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The Impacts of Robotics, Artificial Intelligence On Business and Economics

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Abstract

In the Industrial Age that humanity has entered long time ago with steam series has caused to primitive mechanization in production. With the development of internet and mobile technologies, electronics, nano technology, advances in medicine, health and digital applications and so on speed up mechatronics studies nowadays. Last World Economic Forum holds an important place on the agenda of Robotics and Artificial Intelligence and the economists like Roubini, Stiglitz also entered in the discussion of robotics and artificial in intelligence impacts on economics and business. Although Stephen Hawking criticized on the risks in this regard, every day we are witnessing tremendous news and articles in business pages, regarding on these topics and obviously corporate life and professionals can no longer resist to these changes. Changing form of the business terms and work forces, the way of doing business by using new technologies will have serious impacts on the daily business life and deriving from these on countries and on world economics. Many items and headlines such as jobless ratio, Philips Curve, performance, management, CRM Analytics, customer relationship management, sales, strategic planning, mass production, Purchasing Power Parity, GDP, inflation, money, Central Banks, Banking System, coaching, training, accounting, taxes etc. regarding to business and economics will face serious dangers, hits, change, exposures as well as opportunities and gains with the improvements in Artificial Intelligence and Robotics. One simple example can explain the degree of these impacts: Should we continue to make provisions for severance pay of the company's staff or should we calculate reserve for depreciation / amortization of robots in the company, which side of the balance sheet will be managed by human resources managers or shall we still name human resources ? This conceptual and hypothetical paper is aiming to address and discusses the future of robots, mechatronics and artificial intelligence in different perspectives.

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1. Introduction

The evolution of new technologies, mobile and internet, while on the other hand financial crises and economic developments, supported with the changing needs and behaviors of customers are still putting a heavy pressure on the world economics, on countries and its budget deficits, on financial services and on business especially on the profitability and revenues sides of the financial tables. The last global financial turmoil accelerated the entrance of the humanity to a new age by having strong impacts and results on the global economy. The monetary base and the issuance of the money all across the developed and G-20 countries were / are exponentially growing and capital movements and cash flows especially to emerging countries via risk capital funds, business angels, non-bank financial institutions e.g. microfinance, mobile operators boosted new entrepreneurs, SMEs and most of all innovation and more researches in companies and industries. The “Digital Age” that began with internet and mobile technologies, plunges corporations into opening their stores in cloud and web, to mobilize together with its customer base, drag governments into launching their e-government initiatives, financial institutions into presenting themselves in tablets, mobile phones and social media. Huge transformation in doing a new type of business which is called e-business containing e-signature, e-invoice, e-commerce, internet, mobile banking and e-payments, creates efficiency in corporate and individual life. Minimizing or optimizing the work processes, business processes re-engineering shifted industrial age towards the digital age by the help of e-business environments. On the other hand, the amount of the information getting bigger and bigger every single day led business environment to analyze big data and to react simultaneously with CRM systems. Although, digital age together with other sciences like mechatronics, nano technology, genetic and so on is a step for “Space Economics”, some other progresses are going to change business and economics directly or indirectly more than other developments. These progresses are named Robotics and Artificial Intelligence. The “Industrial Age” has been started by the industrial revolution and mechanization primarily in UK and by car makers (McKenzie, 2015). Production and deriving from that the supply side of the economics have made huge impacts on business and economics at the beginning of the 20th Century. The Production Factors, i.e. capital, entrepreneurship, work force, land were affected by the industrial age developments and mechanization and life style, education, finance, management have been all changed due to these effects (Mokyr, 1985). In order to solve new issues and problems, white collars and management have come to the agenda which created higher education needs due to the level of information, decisions and quality of the work force needed (Keller, 1983). Workers in order to be at the same working time at factories or production lines have begun to live in housing estates, large buildings or complex which directed life style to live in cities rather than villages. Wages and wealth have changed the buying attitudes and social behaviors (Davies, 1962). Lowering the human work force costs on one side by bulk population management e.g. transportation, municipal services and employee rights on the business environment, while on the other hand depreciation of allowance of the machines in production lines, calculation of the return on investment of these production lines led to new definitions in accounting and finance and the cost of capital. Robotics and Artificial Intelligence will be also opening new pages in the economics and business which are also bringing new life style and sociological side effects. Roubini and Stiglitz mentioned about the possible results and impacts of these effects in their articles (Roubini 2014; Stiglitz 2014), together with many discussions held in the last World Economic Forum 2015 (WEF, 2015) and papers, news are newly started to be issued on the same topics. One of the clear impacts will be the increase of jobless ratio in the economy. Regarding this first effect on the business side will also be on the hiring or buying new robots which most probably have an artificial intelligence comparing with its first movers. This conceptual and hypothetical paper starts with a summary of the main definitions, trends and latest facts that are still shaping economics, business and finance. This paper is aiming to address and discusses possible disruptive changes and impacts as well as results on industries, management functions and economics theories with visionary perspectives that may / will occur in the near future mainly in an innovative and futuristic way of thinking. Most of the arguments are still under discussion or could not be still valid with today’s disciplines but future is directly related with imagination and estimation as Jules Verne wrote in his novels.

2. Literature Review And Hypotheses

After 2008 Global Financial Turmoil, started with Lehman Brothers failure, the first hypothesis would be that a new age called “Space Economy” has begun in the World’s economics and finance agenda (Seedhouse, 2014 ; Lewis, 2014) due to the main reason of economics, low resources allocation and optimization among population.

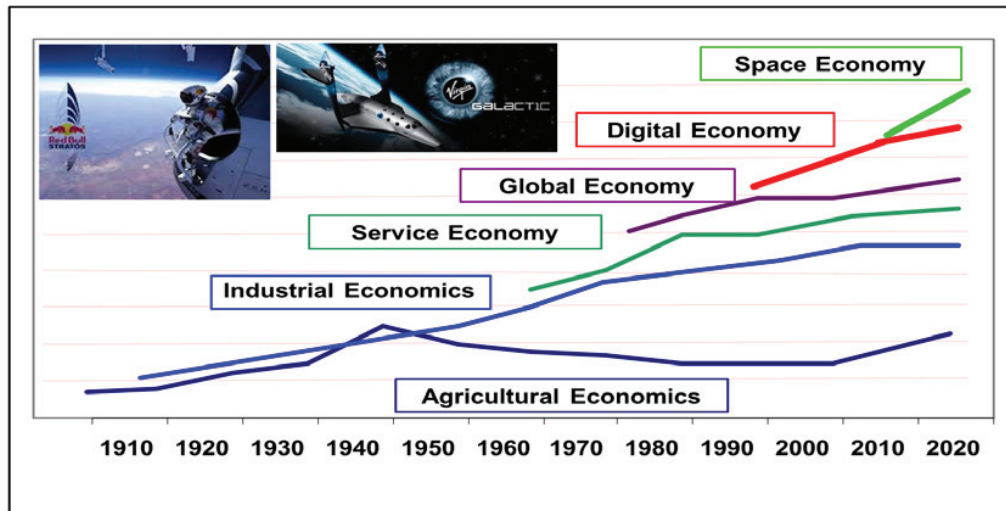


Fig. 1. (a) Main Economics Cycles in 20th and 21st Centuries

Central Banks which are firstly responsible of managing the value of the money and price stability, played important roles by exponentially easing money supply and monetary base expansion after 2008 which they have already been doing steadily before 2008 (Artigas, 2010). Governments' bail-outs and quantitative easing of Central Banks by G-20 and developing countries were done in order to stop failures and bankruptcies of banks, financial institutions and treasuries of the countries, to stop credit crunches, to regain the financial losses during and after 2008, to boost the economic recovery and GDP increase, to bring balance to the global economy and by these efforts to sustain World Economic stability. Apart from the Central Banks balance sheets expansions, changing form of the money in the digital age (and liberalization of printing / issuing money as well as developments on the mobile financial services, the rapid development of payment systems, non-financial intermediaries and non-bank institutions e.g. Wal-Mart, business angels, risk venture capitals, crowdfunding and microfinance institutions beginning to take an active role in the financial markets and by the help of initiatives for access to finance (Karlan & Morduch, 2010) and for financial inclusion by G-20 countries (AFI, 2010). Funding a project or finding capital and loans for investments will be much more easier than today which will ease entrepreneurs and SMEs to discover and to produce more easily and which companies will benefit from to invest in more researches, innovation and patents for launching new products and technologies. It is expected that funding and supporting SMEs will help to meet the inflation, GDP growth and jobless ratios' targets in many countries, in European Union and in US (European Commission, 2011; CGAP & The World Bank Group, 2010 ; Öztürk, Mrkaic & IMF 2014). On the other hand, the usage of Bitcoin type of digital form of money (e-money) will be a big rival for banks and Central Banks which will cause more volatility in the financial system and in the economy (Popper, 2015). Revenues and seignorage losses of (Central) Banks will occur if not globally regulated. Based on the new trends like artificial intelligence, semantic studies, robotics and mechatronics developments, big data and mining, cloud computing, neural networks or main trends such as social media and through the future directions of banking and financial services, humanity and business environments including but not limited to governments and related organizations will look for new opportunities to lower costs and to increase revenues, by efficiency and productivity as Porter mentioned in his book "Value Creation and Competitive Advantage Theory" (Porter, 1985). Companies could achieve more profitability and sustainability only by following two options: Minimizing costs or maximizing value. The developments in technologies, different sciences and disciplines, by the help of convergence among them, would support works to achieve these goals and obviously more discoveries would be seen in coming years that will cause disruptive changes in business, life and global economy (Manyika, Chui, Bughin, Dobbs, Bisson, & Marrs 2013). Companies suffering by low revenues in their income statements or by decrease in their profitability and return on capital ratio will look for and run after more efficiency, productivity, low cost production methods or resources and try to

respond competition and customer demands caused by new developments on the scientific and technological side. When and if commodities are scarce and level of prices goes up, then decision makers in these companies will also turn to sky to look for the cheapest and unlimited ones which will accelerate “Space Economy”. Beyond that, works for interstellar discoveries for alien life and new earth-like planets by various governmental organizations like NASA (The U.S. National Aeronautics and Space Administration) or ESA (European Space Agency) or by new private commercial companies (Wall, 2015 ; Rooney, 2015) have already been started. All of these initiatives and needs accelerated the entrance to the Space Economy Age. Many researches for reaching out more planets and far beyond to Solar System and for having competitive advantages in the military forces (Dillow, 2015 ; Garver 2015), indirectly help businesses to use most of these technologies, innovation and solutions for commercial and trade purposes. Car makers and automotive industry that are using Formula 1 Race’s findings implement them into commercial vehicles. ARPA (United States Defense Advanced Research Project Agency), the father of internet and web technologies, for facilitating the secret communication needs of the military, ABS (Anti-Lock Braking System) system of cars for suddenly stop needs of racing cars, Teflon (Polytetrafluoroethylene, the best-known brand name of PTFE-based formulas is Teflon by DuPont Corporation) for not to inflame space crafts while entering into the atmosphere, are some of these findings and examples of the commercial uses. The University of Washington together with NASA and 11 other universities and research institutions create a working group to search for extra-terrestrial life on other planets. (Wall, 2015) More researches on the academic and commercial sides will help to invent more new technologies. (Farley, 2015). At that point, two of the other hypotheses are that the new military understanding and wars would be in space and in cyber world (Dillow, 2015) The colonization of the humanity in space will need new regulations and protection as well as new politics, besides will change the daily life and urbanization forms (Wall, 2015 ; Wainwright, 2015). Thus, Federal Aviation Administration of USA has already published many and new regulations on commercial space transportation (FAA). Although NASA says that alien life in space could be found in coming years, for getting more budget from the federal government after the budget cuts of 2008 (Leopold, 2015), experimenting Pacific and Atlantic railroads establishments in US or Lloyds maritime lines in UK, private sector investments on transportation which started issuance of companies bonds and bills that were the beginning of capital markets and New York Stock Exchange or issuance of risk insurance policies that was the beginning of insurance sector prove that space, robotics and artificial intelligence scientific progresses would be more developed and be faster under the commercial activities of the private sector (McMaken, 2015) rather than the governments. Amazon.com is a pioneer for robotics and space technologies by using drones for order delivery and his CEO Jeff Bezos is aiming to start first space shuttle service. Boeing, Google, Lockheed Martin, Northrop Grumman, AeroVironment are other companies that invest in drone technologies (Egan, 2014). At that point, some definitions should be given for robotics and mechatronics that lay behind the drones. Robots firstly introduced at Prague in 1921, the idea of Ibn Sina, old Turkish – Persian scientist in history (Bischoff & Guhl, 2010) are some human-like anthropomorphic appearance. The definition of Robotics is given as (Murphy, 2000): “*Robotic is an intelligent robot or a mechanical creature that can function autonomously.*” Yu and Kodama defined Mechatronics as (Yu, 2008 ; Kodama 1986): “*A term coined in Japan in the late 1960’s, is the synergistic combination of precision mechanical engineering, electronic engineering, software engineering and systems thinking in the design of products and manufacturing processes.*” “*Mechatronics is the combination of mechanics and electronics and is an example of technological fusion in which several different industries are involved.*” One of the strongest hypotheses is that human like robots will replace human work force in many fields in business and corporate life. Another approach called “Human adaptive mechatronics” proposed by the 21st century centre of excellence (COE) at Tokyo Denki University in 2003 pretended that a system including the human in the control loop in a structured man-machine interface would improve the human’s workforce operational skills (Yu). Many job positions in marketing, customer relationship management fields including but not limited to sales, after sales, operations, production lines, call center agents, security guards even managers will be affected by mechatronics and robotics improvements. The female-looking robot, named Aiko Chihira produced by Toshiba Corporation, offers six-minute guidance to customers with information in Japanese about the department store at the Mitsukoshi department store in Nihonbashi (Hongo, 2015). Other humanoid robots in customer service, including at Bank of Tokyo Mitsubishi UFJ can make conversation or respond to spoken questions. The banking industry most affected by 2008 crisis, still searches for more profitability, efficiency. Robots could easily be implemented in many departments, even at front ends. Agents in contact centers or tellers could be replaced by robots that are being supported and strengthened by the artificial intelligence. More on that, the arguments suppose that even in managerial positions robots and artificial intelligence would be used and first comers begin to prove that assertion. (Goldberg, 2015). Minimizing the cost of

delivery of internal documents between head office and branches by drones would be another way to minimize costs. On the other hand, drone operators will be hired by the banks and companies as Amazon.com is a good example for it. But the side effects of using drones for commercial purposes are the main discussion points. Robotics and Mechatronics science with Space Economics try to find solutions for the commercially use of drones and space ships, rockets due to the existing laws and aviation regulations that only allow governments to use, to launch, to fly rockets, drones or space crafts. Federal Aviation Administration in USA has already proposed and has concluded some regulations for the usage of drones commercially and privately (FAA, 2015). Globally, trying to find solutions and to shake hands on the general understandings, initiatives are going on just like Zurich hosted the one-day conference in January, "Drones: From Technology to Policy, Security to Ethics" (Lucien, 2015). Artificial Intelligence (Pau, 1986) and Robotics are the latest headlines that have been discussed during the World Economic Forum 2015 in Davos. Mentioned by Roubini and Stiglitz's in their studies (Roubini, 2014; Stiglitz, 2014) the threats on the rise of unemployment with robots or innovation such as artificial intelligence, could be balanced by more efficiency and productivity created by robots and computers. Artificial Intelligence is defined as the scientific studies that computers can think, do, interact and act in many fields as a human that people are good at (Rich, 1985). Cloud computing, is a network-based or Internet-based storage environment that enables and facilitates sharing of knowledge, information, files or resources. According to National Institute of Standards and Technology's (NIST) working definition of cloud computing (NIST Special Publication 800-145) is: "*Cloud computing is a relatively new business model in the computing world. According to the official NIST definition, "cloud computing is a model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction."* (Mell & Grance, 2011). The primitive famous artificial intelligence is Apple's Siri, a learning lady that assists the Apple iPhone owners. Google Android version of artificial intelligence called CEYD-A is also produced by a Turkish software developer at cenker.com (Aytac, 2015). Lolli in his paper defined artificial intelligence and semantic search in search engines referring to Charles Morris book "Foundations of the Theory of Signs" which also defined semiotics used by computer engineers or software designers. Semiotics consists of three components: syntax, semantics, and pragmatics. Semantic is the word used for web searches in internet search engines like Google, Yahoo and is a kind of artificial intelligence (AI) which understands the basic needs and words looking by the searchers and take into consideration the intent and the meaning of the query (Lolli, 2013). On the other hands, "Neural Networks" which can be summarized as a combination of big data, internet, semantic search, artificial intelligence and cloud computing can learn and memorize if they are supported with related examples and can produce valid and right or prioritized answers from huge amount of data. (Taylor, 1993). One of the suggestions could be that robots and drones that use huge amount of information called big data from many databases or connected to cloud computing and managed by artificial intelligence would be in production lines and organizational charts of companies as well as on the managerial boards and human resources management agenda. (Knod, Wall, Daniels, Shane, & Wernimont, 1984). Earlier stages of this assertion could be seen in money and capital markets. The special soft wares in financial markets that uses many theories e.g. portfolio theory of Markowitz, RAROC (Risk-adjusted return on capital), MACD (Moving average convergence/divergence) or VAR (Value at risk), can calculate the risks of the investment portfolios bearing risks and based on the commands and instructions given by the portfolio managers to the soft wares, transact automatically 7/24 in financial markets in order to execute stop-losses or stop-gains orders. Roubini called these developments as the third Industrial Revolution after the invention of microchips and computers (Roubini). Enhanced and supported by the help of robots with artificial intelligence features, increasing efficiency in the business processes and productivity by extending real working hours up to 7/24 which will be maximizing the nominal 7/24 benefits of alternative delivery channels or sales points and so on, banks and companies in retail industry or in different industries will be able to implement Porter's Value Creation Theory (Porter, 1985). But, on the other hand, there will be a big paradox and dilemma by the replacement of human work forces by robots and artificial intelligence. A research done by Nesta, a London-based non-profit research and innovation group, and co-authored by Oxford University academics shows the lowest probability of works ranked below that computerization could affect in US (Mizroch, 2015):

- a. Translators and interpreters (5.8%)
- b. Performing artists (7%)
- c. Radio broadcasters (7.7%)

- d. Film and TV producers (8%)
- e. R&D on natural sciences (10.9%)

According to the report named Creativity versus Robots, the most open to computerization and jobs could be replaced by robots are office administrators, call-center staff, librarians, cattle and crop farmers, loggers, miners, car salesmen and hotel staff and only % 21 of the jobs are highly creative among 721 jobs occupation (Mizroch). Stiglitz argued that unemployment will increase due to the replacement choice of capital owners or human resources managers for such efficiencies and innovation. The paradox starts at that point. The purchasing power decreased by devalued money and by inflation, people whom wages are down or lost their job cannot save money and will not spend more which will cause deflation. The reluctance of the investors for new investments that create new job positions will begin to decline due to short customer demand and will cause the dilemma. The more demand decreases, the more efficiency is needed in the supply side. The more supply and demand minimize in the markets, Central Banks ease money supply and decrease interest rates and push companies for more innovation. And finally more innovation replaces lower skilled work forces with high skilled ones. (Stiglitz, 2014). Due to this paradox and beyond, Stephen Hawking, one of the greatest astrophysicists suggested that humanity should start colonization on other planets for the reason that artificial intelligence and robots will replace the human race in industries and daily life (Kontzer, 2015). Although, Isaac Asimov's "Three Laws of Robotics" in his 1942 short story called "Runaround" explained that robots should never harm humans or disobey orders and became guiding principles for robotics and artificial intelligence, many beliefs are on the end of humanity side by the rise of the machines (Stampler, 2015). Discussions on the security of data and information as well as life privacy of individuals are also other issues that humanity should tackle with (Robinson & Parker, 2015). One of the latest arguments is that talking sensitive information in front of the Smart TVs of Samsung or Sony PlayStation could be listened by others or transmitted by voice recognition system (Hern, 2015). Hawking also added that "Alien Life" may not be friendly as well. Obviously, life on other planets has not been proved yet while water and chemical gas forms have been found in many other planets including our Solar System. Preparation to land the first humans to Mars as a colony is still going on, not only in NASA but from the private companies like spaceX, Lockheed Martin (Wall, 2015) and Blue Origin (Malik, 2015). Controversy, the taxpayers who will benefit from these inventions that they will use cheaply in their daily life and will bring many facilities by efficiency, want also to see more entrepreneurs like Elon Reeve Musk, the CEO of spaceX and private companies in these researches and innovations due to the effects of budget deficits occurred by governments' expenditures that consequently put more tax duties on its citizens (Davenport, 2015). NASA responds these demands coming from the taxpayers by launching its Commercial Crew Program in 2011 (NASA, 2015). The humanity intelligence has already ruined the nature and economy itself by industrial revolution in the first place and finally by toxic financial instruments e.g. derivatives that cannot be leveraged by the global real World Economy. The derivatives contracts volume, 630 trillion USD as of December 2014 is nearly nine times bigger than the World GDP, 75.5 trillion USD as of December 2014, without considering the income inequality (WB, 2014; BIS 2014). Central Banks consolidated assets of emerging markets and advanced economies which are around 17.5 trillion USD and official Foreign Exchange Reserves around 40 trillion USD would not be sufficient to compensate governments' and companies' debts if a clearing and a settlement is needed. For these reasons, governments and companies try to balance this gap by real economy, reminding that compound interest rate is the biggest force on earth as Einstein mentioned. Central Banks cannot stop quantitative easing due to the deflation, recession that World economy faces as IMF reports predicted the slowdown of World GDP. Innovation, social media, big data, cloud computing, digital, web, mobile, sustainability, business angels, microfinance, crowdfunding, mobile financial services, financial inclusion, access to finance are the terms and first steps before the "Space Economy". Governments and companies support and use in order to find new Apple iPhone, Tesla cars or Facebook, WhatsApp types of value creation or added value services for triggering customer demands and productions to obtain again economics and balance sheets recoveries. The result is that new innovations, inventions, tests, researches are still being made while discussions and new hypotheses are an ongoing agenda due to the nature of these new trends and scientific disciplines. Some of these efforts could be summarized by following examples. Electricity cars will replace fuel ones where climate changes are big issues in front of the end of humanity by robots and artificial intelligence. The company Tesla, one of the electricity car producer, invents home type electricity battery that will enable to store huge amount of energy (Riley, 2015 ; Shaffer 2015). Some other traditional car companies try to respond to its new rivals by other technologies or chemicals that still try to replace oil based solutions (McSpadden, 2015). NASA works on a Google Glass type of intelligent glass for astronauts that will help

them in space if a repair action or extra information needed during the space visits (King, 2015). Wearable smart devices are some of the other developments and companies like E-Trade, the biggest online trading platforms, adopted their applications to these smart devices almost simultaneously (Futures Mag, 2015). Nanoparticles, nanotechnologies, nanomedicine are gaining pace to fight with diseases like cancer or Ebola and virtual reality for mental diseases like disorders, phobias, anxiety (Shadbolt, 2015; Kelly 2015). Mining or discovering Moon would be with robotic technology suggested German Research Center for Artificial Intelligence (DFKI) in Bremen, Germany and works on the robots designed as chimpanzee for their lunar missions (Shadbolt, 2015). Finally, World Economic Forum puts robotics, artificial intelligence and drones among the ten emerging technologies of 2015 (Meyerson, 2015).

3. Conclusion

This paper is aiming to be a baseline for further articles, papers, readings and researches. Based on the hypotheses and assertions in this paper, further academic works supported with quantitative and market research methods would be the next steps for highlighting business and economics impacts. By its nature, most of the arguments, assertions and suggestions are still not in place or just at the beginning of their early stages. For that reason, most of the references cited are from the latest developments of scientific researches and from the business life but the findings and consequences are consistent with the previous literature on innovation and technological impacts on business, economy and daily life .As a summary, the current impacts and the expected disruptive changes of the artificial intelligence and robotics on the economics and business which are the earlier stages of the “Space Economy” would be in the near future as: The production, communication, marketing and staff costs as well as funding and capital costs by calculating real-time / on-line the effect of the value proposition and offers to customers on the balance sheet and income statement and maximizing sales and delivery hours by robotics in the distribution channels, the companies will be able to manage profitability and risks more efficiently. Combining sub-headings in Analytical CRM environment in marketing with customer behaviors and neuromarketing with the convergence of mechatronics, robotics, cloud computing, artificial intelligence, neural networks, customer experience and relationship management would shift to the second phase by these high tech solutions and products as suggested “Artificial Intelligence Marketing” (Tarhan, 2010). Hologram technology will enable companies especially in retail to interact with and to reach its customers without having any limits, like direct mailing but more than that will decrease sales, after sales and delivery costs. Hologram technology could also be a new delivery and sales channels for banks and financial institutions for reaching customers, staff and board meetings and so on. (Murray & Keevil, 2014). Companies and governments should be ready for and be open to implement such innovation and processes as quickly as possible. The shift from alternative delivery channels to technology based business environment will also have a direct effect on the organization charts. New CEOs and general managers, presidents would be from IT, engineering, mechatronics or scientific graduates or would have roots or experiences from positive sciences to tackle with the new issues arising from new terms and understandings and to respond the sustainability expectations of shareholders and the regulators. On the other hand, apart from organization charts, innovation and technological developments will lead to unemployment of low skilled (human) work forces (Hirst, 2014). The unemployment rate, the Philips Curve, Purchasing Power Parity, GDP, inflation, money, management and accounting will face significant changes with these developments in the coming years. Most of the organizational development activities that have been already changed forms by e-learning, webinars, gamification or coaching, mentoring, leadership terms that human resources department is investing would be veteran trends in business life due to other work forces coming. Performance management of workers would be a new issue for human resources managers. Evaluation of the staff and robotics in companies should be handled by new approaches. New security regulations and guidelines should be defined, e.g. a drone that lands in a forbidden area or using a robot in public places. The same logic would work for social security and employee benefits. Space Economy will be definitely the new age and by its impacts and consequences on economies, business and daily life. Many schools, theories, books, researches, hypotheses and theses, papers and articles should and would be revised. The revisions should be and would be done in the business and economics as well, e.g. Austrian School of Economics, Keynes, Marx, etc. are all defined economics within the boundaries of this world. International Chamber of Commerce, Incoterms, insurance industry, World Bank, United Nations are some of the examples that

should be considered in the first ranks for understanding the impacts of the space. Digital money formats will have a direct effect on seignorage and insolvency of the financial systems and Central Banks. Purchasing power of the citizens in many countries will decrease swiftly due to this effect and the unemployment which will cause more deflation at the end. Internet, mobile technology, electronic and advances in digital world have accelerated and have facilitated service delivery and sales in financial services and banking. During the last financial global crisis, multinational and global banks as well as local banking systems have faced many financial troubles and tried to find ways of regaining their profits or minimizing their costs. The robotics and artificial intelligence would be used by the financial institutions in the first ranks. On the accounting side, should we continue to make provisions for severance pay of the company's staff or should we calculate reserve for depreciation / amortization for robots in the company, which side of the balance sheet will be managed by human resources managers or shall we still name human resources? Shall the companies will pay extra taxes for this new work force?. New Key Performance Indicators (KPIs), new financial analyses ratios will be defined in order to measure the customer experiences e.g. Net Promoter Score of a company that uses drones, and financial performance of the company. The usage of new technologies in daily life will be much more cheaper by the new inventions and cost minimization in production lines, e.g. home type batteries, satellite TV, 3D printing. Some industries and companies will be dramatically minimized in figures or be lost due to the consequences of these developments, e.g. electricity distribution companies or IKEA when and if a family can print their furniture at home. Will automated teller machines still exist in the near future?. Universities, higher education would also be affected by these improvements. New sciences and tracks would be defined and most probably artificial intelligence would replace most academic people in many departments. Low skilled people will tend not to go to high schools, colleges and universities for the reason that they do not have any chances against robots or decreases in their purchasing powers or the ease of reaching and of processing data in various ways. Is not the case of the new generation students?. There will be convergence between ministries or regulators on government's level, e.g. telecom and finance convergence due to the nature of the technological developments i.e. for commercial space transportation. Will be Ministry of Economics or Ministry of Telecommunications and Transportation responsible for new legislations? The same question could be valid for digital money, Finance or Telecommunication?. Management consultancy firms are beginning to issue new articles and reports on these topics. Most of the academic researches and works are in general on the scientific side or in specific areas of the business and management, e.g. Stiglitz innovation and unemployment article. Instead, a new approach and school would replace the old ones and its followers. This paper that presented in "World Conference On Technology, Innovation And Entrepreneurship" in Istanbul at 2015 is aiming to be the first step of "School of Istanbul – L'École İstanbul" approach which will be a new candidate for a new doctrine on Space Economy, its subtitles and its derivatives as well as innovative and radical approaches on business and management, challenging the Austrians, just like the first step of the mankind on the Moon.

References

- AFI Alliance for Financial Inclusion. (2010) G20 Principles for Innovative Financial Inclusion : 2-3
<http://www.gpfi.org/sites/default/files/documents/G20%20Principles%20for%20Innovative%20Financial%20Inclusion%20-%20AFI%20brochure.pdf> (Access Date: 19.04.2015).
- Artigas, J.C. (February 2010). Linking global money supply to gold and to future inflation. *World Gold Council, Gold:Report*, WGC-US-INVE-003, 2. New York: World Gold Trust Services, LLC.
- Aytaç, Ç. (April 2015). Devşirme Siri'ye Türk rakip: 'CEYD-A'. TRTTurk News Channel. <http://www.trtturk.com/haber/devsirme-siri-ye-turk-rakip-ceyd-a--124134.html> (Access Date: 19.04.2015).
- BIS (07 February 2015). Global liquidity: selected indicators. Bank for International Settlements, Statistics. http://www.bis.org/statistics/gli/gli_feb15.pdf (Access Date: 19.04.2015).
- BIS (07 February 2015). Amounts outstanding of over-the-counter (OTC) derivatives by risk category and instrument. Bank for International Settlements, Statistics, BIS Quarterly Review. <http://www.bis.org/statistics/dt1920a.pdf> (Access Date: 19.04.2015).
- Bischoff, R., & Guhl, T. (2010). The strategic research agenda for robotics in europe [industrial activities]. *Robotics & Automation Magazine, IEEE*, 17(1), 15-16.
- CGAP & WB. (September 2010). Financial Access 2010. The state of financial inclusion through the crisis. Consultative Group to Assist the Poor / The World Bank Group. United States of America : 5-11
- Davenport, C. (17 February 2015). Americans want rich guys like Elon Musk to pay for space travel — not taxpayers. The Washington Post Newspaper, Blog. http://www.washingtonpost.com/blogs/the-switch/wp/2015/02/17/americans-want-rich-guys-like-elon-musk-to-pay-for-space-travel-not-taxpayers/?tid=sm_fb (Access Date: 19.04.2015).
- Davies, J.C. (February 1962). Toward a theory of revolution. *American Sociological Review*. Vol. 27, No.1., 5. California Institute of Technology.

- Dillow, C. (9 February 2015, 11:50 AM EDT). What Obama's new defense budget means for the aerospace industry. Fortune Magazine, Tech, Aerospace. <http://fortune.com/2015/02/09/obama-defense-budget-aerospace-industry/> (Access Date: 19.04.2015).
- Dillow, C. (16 April 2015, 12:11 PM EDT). Lasers! Robots! Apprehension! Inside this year's Navy technology conference. Fortune Magazine, Tech, Aerospace. <http://fortune.com/2015/04/16/sea-air-space-conference-2015/> (Access Date: 19.04.2015).
- Egan, M. (6 August 2014 08:16 AM ET) 6 companies behind the drone revolution. CNNMoney. CNN News Channel. <http://money.cnn.com/gallery/investing/2014/08/06/drone-stocks/index.html> (Access Date: 30.04.2015).
- European Commission. (7 december 2011). An action plan to improve access to finance for smes. Communication from the Commission to the Council, to the European Parliament, to the Committee of the Regions, and to the European and Social Committee. Brussels. Com(2011) 870 final. {sec(2011) 1527 final}.
- FAA (Şubat 2015). Federal Aviation Administration. Overview of Small UAS Notice of Proposed Rulemaking. http://www.faa.gov/regulations_policies/rulemaking/media/021515_sUAS_Summary.pdf (Access Date: 19.04.2015).
- FAA. Federal Aviation Administration. Regulations and Policies. Commercial Space Transportation. Final Rules. http://www.faa.gov/regulations_policies/faq_regulations/commercial_space/ (Access Date: 19.04.2015).
- Farley, G. (30 April 2015, 9:53 pm). NASA and Universities Hunt for Alien Life. NBC News Channel. <http://www.nbcnews.com/watch/nbc-news-channel/nasa-and-universities-hunt-for-alien-life-436544067877> (Access Date: 30.05.2015).
- Futures Mag. (29 April 2015). E*Trade launches Apple Watch app. Futures Magazin. <http://www.futuresmag.com/2015/04/29/etrade-launches-apple-watch-app#.VUFeyKFejI4.twitter> (Access Date: 30.05.2015).
- Garver, R (30.04.2015) Yikes !Putin Will Soon Have Superhuman Robo-Soldiers. CNBC News Channel. <http://www.cnbc.com/id/102636757> (Access Date: 30.04.2015).
- Goldberg, K. (23 January 2015). Will machines make better decisions than humans? The World Economic Forum Blog, Agenda. https://agenda.weforum.org/2015/01/lets-ditch-the-singularity-and-focus-on-multiplicity/?utm_content=buffer72947&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer (Access Date: 19.04.2015).
- Hem, A. (9 February 2015 09:55 GMT). Samsung rejects concern over 'Orwellian' privacy policy. The Guardian Newspaper, Tech. http://www.theguardian.com/technology/2015/feb/09/samsung-rejects-concern-over-orwellian-privacy-policy?CMP=fb_gu (Access Date: 19.04.2015).
- Hirst, T. (14 November 2014). Does technological innovation increase unemployment? The World Economic Forum Blog, Agenda. https://agenda.weforum.org/2014/11/does-technological-innovation-increase-unemployment/?utm_content=bufferccfe2&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer (Access Date: 19.04.2015).
- Hongo, J. (16 April 2015 1:14 pm JST). Robotic Customer Service? In This Japanese Store, That's the Point. The Wall Street Journal News Paper, Japan Real Time. http://blogs.wsj.com/japanrealtime/2015/04/16/toshiba-humanoid-robot-to-debut-in-tokyo-department-store/?mod=WSJAsia_hpp_LEFTTopStories (Access Date: 19.04.2015).
- Karlan, D. & Morduch, J. Access to Finance. Handbook of Development Economics, Volume 5, 2010 : Chapter 2, Dani Rodrik and Mark Rosenzweig, eds. Pages 4703–4784
- Keller, G. (1 March 1983). Academic Strategy: The Management Revolution in American Higher Education. The John Hopkins University Press, Education - 211 pages.
- Kelly, H. (29 April 2015: 7:15 AM ET). Afraid of spiders? Try virtual reality. CNNMoney News Channel. San Francisco. <http://money.cnn.com/2015/04/29/technology/virtual-reality-therapy-phobias/index.html> (Access Date: 30.04.2015).
- King, I. (11 March 2015:55 PM EET). NASA Is Developing Wearable Tech Glasses for Astronauts. Bloomberg Business News Channel. <http://www.bloomberg.com/news/articles/2015-03-11/nasa-is-developing-wearable-tech-glasses-for-astronauts> (Access Date: 19.04.2015).
- Knod, E. M., Wall, J. L., Daniels, J. P., Shane, H. M., & Wernimont, T. A. (1984). Robotics: Challenges for the human resources manager. Business Horizons, 27(2), 38-46.
- Kodama, F. (1986). Japanese innovation in mechatronics technology. Science and Public Policy, 13(1), 44-51.
- Kontzer, T. (13 March 2015 06:58 PM ET). Robots Take Over The World!: Not Such A Crazy Fear. Investor's Business Daily News. <http://news.investors.com/technology/031315-743468-ai-warnings-from-hawking-musk-gates-taken-to-heart.htm#ixzz3YjSxx9fS> (Access Date: 19.04.2015).
- Leopold, T. (10 April 10 201518:00 GMT) NASA chief scientist: 'Indications' of alien life by 2025. CNN News Channel. <http://edition.cnn.com/2015/04/08/us/feat-nasa-scientist-alien-life/> (Access Date: 19.04.2015).
- Lolli, F.M.A. (2013). Semantics and pragmatics in actual software applications and in web search engines: exploring innovations. CoRR abs/1307.0087. <http://arxiv.org/ftp/arxiv/papers/1307/1307.0087.pdf>
- Lucien, M. (5 February 2015). How should we regulate the use of drones. The World Economic Forum Blog, Agenda. https://agenda.weforum.org/2015/02/how-should-we-regulate-the-use-of-drones/?utm_content=bufferead7&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer (Access Date: 19.04.2015).
- Manyika, J., Chui, M., Bughin, J., Dobbs, R., Bisson, P., & Marrs, A. (2013). Disruptive technologies: Advances that will transform life, business, and the global economy (Vol. 180). San Francisco, CA: McKinsey Global Institute.
- Malik, T. (30 April 2015 10:33am ET). Jeff Bezos' Blue Origin Launches Private Spaceship Test Flight. Space.com. http://www.space.com/29278-blue-origin-launches-private-spaceship-test.html?adbid=10152788235346466&adbpl=fb&adbpr=17610706465&cmpid=514630_20150430_44947826&short_code=2wkb1 (Access Date: 30.04.2015).
- McKenzie, S. (29 April 2015 05:40 AM). Rise of the robots: The evolution of Ford's assembly line. CNN Money News Channel, Tech. <http://money.cnn.com/gallery/technology/2015/04/29/ford-factory-assembly-line-robots/1.html> (Access Date: 30.04.2015).
- McMaken, R. (9 April 2015). NASA: Give Us More Money So We'll Discover Alien Life. Mises Institute. Mises Wire. <https://mises.org/blog/nasa-give-us-more-money-so-well-discover-alien-life> (Access Date: 19.04.2015).
- McSpadden, K. (28 April 2015 5:01 AM EDT). Audi just invented fuel made from CO2 and water. Fortune & Time Magazines. <http://fortune.com/2015/04/28/audi-just-invented-fuel-made-from-co2-and->

- [water/?utm_content=buffer75fa9&utm_medium=social&utm_source=facebook.com&utm_campaign=buffer](#) (Access Date: 30.04.2015).
- Mell, P., & Grance, T. (September 2011). The NIST definition of cloud computing. Recommendations of the National Institute of Standards and Technology US Department of Commerce. Special Publication 800-145.
- Meyerson, B. (4 March 2015). Top 10 emerging technologies of 2015. The World Economic Forum Blog, Agenda. <https://agenda.weforum.org/2015/03/top-10-emerging-technologies-of-2015-2/> (Access Date: 30.04.2015).
- Mizroch, A. (27 April 2015 5:23 pm ET). Is your job creative enough to resist robot automation? The Wall Street Journal Newspaper, Blog, Management, At Works. <http://blogs.wsj.com/atwork/2015/04/27/is-your-job-creative-enough-to-resist-robot-automation/?mod=e2fb> (Access Date: 30.04.2015).
- Mokyr, J. (1985). The economics of the industrial revolution. (Reprinted 1989). USA : Rowman & Littlefield Publishers, Inc. : 1-30.
- Murphy, B. (2000). Introduction to AI robotics. MIT press.
- Murray, S.H., Keevil, A.A. (21 August 2014). System and Method for Interactive Virtual Banking, Patent, No : US 20140236740 A1.
- NASA. (7 April 2015 at 2:31 pm) Commercial-crew-program. Happy Fourth Birthday to America's Commercial Crew Program ! <https://blogs.nasa.gov/commercialcrew/2015/04/07/happy-fourth-birthday-to-americas-commercial-crew-program/> (Access Date: 19.04.2015).
- Öztürk, B. & Mrkaic, M. (May 2014). SMEs' Access to Finance in the Euro Area: What Helps or Hampers? *IMF Working Paper, WP/14/78*. International Monetary Fund, European Department.
- Pau, Louis F. Artificial intelligence in economics and management. Elsevier Science Inc., 1986.
- Popper, N. (29 April 2015). Can Bitcoin Conquer Argentina? New York Times Magazine. http://www.nytimes.com/2015/05/03/magazine/how-bitcoin-is-disrupting-argentinas-economy.html?smid=fb-nytimes&smtyp=cur&bcimp=AD&bciclup=WT.mc_id&bcmst=1409232722000&bcmet=1419773522000&r=0 (Access Date: 30.04.2015).
- Rich, E. (1985). Artificial intelligence and the humanities. *Computers and the Humanities*, 19(2), 117-122.
- Riley, C. (2015). Tesla's new product is a battery for your home. CNNMoney News Channel Tech. http://money.cnn.com/2015/05/01/technology/tesla-powerwall-battery-product/index.html?iid=SF_T_Lead
- Rooney, B. April (30 April 2015: 5:00 PM ET). Amazon founder Jeff Bezos' space company launches first rocket into space. CNNMoney, New York. http://money.cnn.com/2015/04/30/news/jeff-bezos-rocket-launch/index.html?iid=SF_T_River (Access Date: 30.04.2015).
- Roubini, N. (08 December 2014). Rise of the Machines: Downfall of the Economy? <http://www.roubinisedge.com/nouriel-unplugged/rise-of-the-machines-downfall-of-the-economy> (Access Date: 19.04.2015).
- Shadbolt, P. (26 March 2015, Updated 0139 GMT. 0939 HKT). Fighting cancer and Ebola with nanoparticles. CNN News Channel. <http://edition.cnn.com/2015/03/25/tech/webster-nanoparticles-cancer-mci/index.html?sr=fb033015nanoparticles1IpStoryGalLink> (Access Date: 19.04.2015).
- Shadbolt, P. (30 April 2015). This robotic chimp could one day roam the moon. CNN News Channel. <http://edition.cnn.com/2015/04/30/tech/mci-robochimp/?sr=fb050215roboticchimp83IpStoryGalLink> (Access Date: 30.04.2015).
- Shaffer, L. (2015). Tesla launches batteries for homes, businesses and utilities. CNBC News Channel, Technology. <http://www.cnn.com/id/102637763>
- Stampler, L. (10 February 2015). Google's Robot Dog Brings Us One Step Closer to the End of Humanity. The Time Magazines. <http://time.com/3703243/google-boston-dynamics-robot-dog/> (Access Date: 19.04.2015).
- Stiglitz, J.E. (November 2014), Unemployment And Innovation. Working Paper 20670. *National Bureau Of Economic Research* 1050 : 3. <http://www.nber.org/papers/w20670>
- Tarhan, U (February 2010). Geleceğin Meslekleri. Türkiye İşveren Sendikaları Konfederasyonu İşveren Dergisi. No. 5 : 26-29. <http://tisk.org.tr/tr/e-dergiler/isveren/2010/subat/index.html> (Access Date: 19.04.2015).
- Taylor, J. G. (1993). The Promise of neural networks. Springer-Verlag New York, Inc..
- Wainwright, O. (9 March 2015 18:52 GMT) Let's all move to Mars! The space architects shaping our future. The Guardian Newspaper. http://www.theguardian.com/artanddesign/2015/mar/09/space-architects-shaping-plans-for-life-on-moon-and-mars?CMP=fb_gu (Access Date: 19.04.2015).
- Wall, M. (March 12, 2015 12:50pm ET). Lockheed's 'Jupiter' Space Tug Could Fly to Space Station, Moon and Beyond. Space.com. http://www.space.com/28817-jupiter-system-space-station-cargo-exploration.html?adbid=10152692170306466&adbpl=fb&adbpr=17610706465&cmpid=514630_20150313_42027666&short_code=2mhhg (Access Date: 19.04.2015).
- Wall, M. (06 April 2015 08:00am ET). Incredible Technology: Spiderlike Robots Could Build Giant Space Structures. Space.com. http://www.space.com/28846-spiderfab-space-structures-incredible-technology.html?adbid=10152741022781466&adbpl=fb&adbpr=17610706465&cmpid=514630_20150406_43305826&short_code=2r0ia (Access Date: 19.04.2015).
- Wall, M. (27 April 2015 01:30pm ET) NASA Launches Project to Help Search for Alien Life. Space.com. http://www.space.com/29205-nasa-alien-life-search-exoplanets-nexss.html?adbid=10152782772156466&adbpl=fb&adbpr=17610706465&cmpid=514630_20150427_44747886&short_code=2vs2j (Access Date: 30.04.2015).
- WB. The World Bank, Data. GDP (current US\$) <http://data.worldbank.org/indicator/NY.GDP.MKTP.CD/countries?display=default> (Access Date: 30.04.2015).
- WEF. World Economic Forum Annual Meeting 2015 Programme. (21-24 January 2015). Davos-Klosters, Switzerland. http://www3.weforum.org/docs/AM15/WEF_AM15_Programme_A3526EC2F4.pdf (Access Date: 19.04.2015).
- Yu, H. (June, 2008). Overview of human adaptive mechatronics. In Proceedings of the 9th WSEAS International Conference on Mathematics & Computers In Business and Economics (pp. 152-157). World Scientific and Engineering Academy and Society (WSEAS).