**INDUSTRY 4.0, SOCIAL TRANSFORMATION AND SITUATION IN TURKEY**

**Invited Speaker**

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The aim of the presentation is to provide some information regarding industry 4.0, social transformation towards implementing the proposed technologies under the Fourth Industrial Revolution. The progress and activities carried out in Turkey is reviewed and some recommendations along this line is listed for the benefit of industrial practitioners.

The first industrial revolution appeared towards the end of 17$^{th}$ century. This was the invention of the first machine which can work using steam power *(Industry 1.0)*. This finished the agricultural society and became the main motivation for all industrial revolutions. Following progressive machining process resulted with industrial society which also played a key role in the development of the nations especially after the invention of electricity and mass production capabilities *(Industry 2.0)*. With the introduction of computers and progress on information technology made it possible for the enterprises to device automatic machines and software operations. This ended up with another industrial revolution *(Industry 3.0)* where IT and digitization was the main baseline for this.

Due to technological progress especially on Artificial Intelligence and sensor technology, the machines are equipped with capabilities of autonomy and self-behaving which than played a main role in developing industrial applications. Along this line, sensor technologies and information networking for communication has increasingly progressed and made it possible to generate cyber-physical systems. Additionally, internet of things (IoT), virtualization, and big data applications surpassed other systems. This became an encouraging attitude towards generating unmanned factories and systems. On the other hand manufacturing vision has changed from "energy-machine-money-material" to "product-intelligence- information- communication network". The changes triggered digital transformation which is now considered to be another industrial revolution so called *Industry 4.0*

It is obvious that Innovation, customer expectations and the need for rapid response to those, enhanced security, possibilities offered by digital marketing and consumer management capabilities, global competition, services that can be provided by digital assistants drives the transformation toward industry 4.0. Continuing along utilizing these elements as the base line for the change, some new systems is invented which affect human line. Robots and intelligent software systems have now being more and more active in helping people to analyze, establish relations, make inferences and solve problems. They can learn the events and reason about the similar ones. Thy can solve very complex problems which is not easy to be sorted out by using traditional computing methodologies. They can even understand meaning of word and perform respective computations. They can answer questions, communicate each other, read text, understand and teach Natural Language as well as observe, perceive, priorities, focus attention over the range of events occurring surroundings.

In due time, the social life is also heavily affected by the progress towards industry 4.0. Some new technologies such as cloud, IoT, Big data systems, 3D printing and blockchain etc. generated completely new systems which are more effective and more functional in every area of life from

transportation to health, from agriculture to manufacturing, from public administration to trade, from energy to education etc.  By using these technologies make it possible to develop some products implanted to human body, AI robots which can perform the role of decision board members in meetings, wearable internets, smart city applications making the life easy for human, vision system utilizing augmented reality for real time decision making, 3D printed products even organs and driverless vehicles on the streets etc. Technology experts are confident enough that the progress among this line will continue to raise up with new jobs, new systems and new products.

Turkey is spending a great amount of effort to catch up the progress on industry 4.0 as being clearly declared by the government as such;

> «*The digitalization of Turkish Industry will have an effect on and contribute to the growth of manufacturing sector. One of government priorities is to increase exports of medium and high-tech* products and achieve the EU average"

Based on this understanding, the government declares willingness at ministerial level to provide support to any initiative for better transformation.

Turkish actors of digital transformation clearly understand that; the impact of digital transformation will not only be limited to industry, industrialists, and industrial workforce, but will have a significant effect in every area of human lives and every individual. It is also well understood that the digital technologies and advanced manufacturing techniques will impact different sectors in different ways. This is important to prevent the technological deficit.

Keeping this in mind; various types of activities such as panels, seminars, focus groups, dedicated analysis etc. are carried out. A comprehensive survey is carried out. 108 technology user and 110 technology provider attended (see the complete report in [1]). The study revealed that;

- ➢ Enterprises are well aware of digitalization but not confident enough about being ready to the way ahead.
- ➢ Strategy and road map generation capability of enterprises seem to be low.
- ➢ Only %44 of the enterprises are at the stage of conducting pilot projects
- ➢ The competency levels of the companies do not differ according to the sectors. However, digital transformation competency level of big enterprises seems to be greater than small ones.
- ➢ Companies state that the biggest challenges against digital transformation are the high investment costs and the uncertainty of return on investment

Additionally, this study indicates that there is a need for the companies to spend some time to understand possible benefits.  Especially the attention should be given to autonomy as having the prime importance. Although ERP, MES, and automated storage systems are heavily engaged not much effort is given on generating cyber-physical as well as RFID systems. Most of the technical background is established on assuring the security of the systems.  This is followed by automation and robotics. Big data analysis seems to be following these. This motivates the researchers and industrial practitioners to spend time and effort to develop smart factories as well as data based quality systems.  The interest is remarkably increasing on "internet of things" and artificial intelligence.


The study clearly points out the lack of autonomy and intelligence in the first initiatives. However, the progress will definitely make this known and the designers will soon understand the way to improve their systems for the sake of better and more intelligent systems. To be able to succeed the designers

and investors should be patient and should overcome some of the barriers preventing the progress. Among them are, high investment costs, uncertainty on the return of investment, lack of knowledge on digitization, lack of finding out local suppliers etc. In order to make the life easy for the industrial investors, the government already made the first attempt as the following.

➢ Turkish Government issued a so called «Manufacturing Reform Package including important regulations intended to remove the obstacles and encourage production, exports, innovation, and R&D.
➢ It is announced that this Manufacturing Reform Package was drafted with an understanding of the fourth Industrial Revolution for the purpose of meeting technological needs.
➢ Similarly, Industrial Property Rights Law recently put into effect is aimed to harmonized Turkish regulations with advanced countries.
➢ The Government remarkably increased R&D expenditures for sustaining industrial infrastructure in order to facilitate the development of own technology.

Government also pioneered a program based on public-private cooperation to accelerate the process of digital transformation in the industry and established the Digital Transformation Platform in Industry, of which the preliminary meeting took place at the end of 2016. Under the leadership of our Ministry of Science, Industry and Technology, the platform brings together TOBB, TİM, TÜSİAD, MÜSİAD, YASED, and TTGV to work together for finding out an implementable road map. This initiative evolves slowly and is expected to become more active. Each of these institutions are assigned a specific task, details of which can be seen in the report, to detail possible research and development activities.

With the new formation of the presidential system, a new office so called "digital transformation office" is established in for being responsible in determining the relevant strategies and policies. In parallel to Government activities, the industry should also make concrete attempts. The manufacturers of today should;

➢ fully understand consumer needs,
➢ develop strategies for technological advance,
➢ design new business models and
➢ organizational structures compatible with the digital world

If the following attitudes are sustained within both public and private institution than, Turkey will have its place in the digitized world more effectively.

➢ Empowerment to action – the authority to do what is needed.
➢ Aligned vision – to understand and be committed to what needs to be done.
➢ Engaged leadership – to support, guide and protect against unanticipated events.
➢ Tolerance for failure – to achieve success, after failing fast, failing smart and keep going.
➢ Tangible incentives – to keep appropriate reward systems in place for success.
➢ Belief it can be done – to know and accept to get the job done.

Additionally enterprises should;

➢ be open to radical reinvention to find new, significant and sustainable sources of revenue.

- ➢ also, be prepared to tear themselves away from routine thinking and behavior and develop a digital ambition.
- ➢ not be afraid of risks and empower employees to take the risks and make mistakes wherever possible.
- ➢ thoughtfully de-risk their processes.
- ➢ create a list of "things to be done" for understanding how digital can upend business models, focusing on the opportunities in the future, sustaining long life learning, removing barriers, create incentives.

## References

1. https://tusiad.org/tr/yayinlar/raporlar/item/9864-tusiad-bcg-turkiye-nin-sanayide-dijital-donusum-yetkinliği)