Social Transformation - Industry 4.0

Uğur Sütlu¹ and Fatma Serab Onursal²

¹ Business Master’s Program, İstanbul Commerce University, İstanbul, Turkey
ugursutlu@outlook.com

² Department of International Logistics and Transportation, İstanbul Commerce University, İstanbul, Turkey
sonursal@ticaret.edu.tr

Abstract. The impact of advanced infrastructure and the rapidly rising production technologies on the industry have caused the desire for faster but less costly production, leading to Industry 4.0. This study addresses the general concepts in Industry 4.0, our country’s position in the Industry 4.0 processes, changes to be caused by Industry 4.0 in the society and Project Management of these changes. Also, the data from the OECD and Dijital Dönüşüm Derneği (Digital Transformation Association) will be interpreted.

Keywords: Industry 4.0 · Digital transformation · Digital agility · Social transformation · Society 5.0

1 Industry 4.0

The first social change in human history was brought by agriculture. Settled life brought solutions to life’s problems with permanent housing, regular nutrition and led to the first permanent revolution in human history.

Following agriculture, humanity has experienced other 3 big revolutions until journeying into Industry 4.0 and with each revolution, people have kept up with social changes and regulations. Learning to use the steam power in the First Industrial Revolution, people have changed the weaving, transportation and metallurgy industries with the steam engine. With the introduction of steel production, steam and steel came together and taking one of the important steps for navigation and railroad transportation.

With the Second Industrial Revolution, electricity entered into every part of life and oil started to be used in transportation. These developments put concepts such as production line and mass production into people’s vocabularies, efficiency started having importance in production areas and humanity started to get socially stronger for the next revolutions.

The Third Revolution, technology, uncovered developments in computers, microchips and genetics. Innovative discoveries and trials that break down traditional discourses in medicine and the spread of electricity in the production and service sectors and the speed arising from the invention of the computer were other remarkable innovations. Computer technology has been improving day by day and humanity is
The world is also undergoing a complete transformation along with humanity and sectors, institutions and all the techniques applied until now are now reconsidered with the changing world dynamics.

The Fourth Revolution, Industry 4.0, brought the people of the information society up against a whole new experience. Introduction of cyber-physical systems in production, generating billions of information per second with an Internet connection and robots working in collaboration carry humanity to a point far beyond the information society mentioned in the technology revolution.

Industry 4.0 is a term that emerged in the Hannover Fair in Germany in 2011 as a solution to Europe’s falling behind countries such as China in terms of production and speed. With this approach, philosophies of having objects talk to each other by advancing Internet technologies far beyond, evaluating the collected information in meaningful data, meeting customer demands quickly by taking rapid actions against the changing world, and removing the human factor from production that will not create added value and cause efficiency issues are now spreading around the world and societies will experience radical changes. New professions, adaptation to the new order, speed, agility are beginning to become important and this new revolution will not only speed up production but also touch the lives of people in every sense.

2 The Door to Change

3D Printers, COBOT Technologies, Augmented Reality, Cybersecurity, Internet of Things and Big Data Technologies are among the technological innovations in the Industry 4.0 journey.

With the Internet of things, billions of devices will have an Internet connection and the speed gained by the 5G technology will increase data transfer to incredible sizes. Some major cybersecurity incidents and their impacts are shown in Table 1 as below.

| Company       | Industry       | Country       | Impact                                      |
|---------------|----------------|---------------|---------------------------------------------|
| T-Mobile      | Telecom        | Czech Republic| 1.5 million records were seized.            |
| Yahoo         | Technology     | USA           | Over 1 billion customer account were seized.|
| Facebook      | Social Media   | USA           | Profile information(birth date, name etc.) were seized. |
| Marriott      | Hotel          | USA           | Customers’ name, adress, passaport number etc. were seized. |
| Tech Bureau Corp | Technology   | Japan         | About 60 million dollars of digital money was stolen. |

Ref.: (Digital Turkey & pwc - Digitalization Journey Turkey, 2019) [4]

Many companies who chose to work from home during the pandemic were exposed to attacks called phishing that try to penetrate cybersecurity. Also, worldwide cyber
security company Kaspersky offers a service that we can monitor instant cyber-attacks on website which is “https://cybermap.kaspersky.com”.

With three-dimensional printers taking more part in our lives, the costs of the spare parts manufacturing industry can be reduced to very low levels, and 24/7 production can be made with the support of an operator at the computer. Recent global health crises such as COVID-19 have also shown how robot-dominated enterprises could continue their production. Robotic technologies have become business continuity tools for the production and service sectors.

As with any change, this change process will also reveal new professional groups. For example, when software developed with artificial intelligence technologies and loaded with constitutional information is designed to be fed with big data, it can render a verdict by combining the lessons it has learned and the past records of the person judged. Even though it may seem like a threat to the profession of attorneyship, it can also open new doors for attorneys with which they can improve themselves. For this reason, each professional chamber and its members need to evaluate this transformation for their professions, present possible threats and opportunities and need to take actions to implement them.

Consumers are becoming more and more demanding and companies have no choice but to understand and get to know them better. Consumers, who have easy access to information and the product they want, started to take an interest in software that can renew itself instead of a product with fixed features. As can be seen in the Fig. 1, market shares of Tesla and Ford brands reveal that interest in electric vehicles and products equipped with software is increasing and Tesla has caught up with Ford in their market shares.

All these developments have also introduced a concept called service economy. Works performed without the content and the product to be sold are the ones with the highest turnover lately. Netflix, Spotify, BluTV and other platforms are the common examples of the service economy. In addition, Nike has established a membership
model with a monthly subscription whose members can use their new shoes as the first consumer. The Nike membership system stands out as an important example both in terms of customer loyalty and the service economy.

ZAPPOS, a shoe company, sends your orders to wherever you are free of charge. Without the need for a fixed shipping address, your product is delivered to wherever you want. All these practices now highlight the quality of service rather than the product itself. For all these reasons, companies need to invest in the service economy and customer relations in order to achieve success in the Industry 4.0 investments in production.

3 How Prepared Are We for Change?

Even though Turkey is shown to be breaking its shell Digital Competitive Analyses, especially sectors with dominant foreign investment adapt to the change more easily and accelerate Turkey in this regard. Evaluations made in the production sector reveal that SMEs and lower levels of businesses that are positioned between Industries 2 and 3 pose the biggest challenge in this change.

For Internet use and access to the Internet per household, the OECD figures showing that our country has seen a significant upward trend in the last 20 years can be seen in the Fig. 2. However, “Digital Transformation Power” is not affected by the figures for access to the Internet alone.

![Fig. 2. Internet use rates among OECD countries (OECD, 2020) [6]](image-url)
Three main KPIs are considered in digital competitiveness analyses;

3.1 Technological Knowledge Level

How much research do countries do on new technologies, how much knowledge they have to understand and implement these new technologies are gaining importance. The indicators to measure this is the quality human resources, educational level and quality, and the level of scientific studies in the country.

3.2 Technological Development

Topics such as how advanced countries are in terms of technological development, whether they have the required environment for the digital technological development, the statuses of economic models, incentives and regulations are addressed under “Technological Development”.

3.3 Digital Transformation Agility

The data of how prepared countries are for the digital future, how agile they are for digital transformation, how much place is given for digital technologies in the economic model is used to determine the country’s “Digital Transformation Agility” score.

Turkey’s position in World Digital Competitiveness rankings has not changed in the last 3 years. Turkey’s 52nd place among 63 countries in IMD World Digital Competitiveness ranking (Table 2) is interpreted as Turkey’s missing the digital transformation train (International Institute for Management Development(IMD) - Digital Competition) [5].

The current situation is analyzed in the report of Digital Türkiye Platformu (Digital Turkey Platform) as follows;

“When only 34% of individuals aged 16–74 have digital skills at or above the basic level, this average is 57% in the European Union. Workforce rate with digital skills at or above the basic level is 46% in Turkey and 65% in the European Union.1 Turkey is seen to have fallen behind European countries in terms of digital skills. This poses a significant competition and growth issue for the Turkish economy and is also a major social risk. In addition, the effects of the fourth industrial revolution, in other words, Industry 4.0 are now beginning to be felt by companies and employees almost all around the world. Major changes in business models in most sectors cause the labor market to transform as well.”

And this change is anticipated to bring new occupations with it. Inadequate educational levels of Turkey’s young population in recent studies seems to be the biggest threat in the way of adaptation to new occupations and the transformation. As shown in the chart below, 33% of the young people aged 20–24 in Turkey don’t receive any kind of education. Sadly, this can be interpreted that we will not be easily integrated into new occupational groups that will emerge with Industry 4.0 and there will be an increase in unemployment numbers. (Figure 3) (Digital Turkey & pwc - Digitalization Journey Turkey, 2019) [4]
Qualified and knowledgeable citizens are a country’s greatest power in the road to digital transformation and its most valuable capital that cannot be copied by anyone. Given that 200,000 software developers migrated other countries in 2019, we can say...

**Table 2.** World digital competitiveness rankings (Ref.: (International Institute for Management Development (IMD) - Digital Competition) [5])

| Rank | Country       | 2019 | 2018 | Change |
|------|---------------|------|------|--------|
| 1    | USA           | 1    |      |        |
| 2    | Singapore     | 2    |      |        |
| 3    | Sweden        | 3    |      |        |
| 4    | Denmark       | 4    |      |        |
| 5    | Switzerland   | 5    |      |        |
| 6    | Netherlands   | 6    | +3   |        |
| 7    | Finland       | 7    |      |        |
| 8    | Hong Kong SAR | 11   | +3   |        |
| 9    | Norway        | 9    | -3   |        |
| 10   | Korea Rep.    | 10   | +4   |        |
| 11   | Canada        | 11   | -3   |        |
| 12   | UAE           | 12   | +5   |        |
| 13   | Taiwan, China | 13   | +3   |        |
| 14   | Australia     | 14   | -1   |        |
| 15   | United Kingdom| 15   | -5   |        |
| 16   | Israel        | 16   | -4   |        |
| 17   | Germany       | 17   | +1   |        |
| 18   | New Zealand   | 18   | +1   |        |
| 19   | Ireland       | 19   | +1   |        |
| 20   | Austria       | 20   | +1   |        |
| 21   | Luxembourg    | 21   | +3   |        |
| 22   | Norway        | 22   | -1   |        |
| 23   | Japan         | 23   | +2   |        |
| 24   | France        | 24   | -2   |        |
| 25   | Belgium       | 25   | -2   |        |
| 26   | Malaysia      | 26   | +1   |        |
| 27   | Iceland       | 27   | +3   |        |
| 28   | Spain         | 28   | +3   |        |
| 29   | Estonia       | 29   | -4   |        |
| 30   | Lithuania     | 30   | -1   |        |
| 31   | Qatar         | 31   | -3   |        |
| 32   | Slovenia      | 32   | +2   |        |
| 33   | Poland        | 33   | 36   | +3   |
| 34   | Portugal      | 34   | 32   | -2   |
| 35   | Kazakhstan    | 35   | 38   | +3   |
| 36   | Latvia        | 36   | 35   | -1   |
| 37   | Czech Republic| 37   | 33   | -4   |
| 38   | Russia        | 38   | 40   | +2   |
| 39   | Saudi Arabia  | 39   | 42   | +3   |
| 40   | Thailand      | 40   | 39   | -1   |
| 41   | Italy         | 41   | 41   | -2   |
| 42   | Chile         | 42   | 37   | -5   |
| 43   | Hungary       | 43   | 48   | +3   |
| 44   | India         | 44   | 48   | +4   |
| 45   | Bulgaria      | 45   | 43   | -2   |
| 46   | Romania       | 46   | 47   | +1   |
| 47   | Slovak Republic| 47   | 50   | +3   |
| 48   | South Africa  | 48   | 49   | +1   |
| 49   | Mexico        | 49   | 51   | +2   |
| 50   | Jordan        | 50   | 45   | -5   |
| 51   | Croatia       | 51   | 44   | -7   |
| 52   | Turkey        | 52   | 52   | -2   |
| 53   | Greece        | 53   | 53   | -2   |
| 54   | Cyprus        | 54   | 54   | -2   |
| 55   | Philippines   | 55   | 56   | +1   |
| 56   | Indonesia     | 56   | 62   | +6   |
| 57   | Brazil        | 57   | 57   | -2   |
| 58   | Colombia      | 58   | 59   | +1   |
| 59   | Argentina     | 59   | 54   | -4   |
| 60   | Ukraine       | 60   | 58   | -2   |
| 61   | Peru          | 61   | 60   | -1   |
| 62   | Mongolia      | 62   | 61   | -1   |
| 63   | Venezuela     | 63   | 63   | -2   |

**Fig. 3.** Young population (20-24 Age) which not working and untrained (Accenture Turkey Digitalization Index, 2016) [2]
that Turkey needs to train a qualified and knowledgeable workforce to break its shell and keep up with this change.

In the evaluations regarding the sector-based digital transformation (Fig. 4) suitability and current status, it has been seen that the production-dominant sectors have not yet passed the digitalization bar but are not too far from the target.

As mentioned before, if production-dominant sectors position themselves at Industry 3.0 levels and apply computerized production technologies, transformation can be achieved more easily.

### 4 Society 5.0

There will be a capital need by integrating robots into the production sector and the change will be felt by the society, especially on the service economy, everyone will have smart devices at home and people will turn into devices with wearable technologies. These will also create development needs in the internet infrastructure. With these changes, it is estimated that human-robot interaction will rise to the highest levels, affecting societal relationships. In Japan, where Industry 4.0 is heavily discussed, the academic and social organizations started putting Society 5.0 (Human 5.0) into the agenda. (Prof. Dr. Nüket Saracel, Arş. Gör. İrmak Aksoy, 2020) [7]

Every change needs to be managed but this change affects not only the producers but customer demands and methods of addressing these demands in a society. Therefore, people will need to prepare action plans for the level of knowledge, welfare and culture that they want to reach. For example, what prevents the world’s most famous surgeons from performing surgery on a person in another part of the world by

---

**Fig. 4.** Sector-Based Digital Transformation (Accenture Turkey Digitalization Index, 2016) [2]
connecting to a surgery robot like da Vinci? There is only one answer for it, Infrastructure!

You cannot entrust an infrastructure that will detect movements late due to the speed of the Internet with processes that need to be managed with 0 (zero) error, but the innovations that will arise by meeting these needs can completely change a society’s behavior.

5 Project Management

A project is basically non-repetitive works that serve a specific purpose, carried out within a certain calendar. Project Management is a multidisciplinary profession 90% of which is communication. Project management activities (launching-planning-executing-monitoring-controlling-closing) are executed within 10 different information areas (Integration, Scope, Time, Cost, Quality, Human Resources, Communication, Risk, Supply and Shareholder).

A profession group that needs to give 90% of its energy to communication and check the information fields above is directly affected by the changing company structures, digital transformation moves, the policies of suppliers and human resources, and changing consumer needs. Traditional project management methodologies such as waterfall are now replaced in many companies by agile and hybrid models. In Cost, Scope and Time triangle for example, one of the most traditional methods in project management, we cannot keep the scope fixed these days. But the expected output needs to be in better quality than before. Needs and resources have changed, so Project Management needs to renew itself.

6 The Effects of Change on Project Management

In 2001, 17 software gurus published an Agile Manifesto. This manifesto consists of 12 articles and focuses on 4 main messages. Afterwards, this message starts to include not only the software world but also everyone involved in project management.

- **Individuals** rather than processes and tools and interactions between them
- **Running software** rather than comprehensive documentation
- **Cooperation with the customer** rather than contract negotiations
- **Responding to change** rather than sticking to one plan

There are several important steps to this change. The most important thing is to make processes lean; removing the processes that do not add value in terms of the customer and bringing value-added processes to the fore (AgileManifest, 2001) [3]

However, as the most important part of the traditional project management process is that the scope of the project has clear limit, while in the agile project management, the scope is locked within the sprints determined between 1 and 4 weeks, and after this sprint, the issues of the next sprint with meetings with the team and the product owner are prioritized. The most important gain of the claimant is flexibility. Agile project management philosophy decreases time to market periods for companies and aims to
reflect outputs on the field quickly because projects that take months and years to get into the market can face problems too big to compensate in their market share. The flow of agile project management can be summarized as Fig. 5.

![Scrum framework](image)

**Fig. 5.** Scrum framework (AgileManifest, 2001) [3]

Agile project management’s one of the biggest goals is to give meaningful parts of the scope as partial but usable outputs iteratively, rather than giving the whole scope at once.

### 7 Conclusion and Evaluation

Even though the concept of Industry 4.0 seems to be a need for a transformation with a focus on the production sector due to its advantages, the conditions such as that customers are on the more demanding side and the best service they receive in the digital environment becomes a criterion for their next service greatly affect our social lives and the service sector. Attaching importance on education and increasing digital skills are very important steps to take in order not to miss the Fourth Industrial revolution.

Customers have become as digital and super smart profile with society 5.0 approach in all sector so companies should improve digital capabilities for these profiles. People who live in society 5.0, want to reach the high-quality products in short time so efficiency, lean management and customer loyalty have become the most important steps for all company on the digitalization roadmap.

It is very important to take the right steps for the new world order by doing further research on the education sector and shaping the digital society.
References

1. MarketWatch (2017):  https://www.marketwatch.com/story/tesla-surpasses-ford-to-become-no-2-us-car-maker-2017-04-03
2. Accenture Turkey Digitalization Index: Accenture Turkey Digitalization Index (2016). Retrieved from Accenture Turkey Digitalization Index. https://www.accenture.com/_acnmedia/pdf-48/accenture-turkey-digi-ind-report-english.pdf?la=en
3. AgileManifest (2001). AgileManifest. https://agilemanifesto.org
4. Digital Turkey & pwc - Digitalization Journey Turkey: Digitalization Journey Turkey, January 2019. Digitalization Journey Turkey. http://www.tubisad.org.tr/tr/images/pdf/dtp_dijitallesmeyolundatr.pdf
5. International Institute for Management Development(IMD) - Digital Competition: Analysis of Digital Competition (n.d.)
6. OECD (2020). OECD. https://data.oecd.org/ict/internet-access.htm
7. Saracel, N., Gör, A., Aksoy, I.: Society 5.0: super smart society. Soc. Sci. Res. J. (2020)