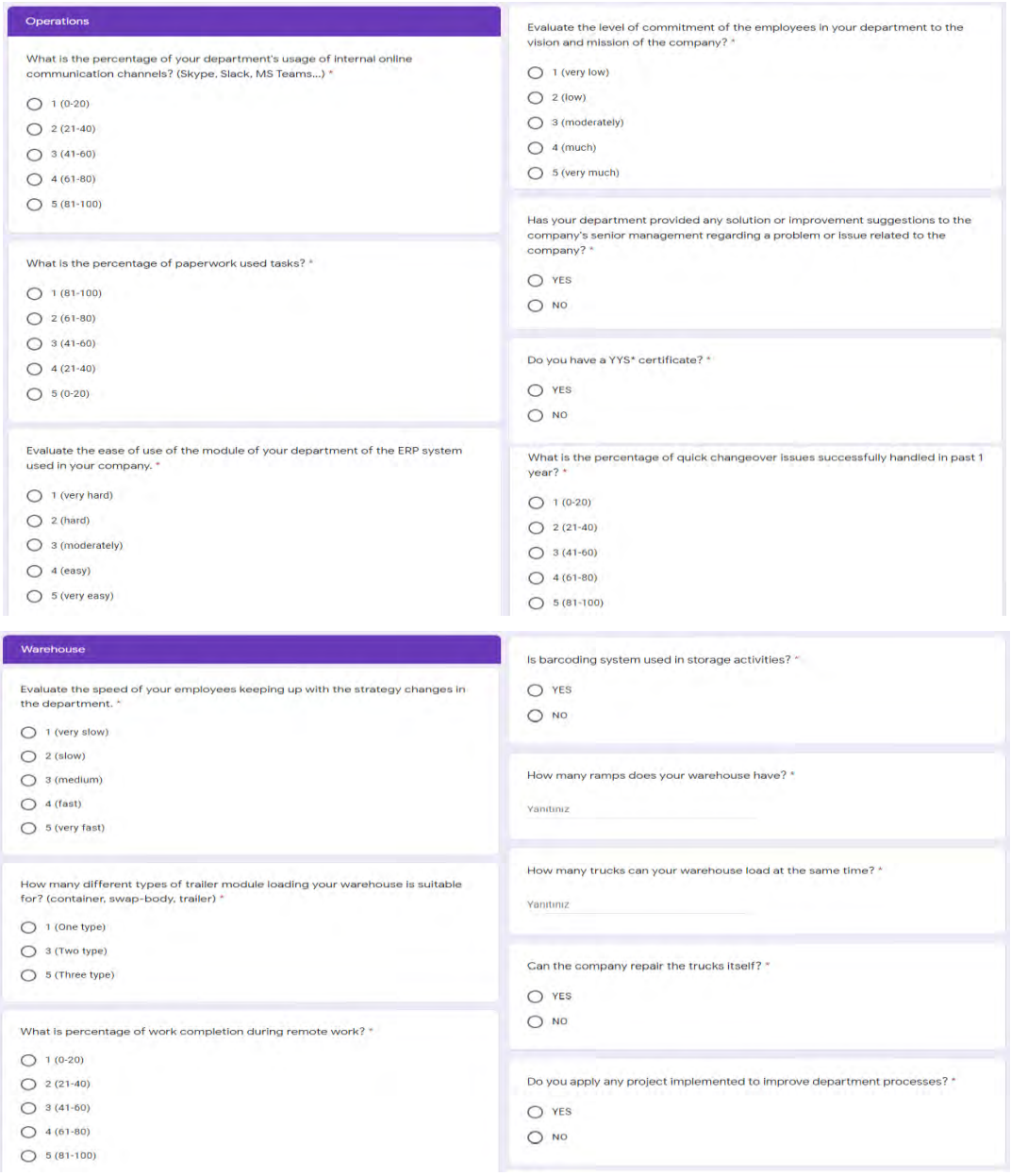
APPENDIX – SURVEY QUESTION EXAMPLES



Operations

What is the percentage of your department's usage of internal online communication channels? (Skype, Slack, MS Teams...) *
- 1 (0-20)
- 2 (21-40)
- 3 (41-60)
- 4 (61-80)
- 5 (81-100)

What is the percentage of paperwork used tasks? *
- 1 (81-100)
- 2 (61-80)
- 3 (41-60)
- 4 (21-40)
- 5 (0-20)

Evaluate the ease of use of the module of your department of the ERP system used in your company. *
- 1 (very hard)
- 2 (hard)
- 3 (moderately)
- 4 (easy)
- 5 (very easy)

Evaluate the level of commitment of the employees in your department to the vision and mission of the company? *
- 1 (very low)
- 2 (low)
- 3 (moderately)
- 4 (much)
- 5 (very much)

Has your department provided any solution or improvement suggestions to the company's senior management regarding a problem or issue related to the company? *
- YES
- NO

Do you have a YYS* certificate? *
- YES
- NO

What is the percentage of quick changeover issues successfully handled in past 1 year? *
- 1 (0-20)
- 2 (21-40)
- 3 (41-60)
- 4 (61-80)
- 5 (81-100)

Warehouse

Evaluate the speed of your employees keeping up with the strategy changes in the department. *
- 1 (very slow)
- 2 (slow)
- 3 (medium)
- 4 (fast)
- 5 (very fast)

How many different types of trailer module loading your warehouse is suitable for? (container, swap-body, trailer) *
- 1 (One type)
- 3 (Two type)
- 5 (Three type)

What is percentage of work completion during remote work? *
- 1 (0-20)
- 2 (21-40)
- 3 (41-60)
- 4 (61-80)
- 5 (81-100)

Is barcoding system used in storage activities? *
- YES
- NO

How many ramps does your warehouse have? *

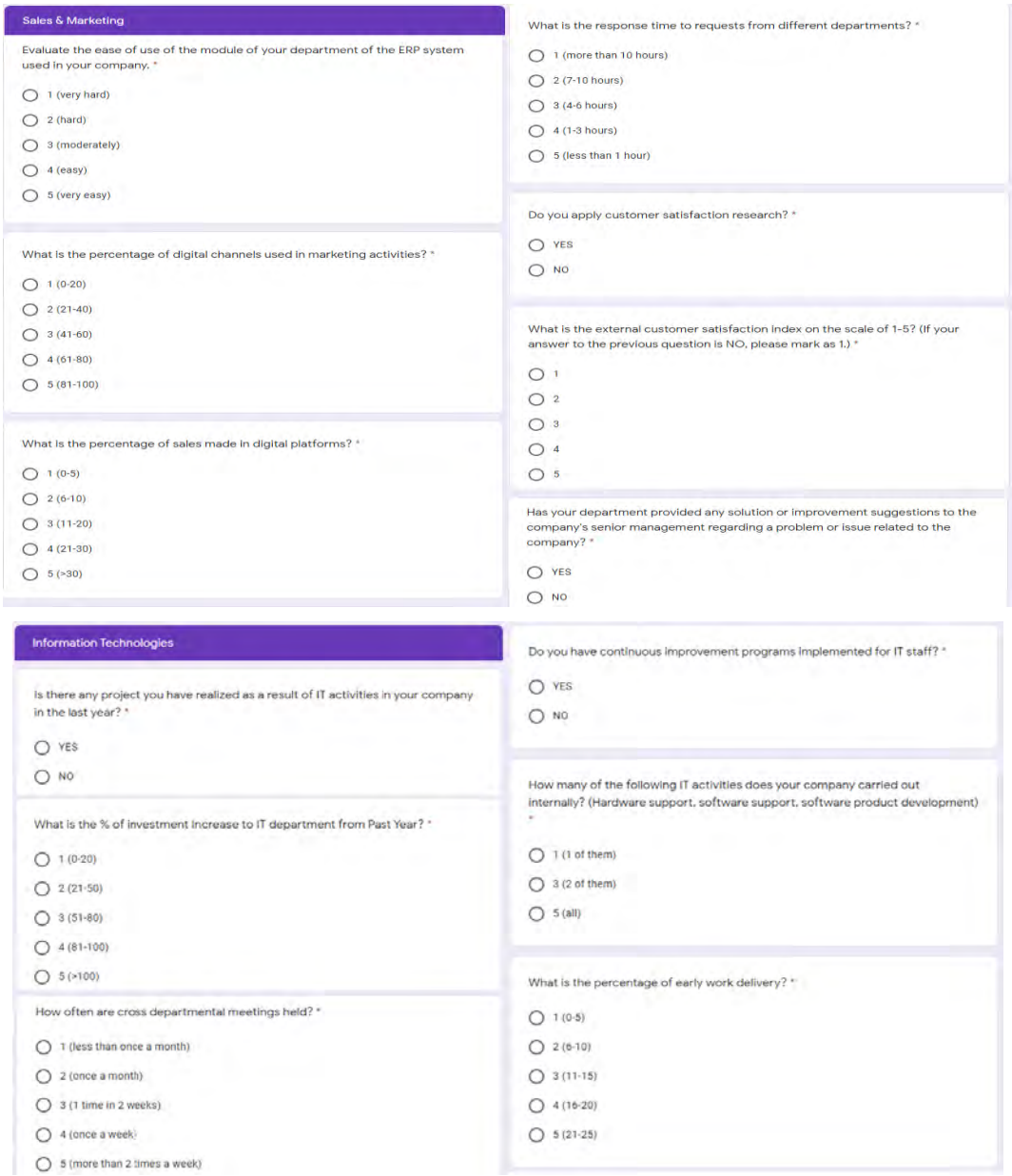
Yanıtınız

How many trucks can your warehouse load at the same time? *

Yanıtınız

Can the company repair the trucks itself? *
- YES
- NO

Do you apply any project implemented to improve department processes? *
- YES
- NO



Sales & Marketing

Evaluate the ease of use of the module of your department of the ERP system used in your company. *

- 1 (very hard)
- 2 (hard)
- 3 (moderately)
- 4 (easy)
- 5 (very easy)

What is the percentage of digital channels used in marketing activities? *

- 1 (0-20)
- 2 (21-40)
- 3 (41-60)
- 4 (61-80)
- 5 (81-100)

What is the percentage of sales made in digital platforms? *

- 1 (0-5)
- 2 (6-10)
- 3 (11-20)
- 4 (21-30)
- 5 (>30)

What is the response time to requests from different departments? *

- 1 (more than 10 hours)
- 2 (7-10 hours)
- 3 (4-6 hours)
- 4 (1-3 hours)
- 5 (less than 1 hour)

Do you apply customer satisfaction research? *

- YES
- NO

What is the external customer satisfaction index on the scale of 1-5? (If your answer to the previous question is NO, please mark as 1.) *

- 1
- 2
- 3
- 4
- 5

Has your department provided any solution or improvement suggestions to the company's senior management regarding a problem or issue related to the company? *

- YES
- NO

Information Technologies

Is there any project you have realized as a result of IT activities in your company in the last year? *

- YES
- NO

What is the % of investment increase to IT department from Past Year? *

- 1 (0-20)
- 2 (21-50)
- 3 (51-80)
- 4 (81-100)
- 5 (>100)

How often are cross departmental meetings held? *

- 1 (less than once a month)
- 2 (once a month)
- 3 (1 time in 2 weeks)
- 4 (once a week)
- 5 (more than 2 times a week)

Do you have continuous improvement programs implemented for IT staff? *

- YES
- NO

How many of the following IT activities does your company carried out internally? (Hardware support, software support, software product development) *

- 1 (1 of them)
- 3 (2 of them)
- 5 (all)

What is the percentage of early work delivery? *

- 1 (0-5)
- 2 (6-10)
- 3 (11-15)
- 4 (16-20)
- 5 (21-25)