DIGITALISATION OF INDUSTRY

Needs Analysis

TEBD/043 – "TRANSFER OF BEST PRACTICES THROUGH STRUCTURAL DIALOGUE FOR CAPACITY DEVELOPMENT IN THE FIELDS OF DIGITALISATION AND INDUSTRY-UNIVERSITY COLLABORATION AND INTERNATIONALISATION"

CONTENT

EXECUTIVE SUMMARY

Istanbul Chamber of Industry Survey Assessment

- There are several obstacles before the digital transformation and Industry 4.0 like: Strategic, cultural, process-based problems, awareness and employees
- The most important digital competencies for employees are data analysis and decision taking processes.
- While cloud applications, autonomous tools and robot technologies are Industry 4.0 applications which is a advance information level, information level regarding the cyber security is very limited.
- The most important sectoral impact has been specified by the robotic processes, big data and analytics. Cyber security and predictive maintenance have remained in the background in terms of impact.
- Investments planned to be made within 3 years by the firms: Cloud technology, robot / co-bot and digital integration with suppliers and customers.

Industry 4.0 Awareness and Application Areas in Turkey

- In the projects conducted in TGB and R&D centers, mostly big data and advanced analytics, artificial Intelligence, Internet of Things and virtualization (augmented/virtual reality) technologies are used.
- According to the survey prepared by Tubitak, Turkish industry sector takes place between Industry 2.0 and 3.0.
- The number of projects and investments realized in 2017 and 2018 in Public Information and Communication Technologies are pointed out. For 255 projects specified in 2018, a budget for 5.066.515 TRY has been realized.
- T.R Ministry of Science, Industry and Technology prepared "Digital Transformation Report and Route Map of Manufacturing Industry" and short (1-2 years), medium (3-5 years) and long term (6-10 years) digital transformation strategies of Turkey and steps to be taken have been specified.
- Profession groups to be most affected by the digital transformation journey in Turkey are as follows: Automotive and Automotive Sub-Industry, Machinery, White Goods, Food and Beverage, Textile, Chemistry.

SECTORAL NEEDS IN TURKEY

Digital Transformation and Industry 4.0 awareness in Turkey, foreseen problems, investment plans and their impacts are specified with the survey prepared with the help of Istanbul Chamber of Industry. Survey questions and data obtained are as follows:

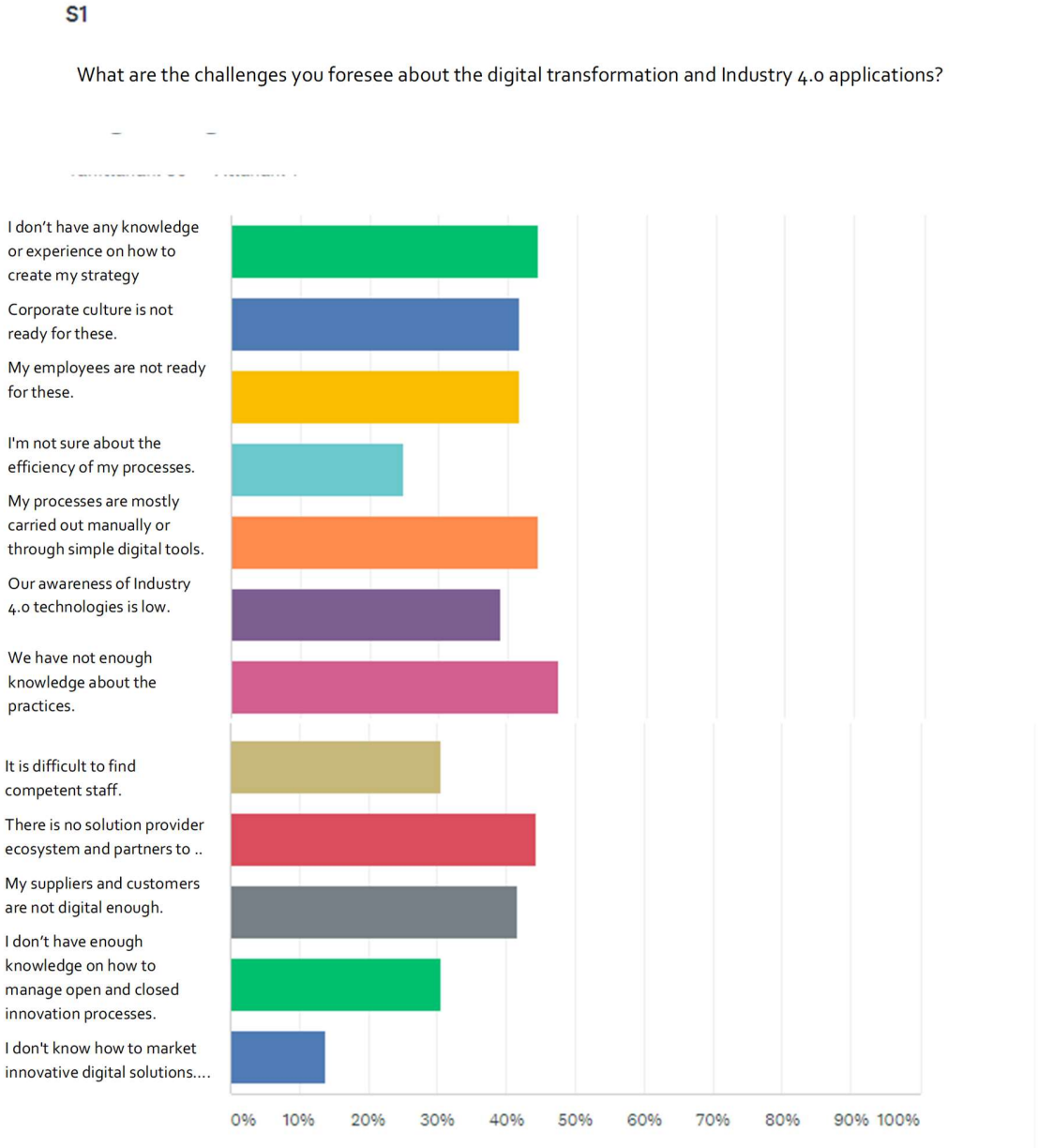


Figure 19: Foreseen Challenges regarding Digital Transformation

ANSWER OPTIONS

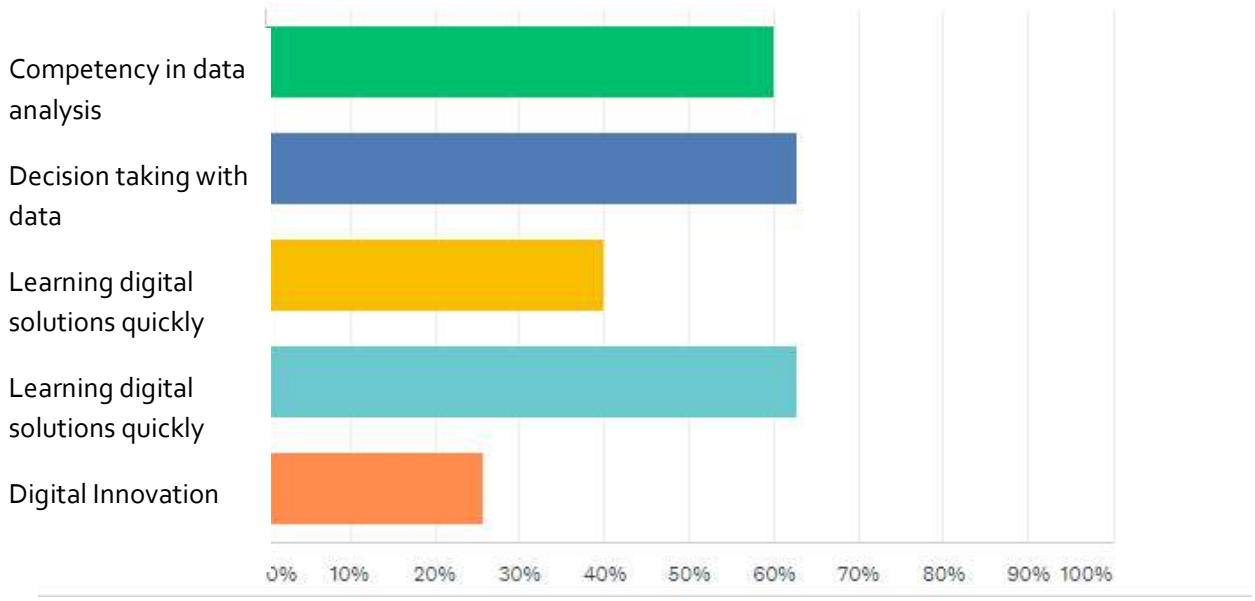
- I don't have any knowledge or experience on how to create my strategy
- Corporate culture is not ready for these.
- My employees are not ready for these.
- I'm not sure about the efficiency of my processes.
- My processes are mostly carried out manually or through simple digital tools. Digitizing them results in high cost in time and money.
- Our awareness of Industry 4.0 technologies is low.
- We have not enough knowledge about the practices.
- It is difficult to find competent staff.
- There is no solution provider ecosystem and partners to support transformation and applications.
- My suppliers and customers are not digital enough. We cannot integrate the processes.
- I don't have enough knowledge on how to manage open and closed innovation processes.
- I don't know how to market innovative digital solutions to put forward with my business partners.

Figure 20: Foreseen Challenges regarding Digital Transformation and An

Figure 19 and Figure 20 show the answers given for the first question of the survey. According to the result obtained by the participation of employees working in different sectors, there are numerous challenges before the digital transformation and Industry 4.0. These challenges with similar percentages might be categorized as strategic, cultural, process-based problems, awareness and employee-related issues.

S2

What digital capabilities do you think are important to your employees?



ANSWER OPTIONS

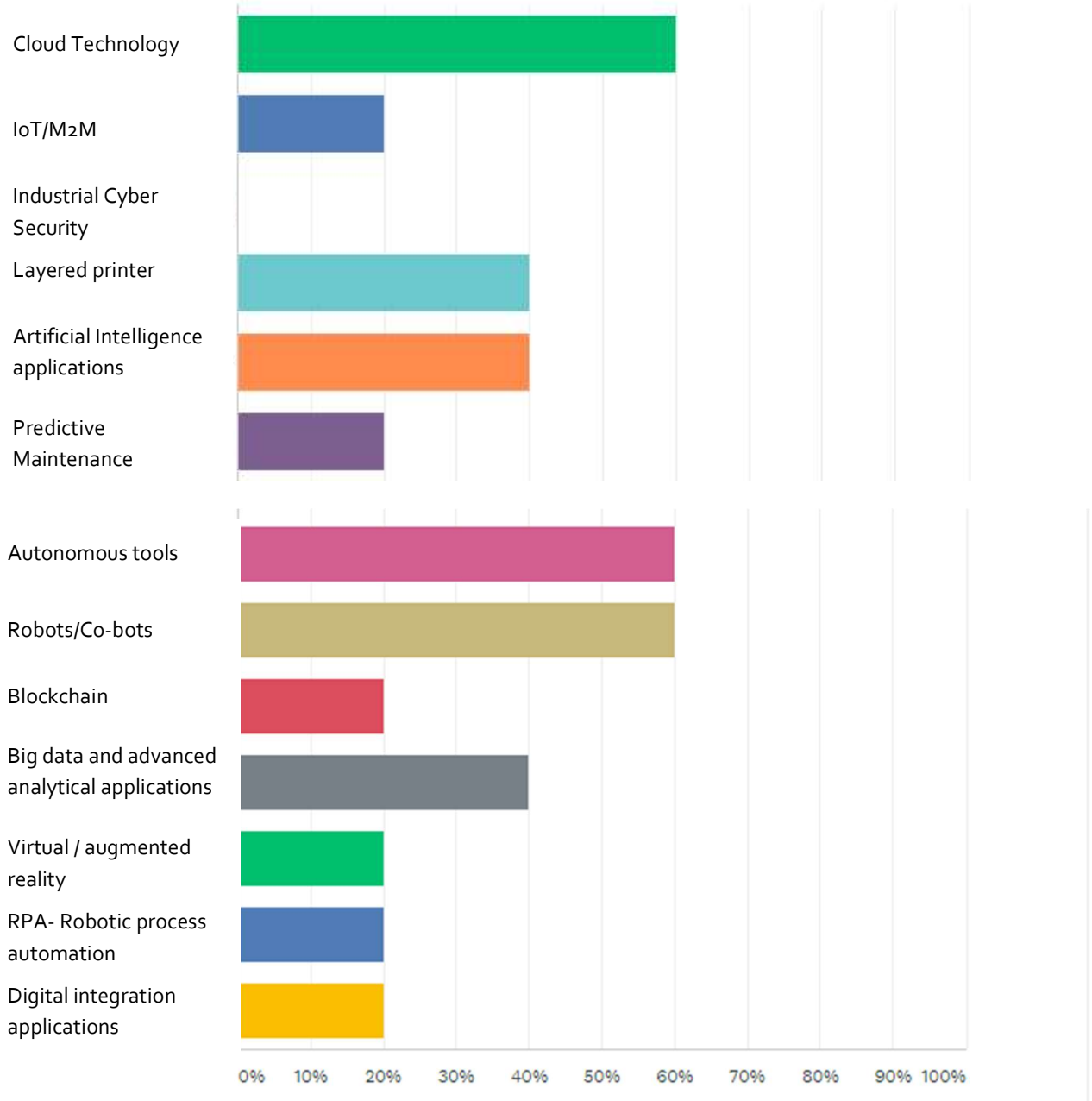
- Competency in data analysis
- Decision taking with data
- Learning digital solutions quickly
- Using digital solutions effectively
- Digital Innovation

Figure 21: Digital Competencies that are important for employees

In the second question of the survey, which digital skills are important for employees have been examined. When the answers are examined, it is seen that data analysis and decision taking processes are on the forefront. Also, it is attached great importance for employees to use the digital solutions provided by the digital transformation and Industry 4.0.

S3

On which Industry 4.0 applications do you have detailed information?



ANSWER OPTIONS

- Cloud Technology
- IoT/M2M
- Industrial Cyber Security
- Layered printer
- Artificial Intelligence applications (visual process, chatbot, digital twin, etc.)
- Predictive Maintenance
- Autonomous tools
- Robots/Co-bots
- Blockchain
- Big data and advanced analytical applications (quality forecasting, demand forecasting, etc.)
- Virtual / augmented reality
- RPA- Robotic process automation
- Digital integration applications (EDI, API Gateway, web service, etc.) with suppliers and customers

Figure 22: Information Level regarding Industry 4.0 Applications

For another question, the information level regarding the Industry 4.0 applications is scaled. While cloud applications, autonomous vehicles and robot technologies come to the forefront, it is attention-grabbing that the level of knowledge on cyber security is very limited.

S4

Which Industry 4.0 applications do you think will have the biggest impact on your industry?

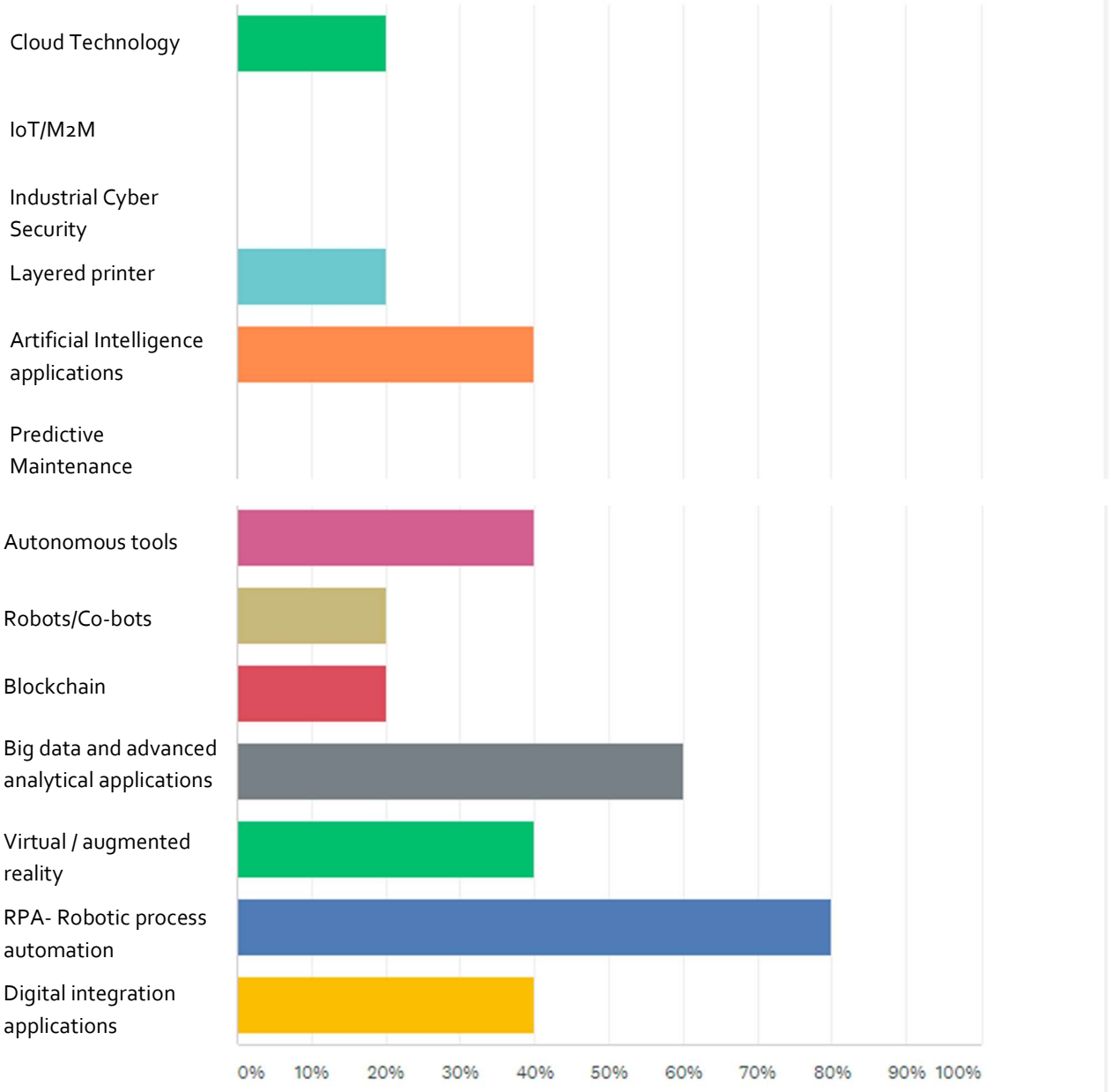


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Figure 23: Industry 4.0 Applications and Sectoral Effects

Sectoral effects of Industry 4.0 applications specified in Figure 22 are examined in Figure 23. If we look at these applications, it is seen that the biggest impact will be provided by robotic processes. Effects of robotic technologies of which usage has been increased in the recent years in different sectors are a known fact. On the other hand, big data and analytics are foreseen to have a strong effect. Cyber security on which employees have very limited knowledge competency and predictive maintenance which has a limited usage area in Turkish manufacturing sector remain in the background in terms of effect.

S5

For which Industry 4.0 applications are planned to be invested in 3 years?

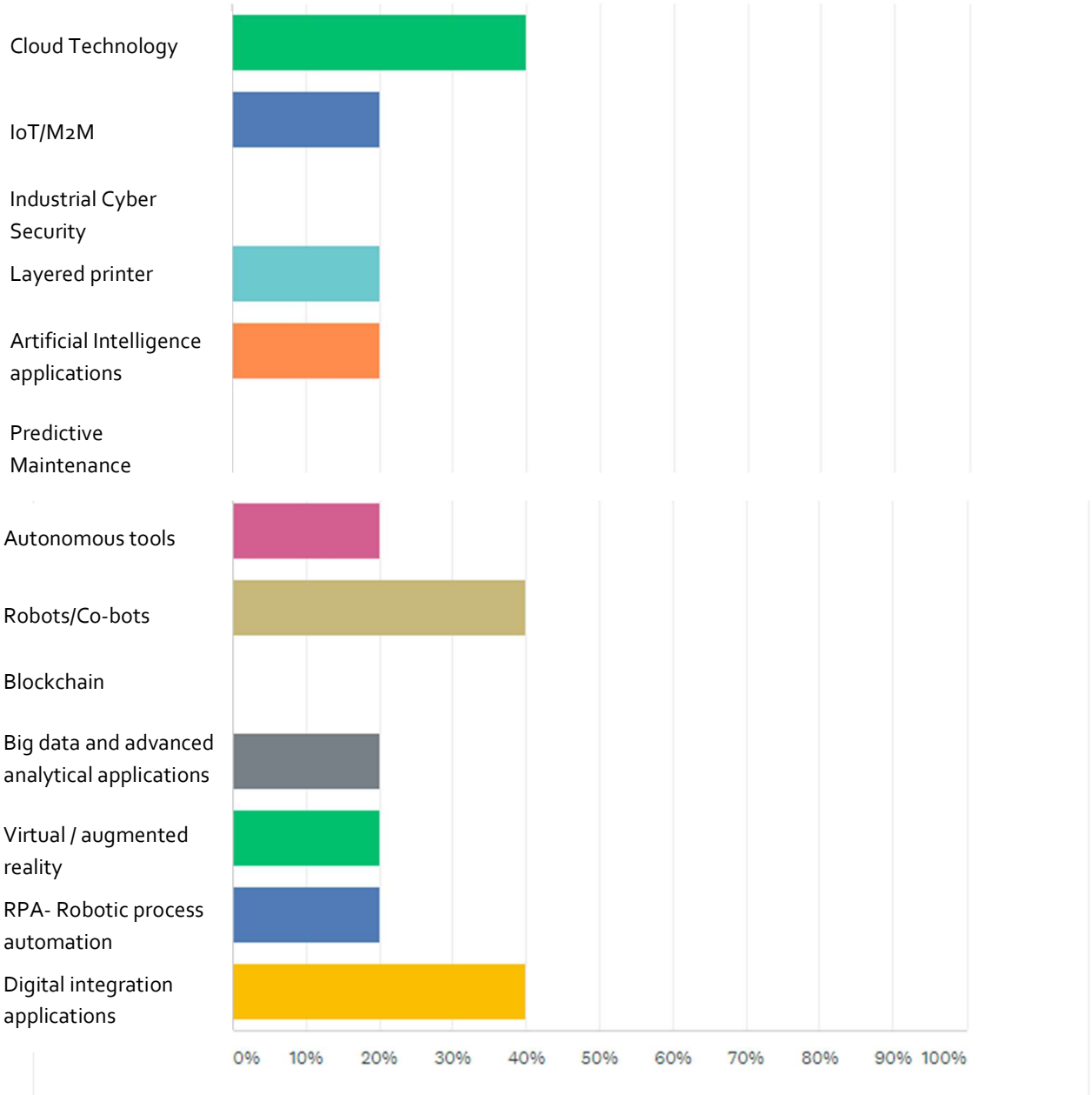

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Figure 24: Industry 4.0 Applications Investment Planning

In the last question of the survey, participants are asked about investments planned to be made for Industry 4.0 applications. Three different applications have come to the forefront among the investments planned to be realized within 3 years. Cloud technology, robot / co-bot and digital integration applications with suppliers and customers.

INDUSTRY 4.0 AWARENESS AND APPLICATION AREAS IN TURKEY

Turkey performs many awareness studies and incentive systems with the aim of realizing digital transformation in industry, enabling innovative companies to be created to develop Industry 4.0 applications and realizing the advanced applications in firms. The primary outcomes of these studies are as follows:

- Digital transformation changes many sectors of economy and social life. Digitalization process affects all aspects of social and financial life varying from health and education to agriculture and industry. Both public institutions and professional organizations take numerous initiatives in order to increase the awareness of firms.
- According to the World Economic Forum (WEF), it is foreseen that the value that (2016) digital transformation will create in social and economic aspects will be $100 trillion totally in the next 10 years. The total net economic benefit of digitalization with other sectors is estimated to be approximately $30 trillion.
- Within the scope of 2023 targets of Turkey, digitalization is of an important instrument for Turkey to take its place among the top 10 economies of the world and increase the rate of its R&D expenses from 1% to 3% within GDP. [1]
- A majority of SMEs operating in the Turkish manufacturing industry is located in OIS while firms conducting mostly R&D activities are located in TGB. A significant increase has been experienced in the number of both planned zone types that provide qualified infrastructure and other supportive services to SMEs in the recent years.
- The distribution of business facilities that implement projects regarding digital technologies in the Technology DeveLopment Zones is as follows: (Figure 1)

Figure 1: Distribution of digital technology projects implemented in the business facilities located in TGBs.

Distribution of digital technology projects in R&D centers are as follows. (Figure 2)

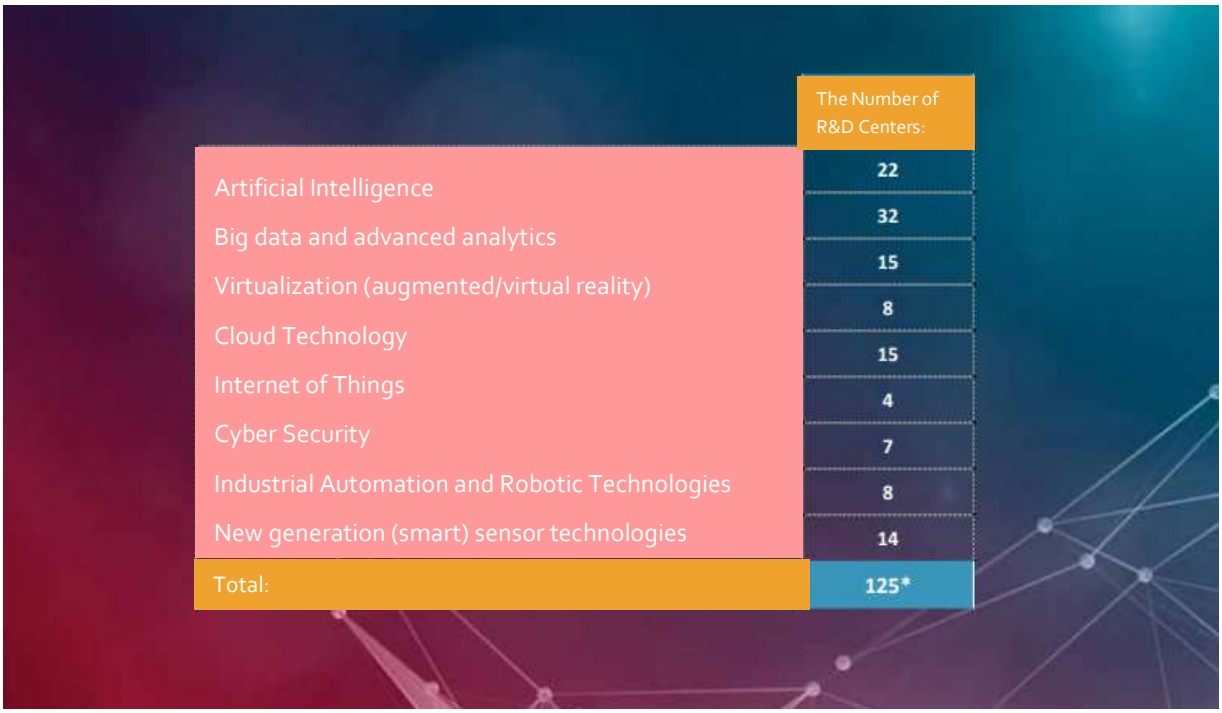

Figure 2: Distribution of digital technology projects implemented in R&D Centers.

- As seen in the Figure 1 and Figure 2, in the projects conducted in TGB and R&D centers, mostly big data and advanced analytics, artificial Intelligence, Internet of Things and virtualization (augmented/virtual reality) technologies are used.
- In Turkish manufacturing industry, the main expectation of the digital transformation process is to improve the production processes and business models of the business facilities in a way that they can make use of applications that lead to speed, efficiency, flexibility and quality increase.
- According to the outcome of the survey study "New Industrial Revolution: Prioritizing Key and Leading Technologies for Smart Production Systems" realized by TUBITAK in 2016, a route map started to be prepared. This survey was conducted to measure the interests and integration levels of the business facilities in R&D and smart production.

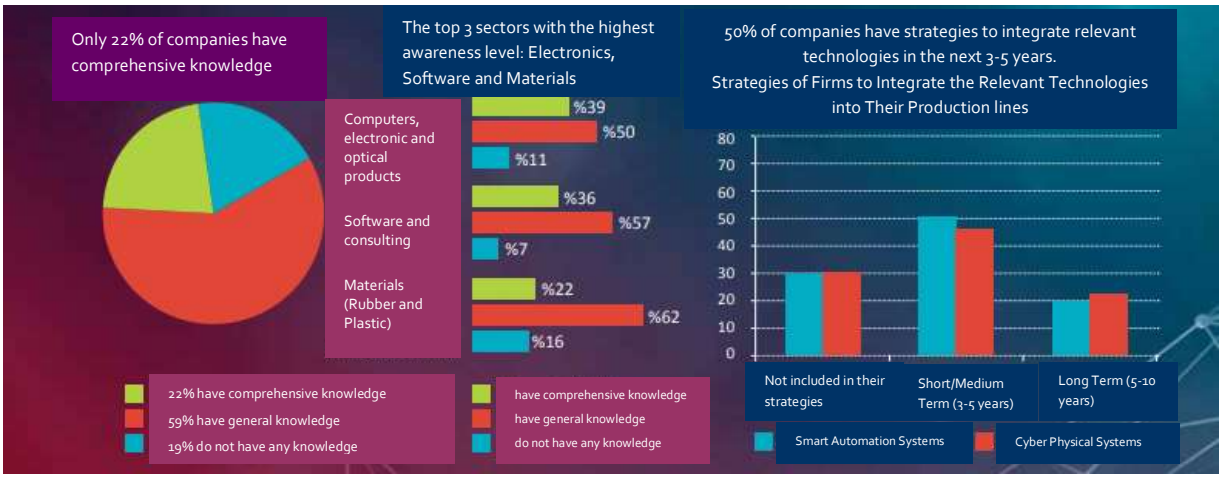

Figure 3: Awareness of enterprises in smart production systems and integration levels in digital technologies [4]

- As stated in Figure 3, digital and smart technology awareness of business facilities operating in the manufacturing industry is very limited. However, these facilities plan the integration of these technologies within 3-5 years.

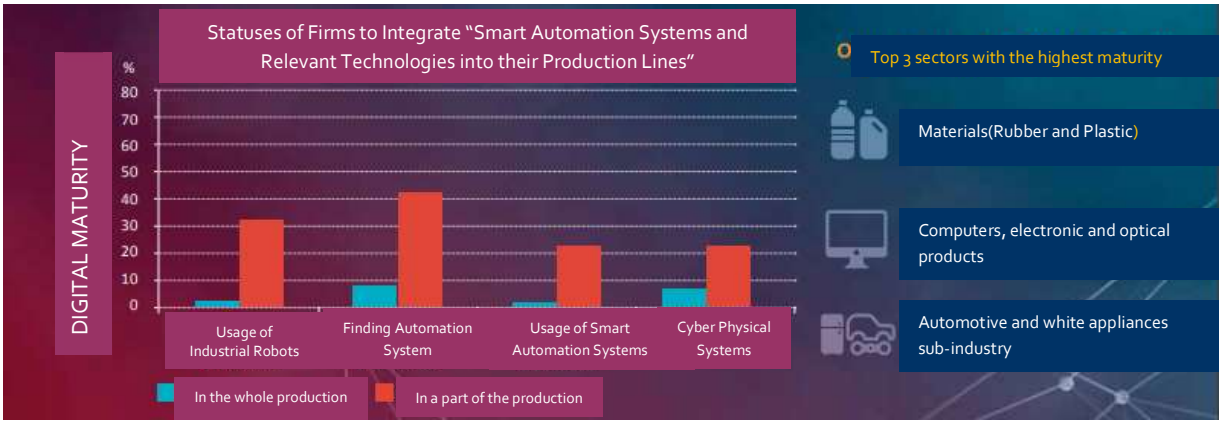

Figure 4: Digital maturity level of the industry [5]

- According to the survey prepared by Tubitak, Turkish industry sector takes place between Industry 2.0 and 3.0. The sectors where digital technologies are used in the highest rate are material, electronics and automotive sectors. (Figure 4)
- According to the research conducted with 104 companies operating in different sectors in Turkey within the scope of "Accenture Digitalization Index", Turkey's average digitalization index score is 60%. This index is measured in three dimensions as digital strategy, digital services and digital operational competencies and based on 10 criteria. [6]

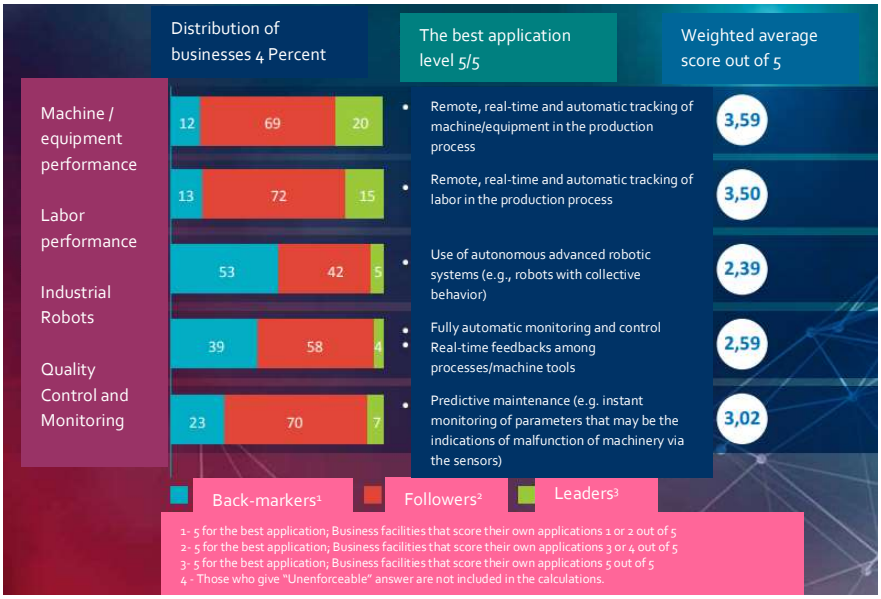

Figure 5: Digital technology usage statuses of enterprises in production [7]

- According to the survey, it is seen that in Turkish manufacturing industry, traceability of production factors (machine and labor force) is of great importance. Another attention-grabbing point in manufacturing industry is that the ratio of business facilities to make use of industrial robots is low. More than half of the business facilities do not use industrial robots while only 4,8% of them use advanced robotic systems. (Figure 5)

Figure 6: Technology areas in which technology suppliers operate and their turnover distribution [8]

- In the same survey, turnover distributions of business facilities in the fields where they operate have been specified. 16 of 73 business facilities operating in cloud technology and big data gain more than 50% of their turnover from the product and service presentation in this technology field. For turnovers of automation and control system suppliers, there is a high rate for 33%. (Figure 6)

Sector	2017					2018			
	The number of projects	The amount of project	Cumulative Spending	Allowance for the Year	At prices of 2018	The number of projects	The amount of project	Cumulative Spending	Allowance for the Year
Agriculture	12	855.214	391.437	197.552	**212.566**	11	696.834	396.635	**151.264**
Mining	8	293.932	56	100.198	**107.813**	8	110.343	3.720	**80.143**
Manufacture	7	94.310	4.945	16.220	**17.453**	9	57.661	750	**48.022**
Energy	12	350.945	160.119	116.705	**125.575**	10	451.852	233.802	**139.575**
Transport - Communication	39	2.967.083	1.421.092	444.418	**478.194**	36	3.588.574	1.420.107	**359.450**
Tourism	5	10.511	2.660	3.635	**3.911**	6	16.860	5.784	**8.076**
Education	16	7.469.500	3.125.281	1.285.616	**1.383.323**	26	8.587.846	3.181.220	**1.472.055**
Healths	3	294.105	90.888	111.314	**119.774**	2	459.408	294.144	**165.264**
Other Public Services	154	7.301.358	2.371.007	2.168.773	**2.333.600**	147	6.518.141	1.728.551	**2.642.666**
TOTAL	**256**	19.636.958	7.567.485	**4.444.431**	**4.782.208**	**255**	20.487.519	7.264.713	**5.066.515**
TOTAL (One Thousands USD)	**256**	6.177.475	2.380.611	**1.398.147**	**1.280.891**	**255**	5.487.483	1.945.818	**1.357.042**

Figure 7: Summary Table of Public Information and Communication Technologies Investments for 2017-2018 [9]

- In the Figure 7, the number of projects and investments realized in 2017 and 2018 in Public Information and Communication Technologies are pointed out. For 255 projects specified in 2018, a budget for 5.066.515 TRY has been realized. If we assess it through sectoral perspective, the highest project number and allowance are in education and transformation-communication fields.
- Digital technology usage and the financing methods in Turkey can be evaluated in four titles:

  Stakeholder Equity 90% of the business facilities use their stakeholder equity for their technology development and commercialization activities.

  Governmental supports: 61% of technology suppliers on average stated that they benefit from governmental supports.

  Bank credits: 25% of business facilities stated that they use bank credit for technology development and commercialization activities. Great majority (80%) of the credits consists of short time credits.

  Investment capital: 19% of technology suppliers stated that they seized the opportunity to use investment capitals such as private equity, enterprise capital, etc. 84% of the business facilities using investment capital are micro-scaled while the rest is small-scaled.

TURKEY'S DIGITAL TRANSFORMATION FUTURE, USAGE AREAS AND ROUTE MAP

Many developed countries that are intended to experience efficiency, quality, speed, flexibility increase and come up with new precautions against labor force have developed policies and strategies regarding digital transformation and prepared their digital route maps.

T.R Ministry of Science, Industry and Technology prepared "Digital Transformation Report and Route Map of Manufacturing Industry" and short, medium and long term digital transformation strategies of Turkey and steps to be taken have been specified.

According to the route map:

- In the first stage (1-2 years), it is aimed to take tangible steps to accelerate the digital transformation process of the manufacturing industry and create intellectual and physical infrastructure to support the transformation process.
- In the second stage (3-5 years), it is aimed to further strengthen the competencies and infrastructure and close the gap between the leading countries in the journey of digitalization.
- The long term vision of the route map (6-10 years) is to enable Turkish manufacturing industry to have more share out of the global value pools and become regional or global leader in the chosen technology fields. [14]
- Within this scope, it can be said that the route map of the digital transformation is composed of 6 different components. (Figure 11)

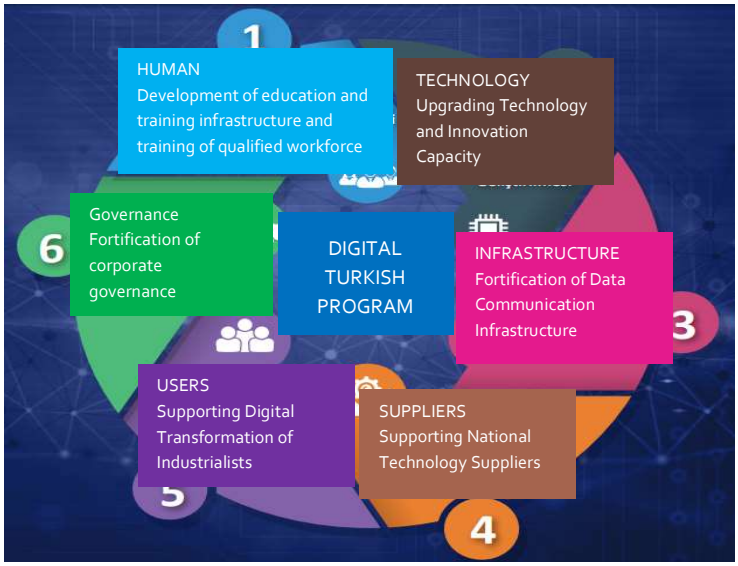

Figure 11: Route Map Components [15]

- Locations and action fields of these 6 components in the digital transformation of Turkey are specified as follows: (Figure 12)

	COMPONENTS	ACTION AREAS
1	Human- Development of education and training infrastructure and training of qualified workforce	Qualified Labor Force •Training digital technology users •Training digital technology developers •Providing trainers with digital competencies •Bringing the digitally skilled workforce together with the industry Awareness •Increasing and disseminating digital transformation awareness •Improving cooperation among digital transformation stakeholders
2	Technology- Upgrading Technology and Innovation Capacity	•Development of R&D infrastructures for digital technologies •Development of digital technology applications
3	Infrastructure- Fortification of Data Communication Infrastructure	•Increasing the Data Communication Speed •Improving data communication standards •Providing industrial cyber security and data security •Increase in the industrial demand to the data centers
4	Suppliers- Supporting National Technology Suppliers	•Taking the inventory of domestic digital technology companies •Fortification of technology acquisition and development opportunities •Supporting the customers' access to products and services of national suppliers.
5	Users - Supporting the digital transformation of	•Supporting digital transformation investments
6	Governance - Fortification of corporate governance	•Institutionalization of the Digital Transformation Platform in Industry

Figure 12: Digital Transformation Route Map Components and Action Fields [16]

- One of the differences to be caused in the social life with the digital transformation will be the change and transformation to be experienced in the labor force. New business environment created by the digitalization of the industry and other sectors will require a labor force that is capable of effectively using the digital technologies. Upon the development of big data and analytic technologies, the professions such as data scientist, data translator have gained importance and labor force with educational background, competency and experience in such subjects started to be demanded. If we need to give an example, the professions that we will more confront in the next 10 years will be those specified in the Figure 13.

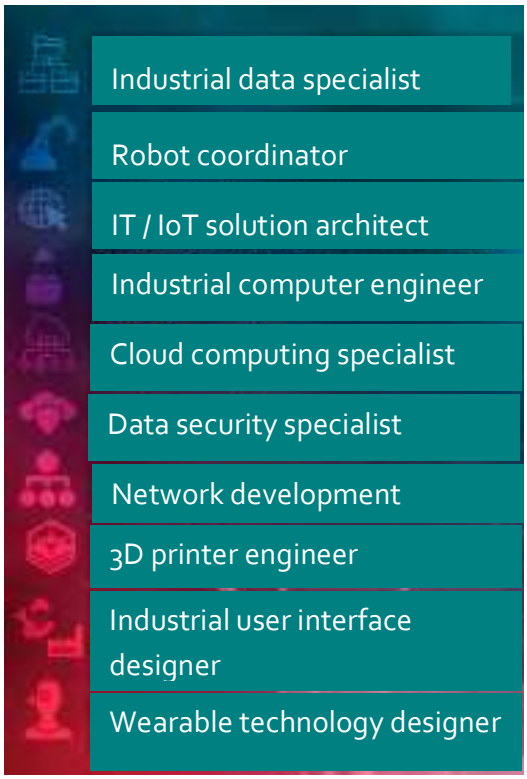

Figure 13: Future's Professions [17]

- It is foreseen that theoretically 50% of the existing works might be realized with automation technologies upon the digitalization.

- A research predicts that 400 million- 800 million people might lose their current jobs until 2030 based on their technology-adoption speed and 75 million - 375

million of them might gain new competencies and can perform other works and professions.

- On the other hand, the same report states that nearly 900 million new business opportunities might be created upon the impact of six important catalytic to increase labor force demand.
- Figure 14 includes a graphic that is prepared by Global Institute and explains the impacts to be created in the economy in 2025 by the digital technologies. According to the figure, mobile Internet, IoT and cloud technologies among these technologies which will shape the future's world will create a significant economic growth. [18]

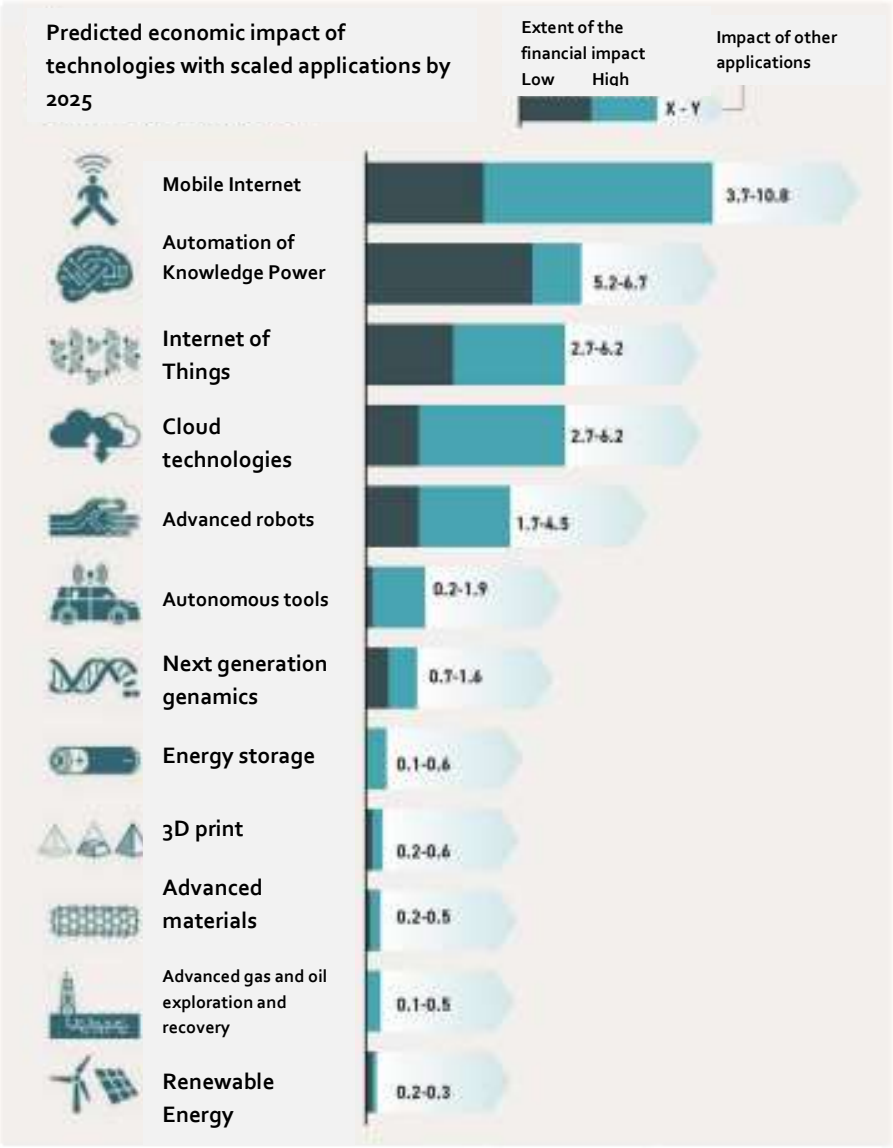

Figure 14: Economic Impacts of Technologies in 2025 (Trillion)

- While assessing the digital transformation and the economic growth to be caused by it, it is necessary to examine its sectoral impacts. Figure 15 points out the distribution of the business growth based on professional groups to emerge until 2025 and specified by Boston Consulting Group.

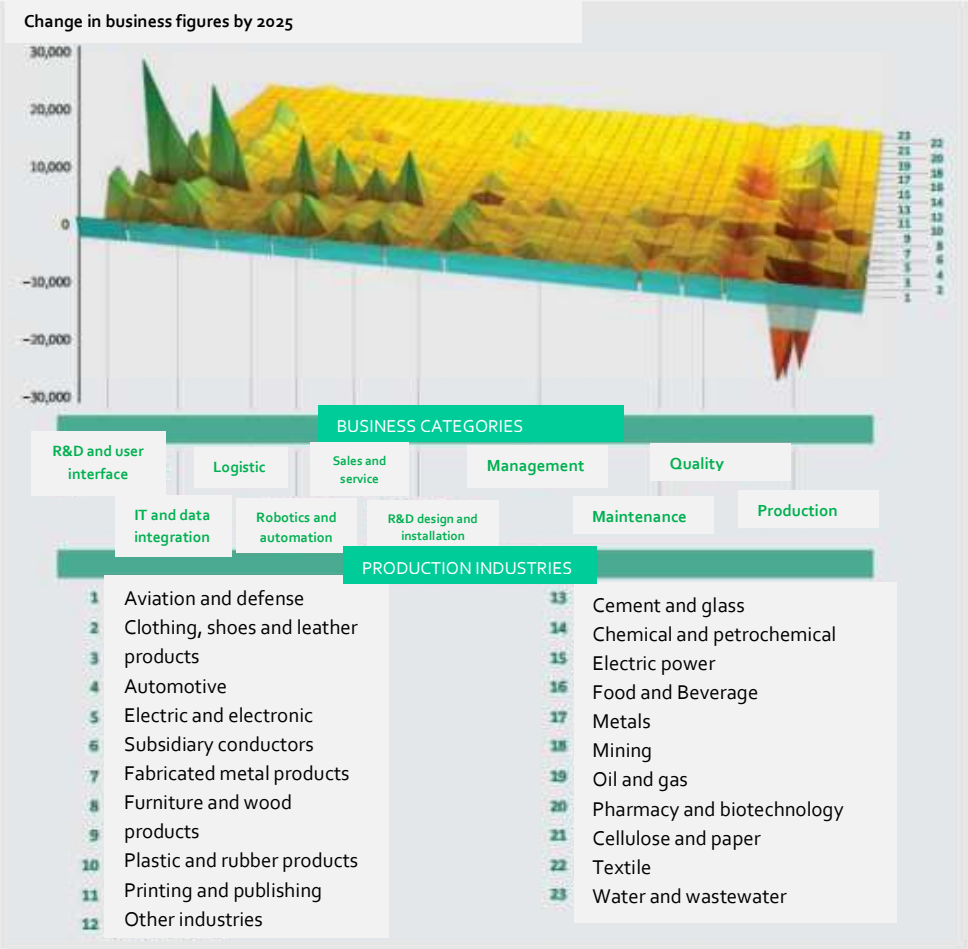

Figure 15: Transformation of Business Growth until 2025 based on Professional and Industrial Groups. [19]

- If we will examine the graphic, We can list the profession group that will be mostly affected by the 4th Industrial Revolution as space and defense, automotive, chemical, electronics, engineering and construction, forestry products, paper and packaging, metals, manufacturing industry, transport and logistics sectors.
- Profession groups to be most affected by the digital transformation journey in Turkey are predicted as "Automotive and Automotive Subsidiary Industry, Machinery, White Appliances, Food and Beverage, Textile, Chemistry".

RESULT

When the digital score of Turkish manufacturing industry is evaluated, it is seen to be between Industry 2.0 and 3.0; and the labor force prevails in our manufacturing industry. Industry 4.0 applications have started to have a more role in our business facilities. T.R Ministry of Science, Industry and Technology prepared "Digital Transformation Report and Route Map of Manufacturing Industry" and put forward a significant vision for short, medium and long term digital transformation strategies of Turkey and steps to be taken. As specified in the report, business facilities which are late to create their digital transformation agenda and fail to benefit from the efficiency opportunities of Industry 4.0 will have a higher risk against the competition in the future. Within this framework, it is crucial importance for our business facilities to increase their awareness on Industry 4.0 and create a realistic route map for themselves.

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