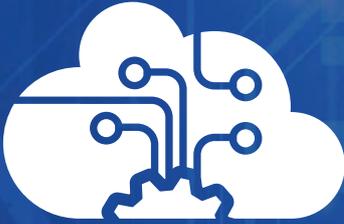


**INDUSTRY 4.0 IN TURKEY AS AN IMPERATIVE
FOR GLOBAL COMPETITIVENESS
AN EMERGING MARKET PERSPECTIVE**



TÜSİAD
SANAYİ 4.0
TÜRKİYE'NİN SANAYİ 4.0 DÖNÜŞÜMÜ

INDUSTRY 4.0 IN TURKEY AS AN IMPERATIVE FOR GLOBAL COMPETITIVENESS AN EMERGING MARKET PERSPECTIVE

EXECUTIVE SUMMARY

This publication is the executive summary of
“Industry 4.0 in Turkey As An Imperative For Global Competitiveness:
An Emerging Market Perspective” report.

March 2016
Publication Number: : TÜSİAD-T/2016-03/576

Meşrutiyet Caddesi, No: 46 34420 Tepebaşı/İstanbul
Telefon: (0 212) 249 07 23 • Telefax: (0 212) 249 13 50
www.tusiad.org

© 2016, TÜSİAD

*“All rights reserved. No part of this publication shall be processed/
adapted, reproduced, circulated,
re-sold, rent, lent, represented, performed, recorded, transmitted with
cord/cordless or any technical, digital and/or electronic devices without
prior written permission from the author(s)/right
holder subject to
Article 52 of Law No. 4110 amended by Law No. 5846 for Intellectual
and Artistic Works*

ISBN: 978-605-165-016-6

Editors: Dr. Nurşen Numanoğlu, Mehmet Evren Eynehan, Güzde Morkoç-Nikelay, Ecem Aksoy

Cover Design: Marjinal Porter Novelli

Typesetting and Page Editing: Kamber Ertem

Grafik Tasarım:

SİS MATBAACILIK PROM. TANITIM HİZ. TİC. LTD. ŞTİ.
Eğitim Mah. Poyraz Sok. No:1/14 Kadıköy - İSTANBUL
Tel: (0216) 450 46 38 Basım CB Basımevi: (0212) 612 65 22

PREFACE

TÜSİAD (Turkish Industry and Business Association), which was founded in 1971, according to the principles laid in the Constitution and in the Associations Act, is a non-governmental organization working for the public interest. TÜSİAD aims at enhancing the development of a social structure committed to the universal principles of human rights, together with the freedoms of enterprise, belief and opinion, secular state governed by the rule of law, participatory democracy, liberal economy and the rules and institutions of competitive market within a sustainable environment. TÜSİAD, in conformity with Atatürk's principles and objectives, with a view of seizing and outreaching the contemporary civilization level, works for the realization of the above-mentioned objective believing in the pioneer and entrepreneurial nature of business people who consider gender equality in politics, economy and education. TÜSİAD representing Turkish business working for the public interest, strives for entrepreneurs to operate in conformity with the universal business ethics; supports all the policies aimed at improvement of competitiveness of Turkish economy and social welfare in the globalization process through enhancement of employment, productivity, innovation capacity and the scope and quality of education. TÜSİAD contributes to the formulation of national economic policies, in an environment with persisting social peace and compromise, for the economic and social development by taking into account the regional and sectoral potentials. TÜSİAD contributes to Turkey's communication taking into account competitiveness at global level, initiates a range of studies to develop political, economic, social and cultural relations as well as communication, representation and cooperation networks at international level to support the accession process of Turkey to the European Union. TÜSİAD conducts researches, generates opinions, develops projects and organizes activities in order to expedite international integration and interaction as well as regional and local development. TÜSİAD, in the name of Turkish business, forms opinions and proposals, conveys them to the national parliament, the government as well as foreign states, international organizations and public opinion directly or through media and by using other means, aims to create a unity of opinion and action in the direction of the above-mentioned objectives.

Following the global financial crises in 2008, industry sector has been positioned at the center of economic growth by most of the countries as a leading sector. In this context, productivity growth and innovative technologies became determinant factors for added value increase with the knowledge based society transformation. Those factors, which are also crucial for increasing competitive power of Turkish economy, brought the global developments into the country's agenda as vital matters need to be monitored rigorously and simultaneously.

This process points out a transformation spreading the whole value chain. It is believed that Industry 4.0 as a phenomena based on high technology and innovation, is going to be an anchor for the transformation of Turkish industry.

With this understanding, a project had been initiated by the TUSIAD Industrial Transformation Round Table to analyze the opportunities of Industry 4.0, reveal the potential of Turkish industry and define the requirements for realizing its transformation.

This report, which involves The Boston Consulting Group as the content partner, aims to reveal the potential benefits and costs with sectoral and quantitative assessments.

Our report, covers six pilot sectors including automotive, machinery, white appliances, food and beverages, textile and chemicals. We would like to express our sincere thanks to the executives who shared their opinions and helped us to conduct interviews in 25 different companies.

We are also grateful to Mr. Levent Çakıroğlu, CEO in Koç Holding, Mr. Erdal Karamercan, CEO in Ezcacıbaşı Holding and Mr. Agah Uğur, CEO in Borusan Holding; those shared their valuable opinions within the steering committee which was established to ensure a fruitful environment during the preparation of this report.

This report is prepared by Mr. Aykan Gökbulut and Mr. Burak Tansan, Partners and Managing Directors and Mr. Tevfik Eren, Senior Consultant and Çağlar Targotay, Project Leader from The Boston Consulting Group (BCG) Istanbul Office, the content partner of this study, under the guidance of Mr. Mehmet Bahadır Balkır and Mr. Mehmet Nurettin Pekarun, co-chairs of the TUSIAD Industrial Transformation Round Table.

During the preparation of the report, contributions were made by Dr. Nurşen Numanoğlu, Deputy Secretary General of TUSIAD, Ms. Gözde Morkoç-Nikelay, Expert of Industrial Transformation and Sectoral Policies Department.

March 2016

ABOUT THE AUTHORS

Burak Tansan

Partner and Managing Director, BCG Istanbul

Burak Tansan rejoined The Boston Consulting Group in 2010 and is currently a Partner and Managing Director in the Istanbul office and Head of BCG's operations in Turkey.

He has 17 years of strategy project experience, including 7+ years of line experience at leading Turkish Banks and extensive experience in Management Consulting and strategy development.

Burak Tansan received his Bachelor of Science Degree, Summa Cum Laude, as Highest Graduating Student in Business Administration from Boston University in 1996 and his MBA degree from Harvard Business School in 2000.

Aykan Gökbulut

Partner and Managing Director, BCG Istanbul

Aykan Gökbulut joined The Boston Consulting Group in 2005 in Vienna and is currently a Partner and Managing Director in the Istanbul office.

Prior to joining BCG, he worked 9 years in automotive and technology sectors in various management positions. Aykan is a core member of Industrial Goods and Consumer Goods and Retail practice areas and leads the Industrial Goods sector of BCG in Turkey.

Aykan Gökbulut holds an MBA from INSEAD, Fontainebleau and Master of Science in Industrial Electronics from Vienna University of Technology, Austria.

Çağlar Targotay

Project Leader, BCG Istanbul

Çağlar Targotay joined The Boston Consulting Group as a Consultant in 2012 and is currently Project Leader in the office with primary focus in industrial goods sector. Previously, he worked at Ernst & Young as financial auditor and advisor for five years. He has professional experience in industrial and consumer goods industries focusing on corporate strategy, strategic transformation practices.

Çağlar holds an MBA from SDA Bocconi, Milan and BSc degree in Management from Bilkent University, Ankara with high honors.

Tevfik Eren

Consultant, BCG Istanbul

Tevfik Eren joined The Boston Consulting Group as a Consultant in 2013 with primary focus in Telecommunications and Industrial Goods.

Prior to joining BCG, Tevfik worked 11 years in technology and finance sectors in various management positions. He has professional experience in numerous industries focusing on M&A, strategy, and large-scale transformation programs.

Tevfik holds an MBA from London Business School, London and BA in Economics from Bosphorus University, Istanbul.

EXECUTIVE SUMMARY

Technology's relentless advance has made it possible to significantly boost industrial productivity, especially since the late 18th century in three main waves. Steam-powered machines, the introduction of electricity in production and increasingly widespread robot automation movement after 1970s triggered these three trail-blazing revolutions.

Today, we are in the midst of a fourth industrial (r)evolution, triggered by digital technologies. Nine technologies—including smart robots, big data, the Internet of Things, 3-D printing, and the cloud—have played a critical role in triggering this revolution.

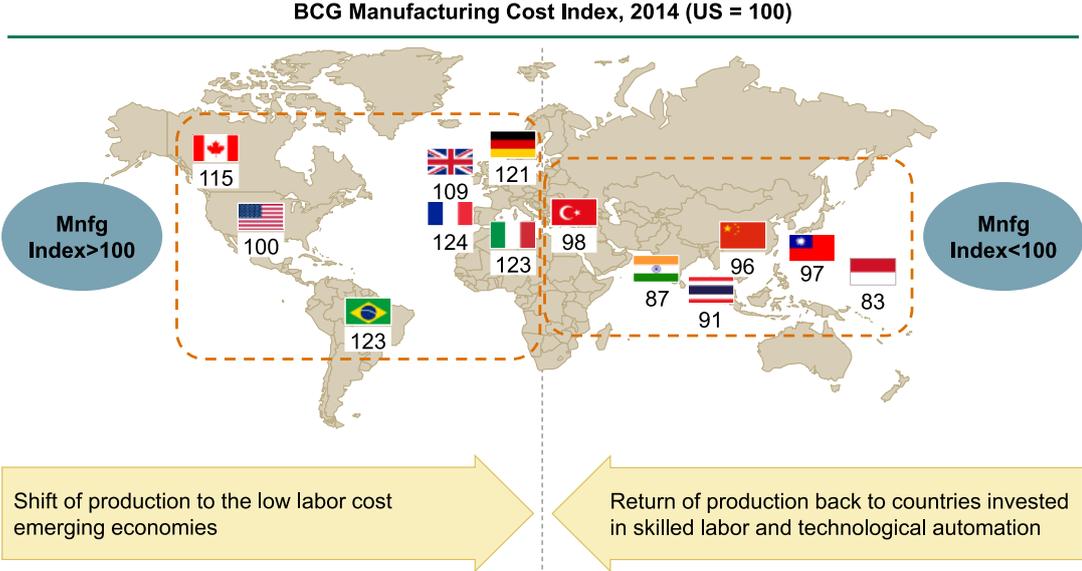


We define the Industry 4.0 concept that has emerged as a result of this revolution as the integration of the links in the value chain in a way that goes beyond automation. The most important characteristic of this integration is that all of the steps in the value chain are in constant real-time communication. Consequently, a vision of achieving an intelligent, self-adapting industrial process has emerged. This vision describes an industrial journey that is faster, more flexible, more efficient, and produces goods with higher quality.

Industry 4.0 was put forward by Germany and later by other industrialized countries such as the U.S.. Industry 4.0 creates significant opportunities for these countries, which have lost their competitiveness in production over the years, to regain their advantage. For example, according to a detailed study conducted by BCG in 2015, widespread application of Industry 4.0 is expected to have a very significant impact on the German economy in the next ten to 15 years. When we put this impact into numbers, we see that it is possible to achieve a cost-savings effect of up to €90 to 150 billion as a result of increased industrial productivity equivalent to 15 to 25 percent of the conversion costs associated with production. Furthermore, beyond the increased productivity, the Industry 4.0 process is a journey that creates its own higher value-added economy, fundamentally changes the established value chain, and, most importantly, creates an increased demand for skilled labor.

It is critical that Turkey not only stay abreast of these developments but also takes its place among the leading economies implementing Industry 4.0. We must anticipate significant pressure on the factors that constitute the foundation of our competitiveness, such as lower labor costs and logistical advantages, especially at a time when the indicators of competitive strength are so diverse and change so rapidly.

Turkey positions itself in the global value chain by rather leveraging on its logistical advantage and at value cost labor



Note: The index covers four direct costs only-No difference is assumed for other costs, such as raw material inputs and machine and tool depreciation. Cost structure calculated as a weighted avg across all industries
Source: US Economic census; US Bureau of Labor statistics; US Bureau of Economic Analysis; International Labour organization; Euromonitor international; Economist intelligence unit; BCG Analysis

In this respect, the goal must be to ensure and enhance the sustainability of our competitive advantage with Industry 4.0, but, beyond this, to create a Turkish industry with greater added value that receives a larger share of the world’s production value chain. We must remember that this will help Turkey achieve its goal of moving from an emerging market to the next level.

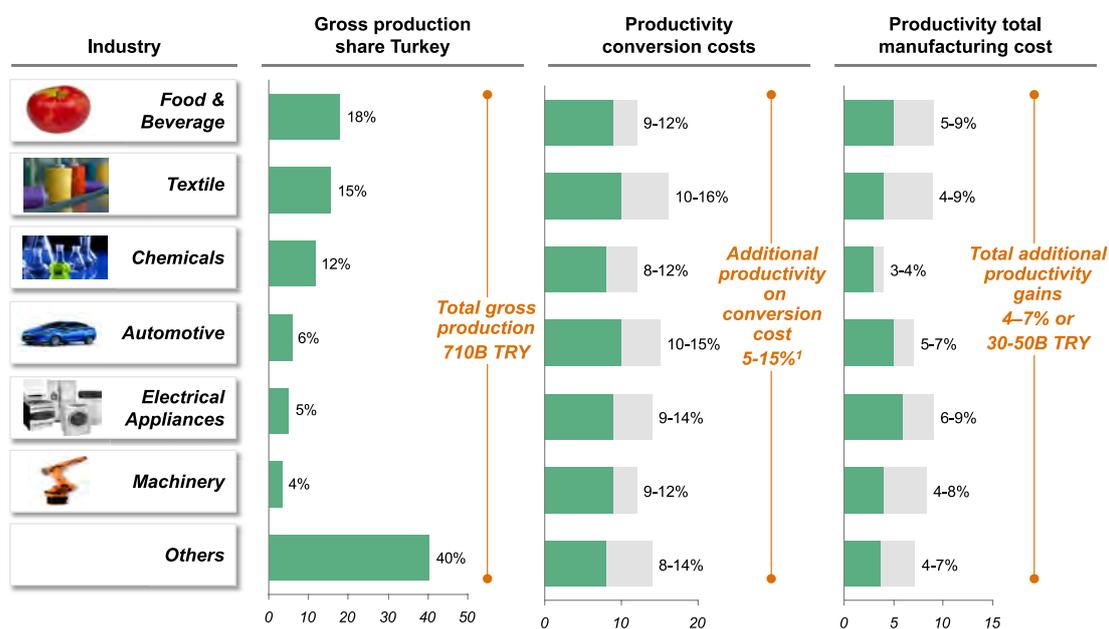
This study provides an opportunity to assess the ideas, experience, and knowledge of the executives in many important Turkish industrial companies, with the goal of outlining an economic perspective that goes beyond a conceptual discussion of Industry 4.0 for Turkey. Within this framework, conversion to Industry 4.0 is expected to result in development in four important categories:

Productivity: If Industry 4.0 is successfully implemented in an economy of the present size, manufacturing sectors in Turkey have the potential to achieve benefits of up to TL50 billion. This analysis is based on an estimated increase in productivity of 4 to 7 percent in light of total production costs. When the cost of conversion alone is taken into consideration (production costs other than material costs), the increase in productivity is projected to be 5 to 15 percent.

Growth: The competitive advantage that will be gained through the economy that emerges within the framework of Industry 4.0 and integration with the global value chain is expected to trigger an increase in industrial production that could reach 3 percent a year. This growth means a boost to Turkey's GDP of 1 percent or more and translates into an additional revenue of around TL150 to 200 billion.

Investment: Based on current prices and the size of the economy, it is estimated that approximately TL10 to 15 billion (about 1 to 1.5 percent of manufacturing revenues) must be invested per year to integrate Industry 4.0 technologies into the manufacturing process over the next ten years.

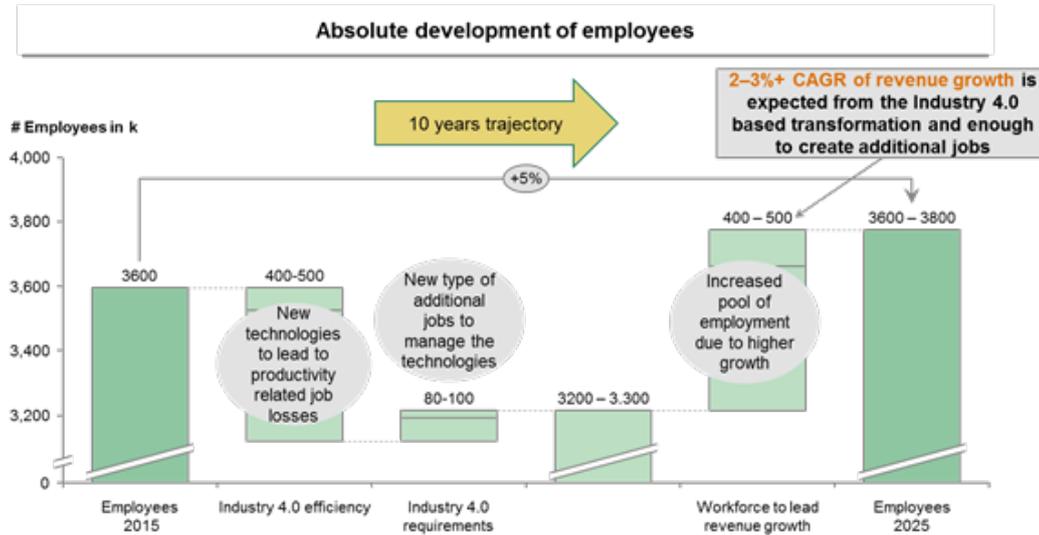
Turkey: Productivity increases for producers of 4-7% on total costs and 5-15% on conversion costs



Note: conversion cost=manufacturing cost excl. material. 1. Additional net effect for manufacturing industries, incl. investments, supplementary to conventional productivity increases 2. Construction of wind power plants included in mechanical engineering (incl. technical components, tower, nacelle); Source: Federal Statistical Office Germany, Expert Interviews, BCG Analysis

Employment: On the assumption that growth targets will also be realized, it is anticipated that the need for labor employed in industry as a whole will increase and, more importantly, that this labor force will be more skilled, be better educated, and earn higher wages. In this context, we can expect that labor employed in low-skilled jobs will decrease, but there will be an absolute overall increase in employment with the rise in industrial production. The income pyramid and Turkey's "know-how" infrastructure will develop with the emergence of a skilled workforce.

Vision for Turkey: In the long run a better skilled labour force with increasing absolute employment



The study examined the automotive, white goods, textile, chemical, food and beverage, and machinery sectors as pilot sectors because of the contributions they make to the economy and their ability to serve as potential examples in modeling of many other sectors. When Industry 4.0 applications are evaluated in these sectors, emerging opportunities are the flow of information and materials, integration with suppliers, simulation of the product and production process in the design phase, flexible production, and smart product and production lines that increase predictability. However, there is a significant need for qualified solution partners and human resources. When examined in more depth, the impacts and opportunities summarized here include many variables that depend on the status and needs of the individual sectors. These impacts and opportunities will be different on a company basis when it comes to actual application.

Discussions with industry representatives have shown that awareness of these opportunities is very high and many industrial organizations have already begun to move forward in terms of Industry 4.0 application, even though there are various levels of maturity. Another important and common finding was the belief that this journey could only succeed if all stakeholders contribute and holistic policies are established. It is imperative that a long-term, comprehensive approach be developed to address the numerous structural limitations Turkey faces, such as the workforce, scale, and investment.

All stakeholders have an important role to play in the development of such an approach for a successful Industry 4.0 journey.

- Industrial organizations and suppliers need to stay abreast of the technologies that triggered Industry 4.0 and prepare roadmaps for the opportunities and impact this will have on their own business models. More importantly they need to outline a clear roadmap of their workforce and equipment requirements and act accordingly.
- Important priorities for policy-makers and the public sector, on the other hand, include supporting the development of the nation's technological infrastructure (e.g., in the area of telecommunications, information, communication) with the requirements of Industry 4.0 in mind, preparing the necessary investment and incentive environment, and, most critically, creating long-term education policies to meet the demand for a skilled workforce.

In addition to the aforementioned stakeholders, it is possible to make important comments for the service sector as well. Value chains that develop within the framework of Industry 4.0 will naturally trigger a transformation in the service sectors. Finance, logistics, and software and system integration, which are production solution partners, are also important areas.

Turkey is a young country with an internalized technology and a growing workforce, on the threshold of an opportunity to achieve a huge transformation that will change its role in the global economy. It is urgent and imperative that all stakeholders focus and work within the framework of a joint national plan and objective to join the Industry 4.0 (r)evolution that we believe will be a very fundamental factor in and opportunity to enhancing the development and competitiveness of Turkish industry and allowing the country to take its place among the leading nations. Turkey must identify what is required to make this opportunity a reality and outline a road map to success. Implementation of this roadmap in cooperation with all stakeholders should be one of the most central items on the national agenda for the next ten years.

There is, therefore, a need for a platform where every aspect of the Industry 4.0 approach can be addressed and both the strategic and operational needs and applications can be discussed in depth with the participation of all of the actors responsible for transforming our industrial sectors.

TU SIAD

BCG

THE BOSTON CONSULTING GROUP

