Preface

INTRODUCTION

In its recent history, the world has experienced numerous paradigm shifts propelled by four major stages of revolutionary developments. *The Industrial Revolution* (from approximately 1760 to about 1820-1840) facilitated the transition to new manufacturing processes. This transition signified a shift from manual production methods to machines, new chemical manufacturing and iron production processes, the increasing use of steam power, the development of machine tools and the rise of the factory system. *The Second Industrial Revolution*, a.k.a. the Technological Revolution (from approximately 1870 and 1914 up to the beginning of WWI). At its core, the Second Industrial Revolution is significantly rooted in earlier innovations in manufacturing, such as the emergence of a machine tool industry, methods for manufacturing interchangeable parts, the invention of the Bessemer steel production process, and others, based on widespread adoption of preexisting technological systems such as telegraph and railroad networks, or gas and water supply. In the early 20th century, Henry Ford mastered the moving assembly line and ushered in the age of mass production. *A third revolution* is under way: under it, manufacturing and the whole economy are going digital. A number of remarkable technologies are converging: smart software, novel materials, more dexterous robots, new manufacturing processes (notably 3D printing) and a whole range of web-based services, such as Airbnb (a major company in the peer-to-peer property lodging/rental sector) and Uber (a passenger hauling service), to name a few. The factory of the past was based on mass manufacturing of identical products. Ford once infamously said that car-buyers could have any color they liked, as long as it was black. However, the cost of producing much smaller batches of a wider variety, with each product tailored precisely to each customer's preferences, is falling in the digital world. The factory of the future will focus on mass customization—and may look more like the weavers' cottages of centuries past than Ford's assembly line. *The Fourth Industrial Revolution* signifies a wide range of new technologies that are fusing the physical, digital and biological worlds, and affecting all disciplines, economies, and industries. It involves emerging technological advances in the areas of artificial intelligence, robotics, the Internet of Things, autonomous vehicles, 3D printing, quantum computing and nanotechnology, among others.

In 1942, Joseph Schumpeter, an Austrian-American economist, coined the concept of "creative destruction." It refers to the continuous product and process innovation mechanism by which new production units and platforms replace outdated ones. In 1995, Clayton Christensen of Harvard University and his associates introduced the concept of disruptive innovation. In the field of business administration, this refers to an innovation that creates a new market and value network and eventually disrupts an existing market and value network, displacing established market-leading firms, products, and alliances. Some observers go as far as calling the concept of disruptive innovation the most influential business idea of the early twenty-first century.

A sustaining type of innovation that can be either evolutionary or revolutionary does not significantly affect existing markets. For example, replacing steel with aluminum in automotive manufacturing (evolutionary innovation) was a significant advancement, but was not disruptive in nature. The first automobiles in the late 1900s were initially expensive luxury items, and as such enjoyed limited market appeal. The emergence of the lower-priced Ford Model T, made even more affordable through the proliferation of consumer credit, eventually displaced the horse-drawn carriage. The introduction of a more affordable model had a disruptive effect on the transportation market.

Disruptive innovation in its technological and socio-economical entirety has exerted profound, wide-ranging impacts on various aspects of life—human activities, natural and social environments. To mention a few examples, the advent of Wikipedia has had a disruptive impact on print encyclopedias and crippled their customer appeal; users embrace web-based encyclopedias because they are easily accessible and cost efficient (in many cases, there are no costs involved). The proliferation of smartphones, with their amazing computing capability, imaging power, and universal Internet connectivity, disrupted the watch industry, micro-calculator industry, physical area maps, and GPS-based navigation systems in cars. Digital photography obliterated Polaroid technology, film-based photography and many related industries in the supply chain. Computer word processing exterminated the typewriter. Web-based video streaming technology and the rise of Amazon, Netflix, and Hulu is eroding the power of Hollywood studios, movie theaters, and cable companies. The list goes on.

As the churn continues, innovative products and technologies of the future continue emerging: robotics, cultured meat and seafood in agri/aquaculture; civilian and military drones in aviation; driverless vehicles; new technologies and materials in material sciences; new types of electronic devices, imaging and displays; innovative materials and methods in medicine; 'clean'/renewable energy sources; virtual reality;

artificial intelligence and deep learning; automatic multi-language translation, voice and image recognition, to name just a few.

As noted earlier, these innovative products and technologies exert massive impacts on life and work, natural and social environments. Perhaps one of their most profound disruptive impacts is on jobs.

According to a recent report by McKinsey's Global Institute (2017),[1] automation technologies including artificial intelligence and robotics will generate significant benefits for users, businesses, and economies, lifting productivity and economic growth. The extent to which these technologies displace workers will depend on the pace of their development and adoption, economic growth, and growth in demand for work. Stunningly, even as it causes declines in some occupations, automation will change many more: 60% of occupations have at least 30% of constituent work activities that could be automated. It also will create new occupations that do not exist today, much as technologies of the past have done.

While about half of all work activities globally have the technical potential to be automated by adapting currently demonstrated technologies, the proportion of work actually displaced by 2030 will likely be lower because of technical, economic, and social factors that affect adoption. McKinsey's scenarios across 46 countries suggest that between almost zero and one-third of work activities could be displaced by 2030, with a midpoint of 15% (McKinsey Global Institute, 2017). The proportion varies widely across countries, with advanced economies more affected by automation than developing ones, reflecting higher wage rates and thus economic incentives to automate.

Meanwhile, even with automation, the demand for work and workers could increase as economies grow, partly fueled by productivity growth enabled by technological progress. Rising incomes and consumption especially in developing countries, increasing health care for aging societies, investment in infrastructure and energy, and other trends will create demand for work that could help offset the displacement of workers. Additional investments in infrastructure and construction for instance, while beneficial in their own right, could be needed to reduce the risk of job shortages in some advanced economies.

Even if there is enough work to ensure full employment by 2030, major transitions lie ahead that could match or even exceed the scale of historical shifts out of agriculture and manufacturing. McKinsey's scenarios suggest that by 2030, 75 million to 375 million workers (3% to 14% of the global workforce) will need to switch occupational categories (McKinsey Global Institute, 2017). Moreover, all workers will need to adapt as their occupations evolve alongside increasingly capable machines. Some of that adaptation will require higher educational attainment, or focusing on activities that require social and emotional skills, creativity, high-level cognitive capabilities and other skills that are relatively difficult to automate.

Income polarization could continue in the U.S. and other advanced economies where demand for high-wage occupations may grow the most while middle-wage occupations decline, assuming current wage structures persist. Increased investment and productivity growth from automation could spur enough growth to ensure full employment, but only if most displaced workers find new work within one year. If reemployment is slow, frictional unemployment will likely rise in the short term and wages could face downward pressure. Meanwhile, in China and other emerging economies, middle-wage occupations such as service and construction jobs will likely see the most net job growth, boosting the emerging middle class.

To achieve good outcomes, policy makers and business leaders will need to embrace the benefits of automation and, at the same time, address the worker transitions brought about by these technologies. Ensuring robust demand growth and economic dynamism is a priority; history shows that economies that are not expanding do not generate job growth. Mid-career job training will be essential, as will enhancing labor market dynamism and enabling worker redeployment. These changes will challenge current educational and workforce training models, as well as business approaches to skill-building. Another priority is rethinking and strengthening transition and income support for workers caught in the crosscurrents of automation (McKinsey Global Institute, 2017).

ORGANIZATION OF THE BOOK

Authorship of this book spans geographically from Russia, Spain and Turkey in Eurasia to Canada and the United States in North America. Thematically, the book begins with a chapter exploring business strategies and disruptive technologies in the context of disruptive innovation theory. It is followed by one chapter examining the concept of innovation and identification and categorization of disruptive innovations under the strategic scope of the firm. The next three chapters look at innovative approaches and applications in finance and banking. The topics include peer-to-peer lending as an alternative investment asset class in the EU, fintech impact on EU retail savings and investment, and the role of financial technologies in filling financial inclusion gaps in Russia. Technological aspects of disruptive technologies are represented in the chapters examining cleantech and water treatment and the diffusion of 3D printing technology.

A brief description of the chapters follows:

Chapter 1: Business Strategies and Disruptive Technologies – An Overview of Disruptive Innovation Theory

The chapter presents key findings from a review of existing literature on disruptive technologies and discusses their importance for successful business strategies. The chapter provides a historical overview of the topic from predecessors to the most recent developments as well as an analysis of its predictive side. It also examines whether the theory allows for the development of business models. The last section is devoted to the identification of strategies that are applicable in technological disruptive innovations and discusses relevant issues to develop such strategies. Disruptive innovations are widely recognized as key engines for competitive advantage, so it is important for companies to recognize the opportunities that emerge from developing disruptive technological innovations.

Chapter 2: Identification and Categorization of Disruptive Innovations According to the Strategic Scope of the Firm

This chapter seeks to categorize and analyze the impact of disruptive innovations on established companies from key sectors of an economy in terms of their impact on strategies and commercialization from a sectorial perspective. The author makes an effort to examine and categorize the impact of disruptive innovations according to three drivers of the strategic scope of the business. The chapter seeks to provide insightful information in terms of disruptive innovations, which can be categorized into market-driven, product-driven and competency-driven disruptive innovations.

Chapter 3: Peer-to-Peer Lending as an Alternative Investment Asset Class in the EU

The aftermath of the 2007-2009 financial crisis and European debt crisis proved to be a transformative event for financial markets, primarily in the areas of fixed-income asset yields and asset price appreciation due to widespread credit contraction at the retail level. After worldwide markets collapsed for equities and many corporate debt securities, frightened investors liquidated holdings at absurdly low prices. However, the worldwide recovery, while uneven, remains under way. Yet despite recoveries in the broader indices, individual investors at the retail level have not widely shared in market gains after exiting from their investments during the crises. Because of the uncomfortably high asset prices and the lack of income potential to investment-grade fixed income investments, new alternatives are sought which may present better yield-earning potential amidst the current credit market environment made available by certain fintech companies.

Chapter 4: Fintech Impact on EU Retail Savings and Investment

Years after the 2007-2009 financial crisis and European debt crisis, the European Union's (EU) banking system sustained persistent strain due to those two shocks as well as austerity and economic contraction, political events, poor banking operations, enhanced regulation, and litigation. The European Central Bank's response was significant: short-term interest rates collapsed and markets were flooded with money via quantitative easing programs. Additionally, investors fled risky assets for the safety of government debt. Yet as banks recovered, savers sacrificed asymmetrically: yields on bank deposits and bonds were decimated. As macroeconomic challenges subsided, fintech increasingly threatened legacy financial institutions' business models and benefit the EU savings public. This study assesses the effects of fintech companies on legacy banks in the EU with respect to savings, lending, and wealth management. The study also makes recommendations on a strategy by fintech to benefit savers, and the measures legacy institutions must take to survive amidst this new competitive landscape.

Chapter 5: Inclusive Disruption – The Role of Financial Technologies in Filling Financial Inclusion Gaps in Russia

This chapter discusses the important socioeconomic role of financial technologies in the emerging market, which is Russia today. While the issues of financial inclusion are deemed important for the developing markets, until recently, they were seen largely as areas of affirmative regulatory action, not of competitive play by private market actors. The advent of fintech companies, however, changes the paradigm. Many fintech companies in Russia view the gaps in financial inclusion as attractive market niches and formulate relevant consumer offers. This chapter explores their strategic approaches based on five business case studies and introduces an analytical matrix mapping the approaches to existing inclusivity gaps. The model strengthens the existing policy aimed at developing financial inclusion as it allows a targeted cost-benefit analysis of market players' actions. Because Russia demonstrates many of the financial inclusivity challenges seen in other countries, the findings of this study have certain applicability in the context of both emerging and advanced economies.

Chapter 6: Cleantech and Water Treatment as a Case of Disruptive Innovation

Shifts in disruptive innovations and the growing impact of consumer cleantech can be best understood by looking at megatrends in water management. This chapter examines commercial opportunities for the Internet of things in the market of cleantech with respect to water treatment. From a theoretical perspective, the study looks at the four clusters of water management as related to the application of the Internet of Things: metering, piping, reclamation and agricultural clusters. An analysis of market strategies and competitive strategies is conducted leading to a brief development of innovation frontiers in water management.

Chapter 7: 3D Printing Technology Diffusion – A Revolution or an Illusion?

3D printing technology is one of the most potentially groundbreaking technologies of the future, as customer expectations, market requirements and the competition grow in a global scale. In order to understand the potential effect of 3D printing technology and whether it is a disruptive innovation that will change the traditional manufacturing paradigm, it is essential to examine the diffusion of knowledge in this area. In this study, 3D printing technology has been reviewed and patent analysis regarding 3D printing technology has been conducted in order to understand the diffusion of 3D printing technology. The results of the patent analysis indicate that the diffusion of 3D printing technology, which is represented by the patents of four key methods is not expected to fit with Bass diffusion model. The findings of the study lead to the conclusion that a state of maturity has yet to be reached with respect to 3D printing technologies, yet, growth continues.

Chapter 8: Impacts of the Peer-to-Peer Lodging Platform on the Traditional Lodging Industry – California vs. Southern Europe

The study presents a comparative analysis of trends in peer-to-peer lodging and their impacts on the established lodging industry in the metropolitan regions of Greater Los Angeles, California, USA, and Southern Europe (Athens, Greece; Barcelona, Spain; and Vienna, Austria). The main research question is whether the emerging peer-to-peer lodging platforms, part of the exploding sharing economy, are competitive or complementary to the traditional lodging industry. Data was obtained from secondary research and collected in 24 field interviews. The study found variations in the complementarity/competitiveness equilibrium, depending on the market segment in the hospitality industry and regulatory environment. The paper draws recommendations for competitiveness in the traditional hotel sector.

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ENDNOTE

[1] This report covers 46 countries comprising almost 90 percent of global GDP. The report focuses on six countries that span income levels (China, Germany, India, Japan, Mexico, and the United States). For each of these countries, the researchers modeled the potential net employment changes for more than 800 occupations, based on different scenarios for the pace of automation adoption and for future labor demand.