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International Hellenic University, Department of Finance and Accounting, Greece

Faculty of International Business and Economics, The Bucharest University of Economic Studies, Romania

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FROM GLOBALIZATION TO PLANETIZATION – IS THE TIME OF COLONIZATION OF THE SOLAR SYSTEM APPROACHING?

Pavel Stoynov
Sofia University "St. Kliment Ohridski"
Faculty of Economics and Business Administration
Sofia, Bulgaria
todorov@feb.uni-sofia.bg

ABSTRACT

It can be said that the globalization of the society is ongoing. Now, the main concern for the society is whether it will succeed to jump to other planets before the Earth resources become completely exhausted. The technologies now are developing rapidly but still the level allowing colonization of other planets is not achieved. Economies could assure fast development of the advanced technologies. Another important issues are the regional struggles between multi-polar political powers which spends resources for unnecessary political competition. Solving economic, technological and political issues are the key for speed-up of preparation for colonizing the near planets.

KEYWORDS

globalization, planetization, technologies, economy, policy

JEL CLASSIFICATION CODES

O33, O57, N40

1. INTRODUCTION

Humanity today faces global challenges related to the overpopulation of the planet and its exhausted resources. To meet successfully these challenges, people must make effort to strengthen and concentrate the economical, political and technological potential of mankind in order to speed up planetization and further exploration of the space.

The term planetization is used so far with different meanings. In this article, it is used with two meanings:

1. Building sustainable human society and symbiosis between mankind and the Earth.
2. Human colonization of the other planets of the Solar system.

The planetization in the first sense is called inner planetization. Respectively, it is suitable to denote the first prospective stage of human penetration in space – the colonization of the planets of the Solar system – outer planetization.

2. FROM INNER TO OUTER PLANETIZATION

Because of the fast growing of the human population and the decrease of natural resources on Earth, it is clear that at some stage the leave of Earth should be matter of surviving. Staying on Earth at some time would lead to extinction.

So, outer planetization and following penetration in deep space are necessary and humanity must perform intensive space exploration to finalize the outer planetization. Stephen Hawking, renowned British theoretical physicist, said: "I don't think the human race will survive the next thousand years, unless we spread

into space. There are too many accidents that can befall life on a single planet. But I'm an optimist. We will reach out to the stars." (Highfield, 2001).

The potential objects of outer planetizations are the planets of the Solar system and their natural satellites.

The Moon is the closest object of interest. So it is explainable why it became the first celestial body to be the object of space exploration. It was the first outer planetization object to be flown by, orbited, and landed upon by spacecraft, and the only outer planetization object ever to be visited by humans.

In 1959 USSR obtained the first images of the far side of the Moon. In 1966 the Soviets started deploying landers to the Moon which were able to obtain data directly from the Moon's surface, closely followed by landers of USA. In the early 1970s, first uncrewed rovers of Lunokhod program were deployed by USSR and lunar soil samples were brought to Earth for study. This marked the first (and to date the only) automated return of extraterrestrial soil samples to Earth.

Crewed exploration of the Moon began in 1968 with the Apollo 8 mission that successfully orbited the Moon. In 1969, the Apollo 11 mission marked the first time humans set foot upon another world. The Apollo 17 mission in 1972 marked the sixth landing and the most recent human visit there, and the next, Exploration Mission 2, is expected to orbit the Moon in 2023.

The exploration of Mars has been an important part of the space exploration programs of the Soviet Union (later Russia), the United States, and later of EU, Japan and India. Dozens of robotic spacecraft have been launched toward Mars since the 1960s. These missions gathered data about current conditions and history of Mars.

In contrast to overall high failure rates in the exploration of Mars, India has become the first country to achieve success since the first trial. India's Mars Orbiter Mission (MOM) (Harris, 2014) is one of the least expensive interplanetary missions ever undertaken with an approximate total cost of US $73 million.

The first mission to Mars by any Arab country has been taken up by the United Arab Emirates. Called the Emirates Mars Mission, it is scheduled for launch in 2020.

The exploration of Jupiter has consisted solely of a number of automated NASA spacecraft visiting the planet since 1973. A large majority of the missions, like Pioneer and Voyager programs, were detailed observations without the probe landing or entering orbit. The Galileo and Juno spacecraft are the only spacecrafts to have entered the planet's orbit. As Jupiter is believed to have only a relatively small rocky core and no real solid surface, a landing mission is precluded.

Saturn has been explored only through automated spacecraft launched by NASA, including one mission (Cassini–Huygens) planned and executed in cooperation with other space agencies. These missions consist of flybys in 1979 by Pioneer 11, in 1980 by Voyager 1, in 1982 by Voyager 2 and an orbital mission by the Cassini spacecraft, which lasted from 2004 until 2017.

Saturn has at least 62 known. The largest of the moons is Titan, which is the only moon in the Solar System with an atmosphere denser and thicker than that of Earth. Titan is also the only object in the Outer Solar System that has been explored with a lander, the Huygens probe deployed by the Cassini spacecraft.

The exploration of Uranus has been entirely through the Voyager 2 spacecraft, with no other visits currently planned. The closest approach to Uranus occurred on 24 January 1986. Voyager 2 studied the planet's unique atmosphere and magnetosphere, examined its ring system and the moons of Uranus including all five of the previously known moons, while discovering an additional ten previously unknown moons.

Images of Uranus proved to have a very uniform appearance, with no evidence of the dramatic storms or atmospheric banding evident on Jupiter and Saturn. Great effort was required to even identify a few clouds in the images of the planet. The magnetosphere of Uranus, however, proved to be unique, being profoundly affected by the planet's unusual axial tilt. In contrast to the bland appearance of Uranus itself, striking images were obtained of the Moons of Uranus, including evidence that Miranda had been unusually geologically active.

The exploration of Neptune began with the 25 August 1989 Voyager 2 flyby. The possibility of a Neptune Orbiter has been discussed, but no other missions have been given serious thought.

Exploration of Neptune had obvious banding, visible clouds, auroras, and even a conspicuous anticyclone storm system rivaled in size only by Jupiter's small Spot. Neptune also proved to have the fastest winds of any planet in the Solar System, measured as high as 2,100 km/h (Suomi, Limaye, Johnson, 1991). Voyager 2 also examined Neptune's ring and moon system. It discovered 900 complete rings and additional partial ring "arcs" around Neptune. In addition to examining Neptune's three previously known moons, Voyager 2 also discovered five previously unknown moons, one of which, Proteus, proved to be the last largest moon in the system.

The dwarf planet Pluto presents significant challenges for spacecraft because of its great distance from Earth and small mass, making capture into orbit very difficult. Voyager 1 could have visited Pluto, but

controllers opted instead for a close flyby of Saturn's moon Titan, resulting in a trajectory incompatible with a Pluto flyby. Voyager 2 never had a plausible trajectory for reaching Pluto (Harwood, 2013).

Pluto continues to be of great interest, despite its reclassification as the lead and nearest member of a new and growing class of distant icy bodies of intermediate size (and also the first member of the important subclass, defined by orbit and known as "plutinos"). After an intense political battle, a mission to Pluto dubbed New Horizons was granted funding from the United States government in 2003.New Horizons was launched successfully on 19 January 2006. In early 2007 the craft made use of a gravity assist from Jupiter. Its closest approach to Pluto was on 14 July 2015. The observations of Pluto began five months prior to closest approach and continued for 16 days after the encounter.

3. PLANETIZATION AND ECONOMY

The space exploration is costly. USA can afford the largest spending for that purpose, but space exploration is a relatively minor line item in the U.S. budget. NASA's spending peaked at almost 4,5% of the federal budget in fiscal year 1966, declined to 1% by 1975, and has gradually fallen to about 0,5% in recent years.

If the research and development budgets in the Obama administration's federal budget proposal is considered as an example, for fiscal year 2011 NASA would receive $11 billion, out of a total research and development budget of $148.1 billion. Other space activities are funded out of the research and development budget of the Department of Defense, and from the budgets of the other regulatory agencies involved with space issues.

The 2015 budget proposal for NASA is $17,5 billion, just below the $17,7 billion appropriated for 2014. Major expenditures include science missions ($5 billion), space operations such as the ISS ($3,9 billion), and new commercial and public exploration development ($4 billion).

Historically, 85-90% of NASA's budget went to private contractors—largely to design and manufacture rockets and spacecraft—while NASA maintained close oversight and operated the equipment. But now NASA is beginning to privatize operations as well through the Commercial Orbital Transportation Services program initiated in 2006.

Advocates believe private firms such as SpaceX and Orbital Sciences—both of which won contracts to ferry ISS cargo—can provide routine LEO access at a lower cost, eventually even for manned flight. Proponents of this shift say NASA could then focus more on missions that push scientific and exploration frontiers. Some go further in suggesting that NASA become more like the Defense Advanced Research Projects Agency or the National Science Foundation by setting objectives—such as capturing an asteroid—and then giving grants to private firms.

Entering of private companies in space industry in USA and in other countries show that the time of refunding of huge space exploration costs is coming. Revenues can be obtained from space travels or mining asteroids and planets.

Developments in late 2014 demonstrated the continuing challenge of pursuing safe and reliable space travel. Virgin Galactic had collected more than seven hundred deposits for planned suborbital flights, priced at $250 000 per seat, before a fatal crash during an October 31 test flight.

Some entrepreneurs see a commercial future in space beyond NASA contracts and satellite launches, although many ventures are still on the drawing board. Space Adventures offers customers the opportunity to orbit Earth and experience spectacular views and weightlessness.

Planetary Resources and Deep Space Industries are pursuing asteroid mining, which supporters believe could supply future space colonies and provide a new abundance of precious metals and rare earth elements.

4. PLANETIZATION AND POLICY

This section considers the key policy-makers in the area of space exploration – the countries having enough human, economical and technological resources to participate in space exploration currently. The past achievements, the current state and the future of the space exploration are briefly presented.

The launch of Sputnik in October 1957, of the first human in space - Yuri Gagarin – in 1961 and the subsequent USSR achievements were the beginning of the space exploration era. Now, Russia is successor of USSR in space exploration.

The second major player in this more than 60-year-lasting process are USA. President John Kennedy committed the United States to a lunar landing. After six successful lunar missions, NASA's manned program

pulled back to Earth, while robotic missions such as Voyager and Viking continued to explore the Solar System. NASA focused on sending astronauts into low earth orbit (LEO) with the 1973 launch of Skylab, the first U.S. space station, and the Space Shuttle.

The Space Shuttle served NASA for thirty years (1981–2011) and helped build the International Space Station (ISS), an orbiting laboratory that has been continuously occupied by humans since 2000.

NASA proposes to move forward with the development of the Space Launch System (SLS), which will be designed to carry people, as well as important cargo, equipment, and science experiments to Earth's orbit and destinations beyond.

The George W. Bush administration pushed for a return to the moon and a trip to Mars, but President Barack Obama favored an asteroid mission. The project has evolved into a plan to capture an asteroid twenty to thirty feet in diameter and redirect it into a lunar orbit for astronauts to visit early in the next decade. The Obama administration also set a goal of a manned mission to orbit Mars by the mid-2030s, which would require the commitment of subsequent presidents.

China became the third nation to independently launch a human into orbit in 2003. Launching before that 79 satellites since 1970. Chinese space program is also planning to reach the moon and to build 60-ton multi-module space station in near future.

Meanwhile, India launched its first unmanned mission to Mars in late 2013, and its probe entered Mars's orbit in September 2014. The Indian Space Research Organization has since reached an agreement with NASA on subsequent explorations of Mars.

Another international mission, the dramatic landing of a European Space Agency probe on a comet, attracted widespread interest in November 2014. Though a landing mishap failed to anchor the probe properly, it was still able to send a large amount of valuable data to scientists.

Space can also inspire international cooperation. The 1975 Apollo-Soyuz Test Project, where U.S. and Russian spacecraft docked for the first time, as well as today's ISS project unites leading fourteen nations in perhaps humanity's most expensive project.

The space agencies of Europe, Russia, and Japan were also important partners on robotic missions such as the Mars rovers Spirit and Opportunity. The ISS will likely deorbit in the 2020s, but many say deeper space missions will likely need to be international ventures.

Unfortunately the rivalry between the great power still limits the efforts for a complete collaboration. Each power has its own military space program.

At the beginning of 2019 the Pentagon issued a new document – Review of the anti-missile defense (2019) in which militarization of the close Earth orbit is considered. There will be a layer of cosmic sensors around the globe which will register early any ballistic missile launch from any point of the world. This will ensure more time for calculation of the missile trajectory and for eventual destroy of the missile. The prototype of such a sensor will be ready about 2020. There will be also deployment in orbit of laser systems to destroy the missiles of the enemy in the cosmos. A six-month test period is considered for military before to finally decide if the project will start. There are some alternative of the space defense system. For example, the missiles of the enemy can be destroyed by aircrafts F-35 or by drones equipped by laser weapon.

There are five space law treaties ratified by the United Nations Committee on the Peaceful Uses of Outer Space (OOSA Treaty Database, 2011) covering "non-appropriation of outer space by any one country, arms control, the freedom of exploration, liability for damage caused by space objects, the safety and rescue of spacecraft and astronauts, the prevention of harmful interference with space activities and the environment, the notification and registration of space activities, scientific investigation and the exploitation of natural resources in outer space and the settlement of disputes (United Nations Treaties and Principles on Space Law, 2011).

Since October 1967 satellite based weapons systems have been limited by international treaty to conventional weapons only. Art.IV of the Outer Space Treaty (1967) specifically prohibits signatories from installing weapons of mass destruction in Earth orbit. The treaty became effective on 10 October 1967 and, as of May 2013, 102 countries are parties to the treaty with a further 27 pending full ratification.

The United Nations General Assembly adopted five declarations and legal principles which encourage exercising the international laws, as well as unified communication between countries with, among them:

- The Principles Governing the Use by States of Artificial Earth Satellites for International Direct Television Broadcasting (1982)
- The Principles Relating to Remote Sensing of the Earth from Outer Space (1986)
- The Principles Relevant to the Use of Nuclear Power Sources in Outer Space (1992)
- The Declaration on International Cooperation in the Exploration and Use of Outer Space for the Benefit and in the Interest of All States, Taking into Particular Account the Needs of Developing Countries (1996).

All space exploration will be done with good intentions and is equally open to all States that comply with international law. No one nation may claim ownership of outer space or any celestial body. Activities carried out in space must abide by the international law and the nations undergoing these said activities must accept responsibility for the governmental or non-governmental agency involved. Objects launched into space are subject to their nation of belonging, including people. Objects, parts, and components discovered outside the jurisdiction of a nation will be returned upon identification. If a nation launches an object into space, they are responsible for any damages that occur internationally.

As the nation-state model fails to meet the global changes in the most adequate way, many researchers consider alternative types of human organization.

One proposal is the creation of a cosmic supra-state based on peace, justice and sustainable human progress.

But to reach this end the society has long way to pass. The opposition East-West from the cold war era was changed by the uni-polar world where USA hegemony took center stage. But recently the Islam challenged the Western cultural paradigm of modernity in the field of religion. The global terrorism challenged USA in the field of brute force. And a multi-polar world has emerged with China, India, Russia and EU challenged the USA in politics and economy.

The integration at national and other levels is one way to achieve inner planetization in the globalized world.

5. PLANETIZATION AND TECHNOLOGY

Space technology is technology for use in space exploration.

The main types of space technologies are: satellite technology, space exploration technology and space flight technology.

Satellite technology is related to development of satellites. The main types of satellites are: communications satellite, direct-broadcast satellite, earth observation satellite, geosynchronous satellite, military satellite, reconnaissance satellite, navigation satellite, tracking and data relay satellite, weather satellite.

Examples of space exploration technologies include are the space stations.,

Examples of Space flight technologies are rockets and space shuttles.

A booster rocket (or engine) is either the first stage of a multistage launch vehicle, or else a shorter-burning rocket used in parallel with longer-burning sustainer rockets to augment the space vehicle's takeoff thrust and payload capability.

NASA's Space Shuttle was the first manned vehicle to use solid-fueled boosters as strap-ons. The solid boosters consisted of stacked segments, and were recovered and reused multiple times.

In a new development program initiated in 2011, SpaceX developed reusable first stages of their Falcon 9 rocket. After launching the second stage and the payload, the booster returns to launch site or flies to a drone ship and lands vertically. (Wikipedia, 2019). The program is intended to reduce launch prices significantly.

Many common everyday services such as weather forecasting, remote sensing, GPS systems, satellite television, and some long distance communications systems critically rely on space infrastructure. Of the sciences, astronomy and Earth science (via remote sensing) benefit from space technology. Also, space technologies lead to transferring technologies and innovations in other industry sectors.

NASA catalogues some 1 800 spinoffs in which technologies originally developed for space exploration were transferred to the private sector. Some are obvious, such as communications satellites, but other transfers are less well known. Many medical advances derived from space technologies, from refinements in artificial hearts to improved mammograms and laser eye surgery. Space exploration drove the development of new materials and industrial techniques, including thermoelectric coolers for microchips, high temperature lubricants, and a means of mass-producing carbon nanotubes, a material with significant engineering potential. Even household products such as memory-foam mattresses, programmable ovens, vacuums, and ski apparel trace their origins to NASA.

Some of the best candidates for future deep space engine technologies include anti-matter, nuclear power and beamed propulsion. The latter, beamed propulsion, appears to be the best candidate for deep space exploration presently available, since it uses known physics and known technology that is being developed for other purposes.

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THE CONTRIBUTION TO EFFICIENCY OF PRIVATE-PUBLIC PARTNERSHIP INTEGRATED SERVICES: THE CASE OF "OPERATING ROOM SUPPORT SERVICES" IN ALBANIAN HEALTHCARE

Niccolò Persiani[1], Martina Giusti[1], Laura Yzeiraj[2],
Emiljan Karma[2], Edi Dragusha[2], Alberto Romolini[3]

[1]*University of Florence, Largo Brambilla, 1-50129 – Firenze, Italy, niccolo.persiani@unifi.it*
[1]*University of Florence, Largo Brambilla, 1-50129 – Firenze, Italy, martina.giusti@unifi.it*
[2]*Catholic University Our Lady of Good Counsel, Rr. D. Hoxha, Tirana, Albania, l.yzeiraj@unizkm.al*
[2] *Catholic University Our Lady of Good Counsel, Rr. D. Hoxha, Tirana, Albania, e.karma@unizkm.al*
[2] *Catholic University Our Lady of Good Counsel, Rr. D. Hoxha, Tirana, Albania, e.dragusha@unizkm.al*
[3]*University Uninettuno, Corso Vittorio Emanuele II, 39-00100- Roma, Italy, a.romolini@uninettuno.net*

ABSTRACT

One of the main problems that characterizes healthcare in transition countries, is the inadequacy of their hospital assets, with particular reference to operating rooms.
This aspect usually involves significant levels of inefficiency, scarce productivity of the structures and, at the same time, an incapability to meet international standards with the consequent high level of surgical and nosocomial infections.
During the long transition from the Soviet system to the modern era, Albanian healthcare has established a health system, which is inadequate for the challenges of modern health in order to guarantee the quality of healthcare it offers.
In this framework, the operating rooms system is not an exception.
To cope with this situation, in 2016 the Albanian Ministry of Health implemented a Public-Private Partnership (PPP) project with a group of international companies for the management of operating rooms and for the supply of sterilization services to its hospitals. This is a significant organizational innovation for the Albanian healthcare system, that will redesign the entire related healthcare delivery system over the next few years.
The aim of this paper is to measure the effects generated from an outsourcing system organizational processes relating to operating rooms on the productivity of the clinical process. In particular, the work aims to investigate whether the most efficient organization of operating rooms produces effects on the volumes of activity.
The paper uses the case study approach based on the activity data of Mother Theresa University Hospital centre of Tirana, the main Albanian University hospital including all the main specialties and the first hospital in which the described service was applied. Therefore, for each clinical specialty, the production volumes were compared before and after the introduction of the new organizational model.
In order to confirm the relationship between the change in activity volume and the new organizational model, based on the supply of sterilized kits to operating rooms, the production data was matched with the actual deliveries of the kits from the warehouse of the company provider.
Moreover, targeted interviews with hospital managers, surgeons and private partner managers were used to verify the adequacy of the data and to enable more detailed exploration of the results obtained.
The data demonstrate that the organizational model adopted has translated into a significant increase in productivity in most operating rooms and in related clinical specialties. This increase is due to both the organizational model, which allows a more rapid preparation of the operating room, and the greater safety guaranteed for professionals. This effect, combined with the decreased clinical risk, through the eventual reduction of hospital infections, expresses an element of important growth and development within the Albanian hospital system.

KEYWORDS

Albanian healthcare, operating rooms, clinical risks, hospital organization, PPP.

JEL CLASSIFICATION CODES

H41, H51, D61.

1. INTRODUCTION

Albanian healthcare is evolving very rapidly. After a long transition from the previous model of the Soviet period, the country has tried to enhance its economic growth and its healthcare services. This growth has permitted the creation of a new Welfare State based not only on foreign donors but also on quality services provided by public and private entities (World Health Organization, 2014).

In fact, nowadays Albania has a widespread hospital network characterized by the presence of a significant number of modern clinical specialties and the ability to offer the country's citizens a wide range of differentiated services (Boge and Aliaj, 2017; Akshija and Dibra, 2018).

The Albanian hospital system, however, has suffered many problems related to the difficulty of recovering the lost years (Persiani et al, 2014), the presence of an inadequate financing system (Persiani, 2014), and the existence of high levels of inappropriate treatments and low productivity (Persiani et al, 2018).

A further problem that characterizes the Albanian health service (Shahini and Kalaj, 2016; Kraja et al, 2016), as in most of the transition countries (Sowa, 2016), is the presence of high percentages of hospital infections, which often nullify efforts to raise the care quality (Faria et al, 2006; Erdem et al, 2014; Gjerazi et al, 2015). In fact, recent data reveal that this topic has constituted a real and critical aspect of the Albanian system with inevitable consequences in terms of costs duplication and user dissatisfaction (Tomini et al, 2012; Lastrucci et al, 2016).

To cope with this situation, in 2016 the Albanian Ministry of Health implemented an innovative Public-Private Partnership (PPP) project with a group of international companies for the management of operating rooms and for the supply of sterilization services to hospitals. This project can be considered a significant organizational innovation for the Albanian healthcare system, as it will redesign the entire related healthcare delivery system in the future (McKee et al, 2006; Hoppe and Schmitz, 2013; Tekin, 2012). Consequently, the organizational processes of reengineering and the greater safety of operators, equipped with more effective and modern instruments, have permitted hospital staff to operate with new and higher levels of efficiency and productivity in locations where the service has been started (Mudyarabikwa et al, 2017; Kokatnur and Pilli, 2018).

The aim of this paper is to measure the effects generated from an outsourcing system of operating rooms' organizational processes on the productivity of the clinical paths. In particular, the work aims to investigate whether the most efficient organization of operating rooms influences the volume of activity.

The paper is organized as follows. After the overview of the background of Albanian healthcare, the paper analyses the characteristics of the PPP project. The subsequent pages are dedicated to the analysis of the collected data and to the conclusions reached.

2. BACKGROUND

During the long period of dictatorship, the Albanian government aimed to introduce a centralized healthcare model according to the classic Soviet approach to healthcare, the so-called "Semashko Model", with each service delivered to the population completely free (Maciocco, 2009). The effectiveness of this system was maintained for 50 years, surviving until the closing of diplomatic relations with the Soviet Union. Indeed, the Soviet aid was decisive in the development of healthcare after the war through the supply of drugs, technologies and training.

In particular, the 1960s saw the development of the first national primary healthcare system through the creation of epidemiological centres in each of the country's 26 districts and through the midwifery network provision to every village, with the function and the responsibility for pre-natal care and vaccinations. Only in the 1970s, Albania began the construction of a basic hospital network with a hospital for every district, responsible for basic care, and clinics for specialist treatments.

Moreover, in the 1980s, the Albanian Ministry of Health started a modest path of decentralization through the identification of specific districts for hospitals, management and administration (Cepiku, 2005). It must be highlighted that the quality of services was very low due to the obsolete medical technologies, the low level of training and the absence of qualified scientific research (Tomini et al, 2013).

As in almost all the countries of the former Soviet Bloc, Albanian healthcare, starting in the 1990s, showed a significant decrease in health public expenditure as a result of the severe financial difficulties in the years after the end of the Soviet Era (Bonilla-Chacin et al, 2005; Kornai and Eggleston, 2001). This lack made it increasingly difficult to access healthcare services for the poorest part of the population (Falkingham, 2004) and created the diffusion of "informal" payments, which still have a strong presence in the country (Balabanova and

McKee, 2002; Belli and Shahriari, 2002; Ensor and Savelyeva, 1998). Most of the demand was filled by private entities (Goldstein et al, 1996) and the public healthcare system soon collapsed.

In order to confront this crisis, several initiatives were undertaken to reform the regulatory framework of the healthcare during the early 1990s. This process involved the main intergovernmental organizations, such as the World Bank and the WHO, which acted as main donors and promoters of policy documents processed during these years (Akin et al,1987; The World Bank 1987 and 1993).

A new public healthcare governance structure was thus processed in order to facilitate the access to public services and improve the quality, while simultaneously ensuring the financial self-sufficiency of the system. To achieve these goals, the Ministry of Health published the first Strategic Plan (Ministry of Health, 1993), identifying three fundamental actions:

1. the decentralization so that the Ministry of Health could gradually become a regulatory entity;
2. the creation of a public insurance fund, in order to produce a significant increase in health expenditure;
3. the introduction of an accreditation system for quality in healthcare entities.

These goals have since been reconfirmed in the "Long-term Strategy for the Development of the Albanian Health System (LTSDAHS) 2004" and within the "National Strategy for Development and Integration 2007-2013" and the "National Strategy for Health 2007-2013". In accordance with these plans, the former healthcare model was abolished (Laws n. 7718/1993 and n. 7738/1993) and replaced with a public insurance system (Laws n.7850/1994 and n.7870/1994) accompanied by the privatization of certain complementary sectors (pharmaceuticals and dentistry).

The results are a combined model between the Bismarck and Beveridge health systems, characterized by sophisticated governance and based on compulsory and voluntary contributions as well as on state budget funding.

The National Strategy entrusts the secondary and tertiary level healthcare to a network of 40 hospitals associated with different districts, regions and universities. The district hospitals are structured with at least four specialized departments (internal medicine, paediatrics, general surgery and obstetrics/gynaecology), through which they offer inpatient care in the territory. Some of them are also entrusted with emergency services, anaesthesia and intensive care, radiology, biochemical laboratories and service pharmacies. The regional hospitals offer 10 to 12 specialist departments and must ensure services with greater specialization. Finally, the university hospitals, mainly located in Tirana and Durrës, offer third level services and high-level specializations. They are teaching and research hospitals in accordance with the university institutions. Hospitals are the prevailing response for the needs of the population, with a set of 8,357 beds and 11,331 employees (Table 1).

Table 1. Hospitals in Albania – Year 2016[1]

Classification	Number of hospitals	Number of beds	Number of employers
District Hospitals	24	2,015	2,916
Regional Hospitals	11	3,571	4,948
University Hospitals	5	2,215	3,467
Private Hospitals	7	556	n/a
TOTAL	**47**	**8,357**	**11,331**

Albanian healthcare also sees the strong presence of private hospitals and polyclinics, all located in Tirana, which integrates the public offer.

The most important Albanian hospital is the Mother Theresa University Hospital centre in Tirana, with a capacity of 1,450 beds. On an annual basis, this hospital provides outpatient healthcare services to about 150,000 people, hospital care for over 60,000 people, emergency services for about 200,000 people and medical assistance to a daily average of 400 hospitalized patients, employing more than 2,967 people.

[1] Source: Compulsory Health Insurance Fund (CHIF) and the official websites of private hospitals.

During 2016, the inflow of patients to Mother Theresa University Hospital centre was over 80,000 and the total number of surgical interventions performed was approximately 25,000.

Furthermore, in this prestigious hospital, as in developed countries, nosocomial (Sodano et al, 2003; Faria et al, 2007) and surgical infections (Faria et al, 2008) affect the success of surgery and limit the performance of interventions. In fact, the WHO is particularly active in the promotion of global (Tacconelli et al, 2016; Sartelli et al, 2017) and international (Wilson et al, 2007) alliances to overcome this problem, which can be combated through adherence to shared and approved international guidelines of action and surveillance (WHO, 2016; ECDC, 2016).

3. METHOD

In order to measure the effects generated from an outsourcing system of operating rooms' organizational processes on the productivity of the clinical processes, the case study (Yin, 1994; Eisenhardt, 1989) has been identified as an appropriate tool to conduct the research.

After the description of the organization and the development of the Albanian healthcare system in recent years, the country's main University Hospital Mother Theresa centre of Tirana has been identified as relevant example, considering the numerous surgical specialties within this hospital, to investigate if the most efficient organization of operating rooms produces effects on the volumes of activity.

The data of the performed interventions, divided into the 13 different existing surgical wards, has been obtained from the statistics department of the chosen hospital.

Therefore, for each ward, the production volumes were first compared for the years before and after the introduction of the new organizational model; secondly, they were compared for the first 12 months before and after the reorganization, considering the different moment at which services started.

In order to confirm the relationship between the change in the volume of activity and the reorganization, the production data was matched with the deliveries of the kits, as resulting from the warehouse of the company provider.

Targeted interviews with hospital managers, surgeons and private partner managers were also used to verify the adequacy of the data and to enable a more detailed exploration of the results obtained.

4. OPERATING ROOM SUPPORT SERVICES IN ALBANIAN HEALTHCARE

To address the problem of hospital infections, in 2015 the Albanian government selected, through an international tender, a group of international companies to develop the outsourcing of sterilization functions and the securing of surgical activities.

This typical PPP project was entrusted to a Consortium of European companies for a duration of ten years and provides for the granting of the following services:

a) supply of surgical instruments, differentiated by type of intervention, in all operating rooms throughout the country. These tools are delivered daily from special warehouses and they are retired after each intervention for the related sterilization, maintenance and repackaging;

b) supply of operating room clothes and napkins and, more generally, sterilization and disinfection of the surgery environment;

c) supply of specific medical devices to operating rooms;

d) construction and management of local sterilization plants. At the end of the contract these plants will become property of the Albanian Health Service;

e) other ancillary services for national and regional hospitals.

Essentially, the project favours the distinction between the expertise of the surgeons and their teams, focused on the professional activities and on the operating activities, and those of the private partner, represented in the operating rooms by a specialized nurse responsible for all the logistical activities and sterilization. For the physicians, there are no longer limitations based on the availability of surgical instruments or the preparation of

operating rooms, with the exception of those that can be connected to the demand or availability of beds, thus promoting greater productivity as well as greater work safety.

The project envisaged a progressive introduction of the new organizational model that will become the standard for the whole country by 2019.

The first hospital in which the new organizational model has been implemented is the "Mother Teresa" University Hospital Centre in Tirana, the largest health institution and the only academic institution in Albania. The selection of this hospital derives from to be the largest hospital in the country and to encompass all the principal surgery specializations, which exist in Albania.

Success in this hospital would have guaranteed, the subsequent extension to the whole country, as in the intentions of the Ministry of Health.

The service was introduced progressively from July 2016 in all its operating rooms and this process was completed in December 2016.

5. THE CONTRIBUTION TO EFFICIENCY OF THE NEW ORGANIZATIONAL MODEL

To verify the changes in efficiency following the introduction of the new organizational model, the first data analysed is the variation in the number of surgeries for each operating room of the hospital, in the last three years (Table 2).

Table 2. Comparison between years before and after the reorganization

	2015		**2016**		**2017**	
	N° surgical interventions	**Δ**	**N° surgical interventions**	**Δ**	**N° surgical interventions**	**Δ**
Oculist surgery	3,455	0%	3,946	14%	5,058	28%
Otorhinolaryngology surgery	1,442	0%	1,511	5%	1,469	-3%
Stomatology surgery	728	0%	641	-12%	697	9%
General surgery 1	3,005	0%	3,235	8%	3,410	5%
General surgery 2	1,292	0%	1,415	10%	1,664	18%
General surgery 3	3,009	0%	3,171	5%	3,537	12%
Plastic surgery	1,257	0%	1,275	1%	1,432	12%
Angiology	751	0%	680	-9%	756	11%
Cardiac surgery	646	0%	691	7%	763	10%
Orthopaedic surgery	1,876	0%	1,820	-3%	-	-
Paediatric surgery	3,038	0%	3,122	3%	2,955	-5%
Neurosurgery	1,051	0%	1,280	22%	1,015	-21%
Cancer surgery	1,325	0%	1,634	23%	1,642	0%
TOTAL	**20,999**	**0%**	**22,601**	**8%**	**24,398**	**8%**

It is observed a generalized increase in terms of productivity, except the orthopaedic activities (as these were transferred to the Trauma hospital in Tirana in 2017). Analysing the percentage of annual growth of the interventions for each year, we can see that, for most of the specialities, it varies from + 5% to +18%. Otorhinolaryngology, Stomatology, Paediatric surgery and Neurosurgery appear to be the only exceptions.

To correctly read these variations, however it is necessary to eliminate the impact deriving from the different moment of introduction during the year of the new organizational model in the different operating rooms. Therefore, a comparison has been made between the first fully operational twelve months with the preceding twelve months in the most significant operating rooms (Table 3).

Table 3. Comparison between 12 months before and after the reorganization

	N° surgical interventions		
	First year of use	**Second year of use**	**Δ**
Oculist surgery	3,856	4,846	26%
Otorhinolaryngology surgery	1,417	1,456	3%
Stomatology surgery	527	696	32%
Plastic surgery	1,157	1,432	24%
Angiology	573	738	29%
Cardiac surgery	598	745	25%
Neurosurgery	1,126	1,077	-4%
Cancer surgery	1,439	1,604	11%
TOTAL	**10,693**	**12,594**	**18%**

It is evident that the increase in productivity has been very significant; in fact, the majority of operating wards have experienced an increase in volume interventions of over 20%.

After this analysis, only otorhinolaryngology and neurosurgery remain as exceptions to the growing trend. The reasons for these exceptions are clear from the interviews with hospital managers. The greater availability of surgical instruments and reduced preparation time of the operating rooms are the first reasons for this increasing efficiency, while the greater safety, in which the interventions are carried out, is undoubtedly another factor.

Relatively, in the case of otorhinolaryngology, the structure only substantially affects tonsillectomies; thus, this ward had already reached full production capacity, finding a limit in terms of the available beds. The increase in productivity, although verified, could not therefore be translated into major surgical interventions.

A different case is neurosurgery, where the impact of the new organizational model has been less effective for two reasons: first the specificity of the surgical instruments used remained largely the same as it was previously and, secondly, in previous years the Mother Teresa University Hospital centre had invested in this sector through specific reorganisation projects, making it a national reference. In this last case, the new organizational model has been revealed to be partially innovative and limited in its application.

This explanation is confirmed by the analysis of the relationship between surgical kits and surgical activity. We have, in fact, compared the volume of kits delivered with the number of interventions measured by the hospital information system for 2017 in some operating rooms (Table 4).

Table 4. Kits delivered

	N° surgical interventions	**N° kits**	**Δ**
Oculist surgery	5,058	5,471	8%
Plastic surgery	1,432	1,450	1%

Cardiac surgery	598	745	25%
Neurosurgery	1,642	880	-46%
Cancer surgery	1,642	1,925	17%

The correspondence between delivered kits and surgeries is strong. The delivered kits correspond to the interventions operated in each room (the small difference can be easily explained with waste and mistake in use). The availability of irons is with evidence the main factor, which influence the volume of activity carried out in the specific structures.

A significant exception is neurosurgery, where the volume of activity is significantly superior to the kits and is absolutely not connectable to them because this particular kind of surgery uses specific instruments not recompensed in the project supply. This confirms that the variations of productivity, in this specific context, does not depend on the new organizational system but rather on the complexity of interventions.

6. CONCLUSIONS

The aim of this paper was to measure the effects generated from an outsourcing system of operating rooms' organizational processes on the productivity of the clinical processes. In particular, the work aimed to investigate whether the most efficient organization of operating rooms influences the volumes of activity.

The data clarify that the introduction of the new organizational model has had a significant effect in terms of increasing the productivity of the different operating rooms.

In all operating rooms within the Mother Teresa University Hospital centre, in fact, with the only exceptions of orthopaedic surgery (transferred over the years to another hospital), neurosurgery (in which the model has not been fully implemented) and otorhinolaryngology (in which the limitation is the availability of beds), the growth in production volume has been progressively higher since the first months of its introduction.

From the interviews with the physicians, it is clear that the reasons are the greater availability of surgical instruments, the reduction in the preparation time of the operating theatres and the greater safety, in which the interventions are carried out.

Therefore, the externalization of the management of operating rooms and sterilizations of surgical instruments, in addition to the expected benefits in terms of reducing hospital infections, can be proposed as an instrument for improving the efficiency and reducing the number of patient waiting lists.

The limitations of the research depend on the fact that the new organization has only been observed in one large hospital. For this reason, the next steps will be to measure the effect on productivity levels in smaller hospitals with low availability of specialization and beds that are actually implementing the new organization system.

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DO ENTREPRENEURS OF GENERATION Y ADOPT BUDGET PLANNING PROCEDURES?

S Lambros Tsourgiannis[1], Giannoula Florou[2], Michael Nikolaidis[2] and Anastasios Karasavvoglou[2]

[1] *Directorate of Public Health and Social Care of Regional District of Xanthi, Region of Eastern Macedonia and Thrace, Headquarters Xanthi, Greece ltsourgiannis@gmail.com*
[2]*Department of Accounting and Finance, International University of Greece, Campus of Kavala, Agios Loukas, 65404 Kavala Greece, Kavala*

ABSTRACT

This paper aims to explore the attitudes of entrepreneurs of generation Y towards budget planning procedures. A primary survey conducted in October - December of 2018 to a random sample of entrepreneurs operated in Greece. Principal component analysis (PCA) conducted to identify the main attitudes of entrepreneurs towards budget planning procedures. Cluster analysis performed to classify those entrepreneurs into groups according their behaviour towards business planning whilst discriminant analysis conducted to check cluster predictability. Non parametric tests performed to identify the attitudes of Generation Y businessmen towards business planning procedures as well as to explore if there is any significant association between any particular behaviour of entrepreneurs towards business planning and their demographic characteristics or the characteristics of their enterprise.

KEYWORDS

Business Planning, Generation Y, Budgeting planning.

JEL CLASSIFICATION CODES

M10, M21

1. INTRODUCTION

Entrepreneurs face the challenge of determining the right approach to achieve their goals and aspirations either by engaging in extensive business planning or by just storming the castle by rallying resources together, orchestrating an immediate offering, and hustling for a first customer(Brinckmann et. al. 2010).

Business planning in practice has grown in significance in the last few years, in particular as they are associated with securing and expanding competitive advantage (Johnson et al., 2008). The business planning presents a means for the coherent implementation of a strategy (Dahan et al., 2010). Additionally, Brinckmannet. al. (2010) found that both the output of business planning (written plans) and the process of business planning (planning meetings, market and scenario analysis, use of computers, portfolio analysis) augment firm performance. Based on a business model, the operative implementation can take place in the course of an organizational design or business process model. The business planning procedures can thus be understood as a link between future planning (strategy), and the operative implementation (process management) (Wirtz, B.W., et al.,2016). Gandy (2015) argued that (a) knowing the seasonality of a business, (b) being passionate and dedicated to a business and (c) hiring the appropriate employees may be critical to the success and profitability of small businesses sustaining beyond 5 years of being in business. Business success on the other hand according to Philip (2011) mainly refers to a firm's financial performance. However, there are other some other forms, including (a) survival, (b) return on investment, (c) profit, (d) happiness, (e) number of employed, (f) reputation, and (g) sales growth, that dealing with business success (Philip, 2011). The founder's growth motivation, the entrepreneurs' characteristics, willingness to team up and work with other entrepreneurs, previous experience with management or business ownership, and level of education have been identified as the key factors that influence small business growth according to Fadahunsi (2012). Moreover, Golovko & Valentini, (2011) argued that small businesses can focus their efforts towards a strategic growth strategy to

counter their disadvantages. Sinfield, Calder, McConnell, and Colson (2012) clarified growth strategies often occur through (a) new and improved product development, (b) acquisition strategies, (c) investments in capital equipment to increase efficiencies, and (d) marketing strategies aimed toward consumer insights that respond to the customers' needs. Financing is also an important issue for any small business including adequate financing, efficient operations and production, customer service, information management and administration, marketing and sales, and qualified personnel (Jasra, Khan, Hunjra, Rehman, &Azam, 2011;Yallapragada and Bhuiyan2011).

Entering the third decade of the new millennium, the millennial generation or Generation Y as they called is stepping into their most productive stage of life whilst the world's economy is evolving fast and presenting distinct entrepreneurial opportunities to millennials across the globe. This generation has been nurtured in the environment of new technologies, three dimensionality, video games, online communications and screen and mobile devices, all of which entail a faster pace of life according to Burstein (2014) . Generation Y, refers to those born around 1976-2000, and the main workplace traits of this generation are confidence. sociability, morality, street smart, diversity , collective action , heroic spirit , tenacity, technological savvy , lack of skills for dealing with difficult people, multitasking . They mainly work at office and at home , they desire flexible schedule, build several parallel careers, have a several jobs simultaneously and are motivated by maintaining their personal life (Chadler 2015).

This paper aims to explore the attitudes of entrepreneurs of generation Y towards budget planning procedures. In particular aims: (a) to identify the factors that affects the attitudes of entrepreneurs of generation Y towards budget planning procedures, (b) to classify them into strategic groups according to the budget planning orientation, (c) to profile each strategic group according to characteristics of the enterprises and the demographic characteristics of the entrepreneurs..

2. METHODOLOGY

Digitization and digitalization are two conceptual terms that are closely associated and often used interchangeably in a broad range of literatures. There is analytical value in explicitly making a clear distinction between these two terms (Brennen and Kreiss, 2014).

This study examines the rejection of the following research null hypotheses:

- **Ho1:** entrepreneurs of generation Y cannot be classified into strategic groups according to the factors that affect their attitudes towards budget planning procedures
- **Ho2:** The characteristics of the enterprises are not significantly related to particular budget planning orientation
- **Ho3:** The demographic characteristics of the entrepreneurs are not significantly related to particular budget planning orientation

A primary field survey took place to a random selected sample of entrepreneurs operated in Greece. In particular the sample is consisted of 360 entrepreneurs operated in Greece whilst the 90 of them belong to Generation Y.

Information were gathered through an electronic survey with the use of a structured questionnaire as people are familiar with this kind of research and their educational level is suitablefor the use of this kind of survey method (Oppenheim 2000). Cluster sampling method was used to form the sample. In particular, the general population was stratified into two levels: regions and prefectures. Based on the methodology presented by Oppenheim (2000) [15], in order to have representative sample for the geographical area of Greece, nine regions were randomly selected from a total of thirteen. In the second stage, one prefecture was randomly selected from each studied region. The Chamber of Commerce in each selected prefecture conducted in order to use their member lists as a sampling framework. A systematic random sample of 50 entrepreneurs from each sampling framework was chosen. The questionnaire was piloted in May of 2018 to 30 entrepreneurs in the prefectures of Kavala and Xanthi. The pilot survey indicated that no modification needed to the questionnaire and therefore the main survey was conducted in October 2018-December 2018 to a sample of 450 entrepreneurs operated in Greece whilst the productive sample consists of 360 persons and 90 of them belong to Generation Y.

Principal Component Analysis (PCA) was used to identify the variables that accounted for the maximum amount of variance within the data in terms of the smallest number of uncorrelated variables (components).

The anti-image correlation matrix, as well as the Bartlett's test of sphericity and the Measure of Sampling Adequacy (MSA) were used, in order to check the appropriateness of the data for subsequent factor analysis. The variables with a high proportion of large absolute values of anti -image correlations and MSA less than 0.5 were removed before analysis. An orthogonal rotation (varimax method) was conducted and the standard criteria of eigenvalue = 1, scree test and percentage of variance were used in order to determine the factors in the first rotation (Hair et al. 1998). Different trial rotations followed, where factor interpretability was used to compare the reduced through PCA 10 variables related to the attitudes of entrepreneurs of generation Y towards budget planning procedures to a smaller set of key factors.

These PCA scores were then subjected to cluster analysis to group entrepreneurs with similar and non-hierarchical methods were used (Hair et al. 1998) in order to develop a typology of the entrepreneurs of Generation Y with similar attitudes towards budget planning procedures. Quadratic Discriminant Analysis (QDA) was performed to assess how accurately the key identified factors could predict and discriminate cluster membership through factor analysis. Furthermore, the chi-square analysis was performed to develop the profile each strategic group according to characteristics of the enterprises and the demographic characteristics of the entrepreneurs.

3. RESULTS

3.1 Factors that affect the attitudes of entrepreneurs of generation Y towards budget planning procedures

The variables and the two main key factors affecting the attitudes of entrepreneurs of generation Y towards budget planning procedures along with their eigenvalues and the percentage of variance results from PCA are portrayed in Tables 1 and 2.

The approach that the research addresses is depicted as follows:

Table 1. Variables affecting the attitudes of entrepreneurs of generation Y towards budget planning procedures.

Component	Eigenvalues	% of Variance	Cumulative Variance
1	4.376	43.763	43.763
2	1.216	20.163	63,926
3	0.839	7.389	71.315
4	0.771	6.712	78.027
5	0.689	5.885	83.912
6	0.562	4.616	88.528
7	0.472	3.723	92.251
8	0.446	3.456	95.707
9	0.317	2.173	97.880
10	0.312	2.119	100.00

Table 2. The main factors affecting the attitudes of entrepreneurs of generation Y towards budget planning procedures

Main Factors Affecting the attitudes of entrepreneurs of generation Y towards budget planning procedures	Factor Loadings
Budget Planning	
Pay attention to the precise calculation of the revenues and expenses of my enterprise	0.772
Focus to the low cost of inputs	0.766
Plan my business decisions by always checking the market prices	0.698

Sell niche market products	0.671
Pay attention to the operational planning of my enterprise	0.586
Financial Analysis	
Conduct cash flow analysis on an annual base	0.812
Conduct performance analysis of my enterprise using financial ratios	0.774
Calculate the NPV and IR of my investments	0.768
Plan the marketing expenses of my enterprise annually	0.549
Conduct liquidity analysis of my enterprise using financial ratios	0.522

KMO MSA = 0.792 Bartlett test of Sphericity = 2,274.069 P <0.001

Hence, PCA identified two main factors that affect the attitudes of entrepreneurs of generation Y towards budget planning procedures which are: (a) budget planning, (b) financial analysis.In the next stage, hierarchical and non-hierarchical clustering methods were used to develop a typology of the budget planning orientation of entrepreneurs of generation Y(Hair et al. 1998). Cluster analysis was conducted on the 90 observations, as there were no outliers. It identified three groups of entrepreneurs that were named according to their attitudes towards budget planning procedures (Table 3). These are: (a) opportunists, (b) budget planners and (c) financial analysts.

In particular, opportunists comprise 35.5% of the sample. They do not adopt any budget planning procedures wittingly and run their enterprises empirically. On the other hand, budget planners consist of 14.5% of the sample. -They mainly pay attention to the precise calculation of the revenues and expenses of their firms, focus to the low cost of inputs and plan their business decisions by always checking the market prices. Moreover, they sell niche market products and are very interested in conducting the operational planning of their firm. Besides, the financial analysts comprise 50% of the sample. These businessmen mainly conduct cash flow analysis on an annual base, performance and liquidity analyses of their enterprise using financial ratios. They calculate the NPV and IR of their investments as well as they plan the marketing expenses of their business annually

Table 3. Classification of entrepreneurs of Generation Y regarding their budget planning orientation

Key Strategic Dimensions	Opportunists	Budget Planners	Financial Analysts	P
Budget Planning	-1.00154	0.68405	0.51459	0.001
Financial Analysis	-0.18539	-1.57899	0.58799	0.001
Number of enterprises (n=90)	32	13	45	

Moreover discriminant analysis was conducted to evaluate the prediction of group membership by the predictors derived from the factor analysis. The summary of the cross validation classification derived by the quadratic discriminant analysis is shown in Table 4.

Table 4. Summary of Classification with Cross – validation

Actual Classification	**Predicted Classification**		
	Opportunists	**Budget Planners**	**Financial Analysts**
Opportunists	31	0	1
Budget Planners	0	13	0
Financial Analysts	1	0	44
Total N	**32**	**13**	**45**
N correct	**31**	**13**	**44**
Proportion	**96.9%**	**100%**	**97.8%**
N =90	**N correct=88**	**Proportion Correct=97.8%**	

Thus, the three identified dimensions could accurately predict and discriminate entrepreneurs' group membership regarding their budget planning orientation.

Therefore, the hypothesis :"**Ho1**: Entrepreneurs of generation Y cannot be classified into strategic groups according to the factors that affect their attitudes towards budget planning procedures" can be rejected.

3.2 Profiling each group of entrepreneurs of generation Y according to the characteristics of their enterprises

A chi-square analysis was also performed for each group of entrepreneurs of Generation Y in order to develop their profile regarding the characteristics of their enterprises. As Table 5 indicates, the vast majority of the opportunists and financial analysts have enterprises that occupy less than 5 people personnel, have less than half million euro annual turnover, low debt and their profitability is equal to the average of their competitors. On the other hand, no significant association was found between the business planners and any of the examined characteristics and their enterprises.

Table 5. Profile each group of entrepreneurs of generation Y according to the characteristics of their enterprises

Characteristics of enterprises	**Opportunists**	**Budget Planners**	**Financial Analysts**
Number of employees	**x2=10.938, P<0.05**	**n.s**	**x2=20.133, P<0.001**
<5 person	59.4%	61.5%	64.4%
6-10 persons	12.5%	7.7%	22.2%
>11 persons	28.1%	30.8%	13.4%
Annual Turnover	**x2=16.750, P<0.001**	**n.s**	**x2=26.800, P<0.001**
<500,000 €	53.1%	46.2%	68.9%
500,000 € - 1,000,000€	25%	30.8%	22.2%
>1,000.000 €	21.1%	23%	9.9%
Debt	**x2=26.500, P<0.001**	**n.s**	**x2=26.533, P<0.001**
0-9%	34.4%	38.5%	28.9%
10-19%	3.1%	7.7%	4.5%
20-30%	3.1%	57.1%	50%
>30%			
Profitability in comparison with rivals	**x2=18.250, P<0.001**	**n.s**	**x2=18.533, P<0.001**
Less than average	37.5%	30.8%	26.7%
Average	46.9%	46.2%	62.2%
More than average	15.6%	23%	11.1%

Hence, "**Ho2:** The characteristics of the enterprises are not significantly related to particular budget planning orientation" procedures can be rejected

3.3. Profiling each group of entrepreneurs of generation Y according to to their demographic characteristics

A chi-square analysis was also performed for each group of entrepreneurs of Generation Y in order to develop their profile regarding their demographic characteristics. As Table 6 indicates, the vast majority of the opportunists are male and finished the high school. On the other hand most of the financial analysts hold a university degree. No significant association identified between budget planners and financial analysts and their gender. Moreover, no significant association found between budget planners and their education

Table 6. Profile of each consumer group regarding consumers' demographic characteristics

Characteristics of enterprises	**Opportunists**	**Budget Planners**	**Financial Analysts**
Gender	**x2=4.500, P<0.05**	**n.s**	**n.s**
Male	68.8%	61.5%	55.6%
Female	31.2%	38.5%	44.4%
Education	**x2=16.750, P<0.001**	**n.s**	**x2=36.444, P<0.001**
Primary School	15.6%	0%	4.5%

Secondary School	18.7%	30.8%	4.5%
High School	34.8%	23%	33.3%
University	21.8%	46.2%	48.7%
Postgraduate studies	9.3%	0%	9%

Hence, the hypothesis"**Ho3**: The demographic characteristics of the entrepreneurs are not significantly related to particular budget planning orientation" can be rejected

4. DISCUSSION

This study identified that entrepreneurs of generation Y adopt in their vast majority business planning procedures and have specific business planning orientation. According to the findings of the current study the entrepreneurs of Generation Y in Greece can be classified regarding their business planning orientation into three cluster: (a) Opportunists ,(b) Budget planners and (c) Financial Analysts.

Budget planners and Financial Analysts are the two groups which have a specific business orientation comprising almost the 65.5% of sample and hold a university degree. In particular budget planners mainly pay attention to the precise calculation of the revenues and expenses of their firms, focus to the low cost of input sand plan their business decisions by always checking the market prices. Moreover, they sell niche market products and are very interested in conducting the operational planning of their firm

The financial analysts mainly conduct cash flow analysis on an annual base, performance and liquidity analyses of their enterprise using financial ratios. They calculate the NPV and IR of their investments as well as they plan the marketing expenses of their business annually

On the other hand opportunists do not adopt any budget planning procedures wittingly and run their enterprises empirically

Hence, this study support the findings of Wirtz, B.W., et al., (2016); Philip (2011),Brinckmannet. al. (2010) that business planning procedures can be understood as a link between future planning (strategy), and the operative implementation (process management) and refers to a firm's financial performance. Furthermore, this study indicated that the number of personnel, annual turnover, low debt, level profitability in comparison to their competitors, entrepreneurs gender and educational level are some characteristics that are related to their particular budget planning orientation; supporting the arguments of Fadahunsi (2012) according to whom the founder's growth motivation, the entrepreneurs' characteristics, willingness to team up and work with other entrepreneurs, previous experience with management or business ownership, and level of education have been identified as the key factors that influence small business growth. Conclusively, entrepreneurs of generation Y have a specific business planning orientation by being either business planners of financial analysts. They are well educated, have small firms with less than 5 employees, low annual turnover, low debt and average profitability in comparison with their rivals.

The relative stakeholders should undertake the appropriate actions and initiative in order to train businessmen of Generation to financial analysis and business planning techniques as these people are according to the literature review millennials are motivated by diversity , technological savvy and multitasking, necessary skills for business planning.

On the other hand future research should examine the possible association between the business planning orientation of the millennial entrepreneurs and the marketing strategies they adopt.

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OPERATING ROOM MANAGEMENT AFTER THE ECONOMIC CRISIS IN ITALY: A CASE-STUDY

Andrea Ubiali
School of Hygiene and Preventive Medicine, University of Bologna, Italy

Andrea Rochira
School of Hygiene and Preventive Medicine, University of Bologna, Italy

Matteo Buccioli
IRCCS Istituto Ortopedico Rizzoli, Bologna, Italy

Anselmo Campagna
Health Policies Department, Emilia-Romagna Region, Bologna, Italy

ABSTRACT
Introduction: the world economic crisis of 2008 triggered a wave of public policies oriented towards fiscal austerity. Italy was severely hit, with consequences reverberating upon the National Health Service. After the crisis, many italian hospitals began to implement re-organizational strategies to adapt to the new scenario, mainly targeted at reducing costs and improving efficiency. Operating Rooms (OR) represented one of the most important and most critical targets for intervention, given the high costs related to surgery. Different approaches were tried among different italian regions. The Emilia-Romagna region focused its activities on regulating the management of surgery waiting lists and the compliance with surgery waiting times. Rizzoli Orthopedic Institute (ROI), a monospecialistic research hospital located in Bologna, tried to restructure its surgical activities to comply with regional regulation, adopting Operating Room Management (ORM) as a main strategy. Aim of this paper is to describe the actions taken at ROI and discuss the achieved outcomes.
Methods: The re-organizational process at ROI started in March 2017. A multidisciplinary commission (the Interdepartmental Board), composed by clinical and non-clinical staff, was created to define the *modus operandi* of all surgical activities within the Institute. The Board reviewed the Master Surgical Schedule, in order to separate elective surgery from emergency surgery. In november 2017 the Surgical Planning Office (SPO) was set up to coordinate and monitor the whole surgical path, from insertion of the patient onto the waiting list to discharge. The SPO interfaced with all stakeholders relevant to the surgical process through daily meetings, ensured the collection of key performance Indicators and produced standardized reports regarding productivity, efficiency and state of the art of the surgery waiting list. Performance indicators, mainly pertaining to hip surgery, were collected throughout the process. Descriptive statistics were elaborated to compare scores between 2017 and 2018.
Results: We observed an increase in productivity, as the number of overall surgical procedures went from 10.745 in 2017 to 10.915 in 2018 (+1,6%). The number of hip replacement interventions went from 1.386 to 1.474 (+6,3%) and the percentage of hip replacement interventions performed within 180 days also increased in 2018 (60.8% vs 69.3%). We achieved these outcomes without the need for a concomitant increase in the resources dedicated to surgical activity.
Conclusions: Effective ORM is a key strategy to improve efficiency and productivity without increasing resources consumption. ORM also allowed to improve compliance with surgery waiting times, with a positive impact on equity and accessibility of the service. Knowledge needed to introduce positive organizational changes is widely available in scientific literature and can be easily shared and disseminated to contexts with low economic resources. Soft skill and collaborative practices also proved to be essential to the implementation of the changes, with a multiprofessional involvement.

KEYWORDS
Operating room management
economic crisis
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JEL CLASSIFICATION CODES
I18

1. Introduction

The 2008 global financial crisis severely impacted on European countries, with serious consequences on national and Community policies. A wave of public policies strongly oriented towards fiscal austerity was unleashed, with the involvement of several public sectors, among which the healthcare sector. Severe cuts to healthcare funding were experienced by most of the European countries, while Italy resulted to be one of those that were most heavily struck (De Belvis et al, 2012). Since 2008 the public spending for healthcare in Italy slightly decreased, reaching the 6,6% of GDP in 2017 (OECD, 2019). In the same period, however, several factors contributed in increasing the demand of healthcare services, putting the system under pressure. These factors included the ageing of the population, with an increase in multimorbidity and chronic diseases (McKeown, 2009), the introduction of expensive medical technologies (Cavallo, 2013) and greater community expectations (Inglehart & Welzel, 2005). Increased demand with stable or slightly decreased funding produced the net effect of reducing the available resources for the National Health Service (NHS). Within this scenario, optimization has become a priority for healthcare services, in order to maintain high standards for quality and safety while increasing efficiency. Much attention was focused on high-consuming resources, such as Operating Rooms (ORs). Surgery is in fact recognized as one of the most expensive activities in a hospital: up to 40% of the total expenses can be attributed to ORs (Health Care Financial Management Association, 2005). The management of such an expensive resource can therefore seriously impact on the NHS. In order to improve the economic sustainability of the NHS, in recent years the italian government encouraged initiatives aimed at improving the management of surgical activities across the national territory. This process was quite heterogeneous, partly because of the marked regional autonomy in relation to healthcare policies that characterizes Italy (France et al, 2005). Italian regions behaved differently in relation to Operating Room Management (ORM). The Emilia-Romagna region in 2017 issued a new regulation to control and standardize the surgical path. One of the main goals of the regulation was to improve compliance with waiting times for surgery and to ensure an efficient and accountable management of surgery waiting lists (Regione Emilia-Romagna, 2017). This was thought to grant a greater efficiency in the surgical process and to ensure equity of access to surgical services.
Rizzoli Orthopedic Institute (ROI), a mono-specialistic scientific research hospital located in Bologna, in the Emilia-Romagna region, responded to the new regional directive giving start to a two-years transformative process that began in 2017. ROI is recognized as the regional hub for orthopedic surgery since 2009 (Regione Emilia-Romagna, 2009) and represents a center of excellence which attracts patients from all over the national territory, with almost half of the patients coming from outside Emilia-Romagna. ROI's activity is mainly related to elective surgery, with around 11.000 surgical procedures being performed every year. Among these, hip replacement procedures represent one of the most frequent surgical interventions performed at ROI (almost 13% of overall surgical procedures). The regional directive required at least 90% of hip replacement procedures to be performed within a period of 180 days. Longer waiting times are in fact thought to act as barrier to accessibility (Cylus and Papanicolas, 2015) which can undermine fairness and universality of healthcare services. The whole transformative process at ROI was therefore carried on with the goal of fulfill all regional requirements, keeping a special focus on hip surgery performances.
Aim of this paper is to describe the actions taken at ROI in order to restructure the management of its surgical process and to comply with regional regulation, discussing the main results that were obtained and their implications for its transferability in other contexts characterized by rigid economic constraints.

2. Methods

Setting

ROI owns ten ORs dedicated to major surgery and one for day surgery. Each OR also includes an induction room for anesthetising patients, while only one recovery room is available. Institutional elective surgery is performed from Monday to Friday, from 7.00 am to 1.20 pm (morning session), and from 1.20 pm to 7.40 pm (afternoon session). Each surgical session is dedicated to one of eleven surgical units. Each surgical unit is characterized by a specific subspeciality related to orthopedic surgery. Eight out of eleven surgical units usually perform hip surgery procedures. Besides elective surgery, urgent surgical cases are also managed. ROI hosts an Emergency Department (ED) through which urgent cases are admitted and hospitalized. Urgent surgery on average accounts for 14% of overall surgical procedures.

Description of the intervention

The intervention to restructure the management of surgical activity within ROI started at the beginning of 2017, when a multidisciplinary commission (the Interdepartmental Board) was created. Aim of the Interdepartmental Board was to identify the goals of the intervention, and to plan strategies to achieve them. The board was composed by clinical and non-clinical staff (surgeons, anesthesiologists, nurses, engineers, clinical managers) and had decision-making power. Since March 2017 the Board met on a weekly basis to discuss the main areas

for intervention. The first action agreed by the Board was to review the master surgical scheduling (MSS) system. Before the intervention, the MSS did not reckon on a clear separation between elective surgery and emergency surgery. The admission of patients from the ED, and their scheduling for surgery, were managed on a day by day basis through rotating shifts, involving four of the eleven surgical units. Each day, one of the surgical units took care of ED's admissions and scheduling of urgent procedures along with the scheduling of ordinary patients. This kind of management was judged counterproductive for the scheduling of elective surgery, since the demand for emergency surgery could cause postponements or delays and impeded long-term planning. During the month of August 2017, the Interdepartmental Board reviewed the MSS and separated elective surgery from emergency surgery, creating a specific path for each of them. In September 2017 a new MSS system was implemented. ED's admissions started to be managed on a weekly basis. Nine surgical sessions were dedicated every week to the scheduling of urgent procedures. Each week was attributed to a different surgical unit. Elective surgery was scheduled as usual independently from emergencies. Moreover, eight surgical sessions were reserved every month to be allocated, at the discretion of the Board, for the abatement of the surgical waiting list. This further arrangement was dictated by the need to comply with regional requirements regarding the standard waiting times for surgery. The whole MSS review process was done without increasing the resources dedicated to surgical activities or the amount of surgical sessions allocated.
In January 2019 a second reorganization of the MSS was done. Surgical sessions were preferably scheduled in series rather than in parallel (OR verticalization) in order to increase efficiency. This also helped in creating a back-up room always available for clinical or organizational emergencies. Moreover allocation of ORs was made on a intensity of care basis, taking into account, factors such as distance from intensive care units and from the recovery room.
In November 2017 the Interdepartmental Board set up a new governance body: the Surgical Planning Office (SPO). The SPO was considered part of the medical directorate and was meant to coordinate and monitor the whole surgical productive process, from the insertion of the patient onto the waiting list to discharge, in a patient-centered perspective. Head of the SPO was an engineer with ORM skills, who interfaced with all stakeholders relevant to the surgical production. A daily meeting was held in the SPO and involved surgeons, anesthesiologists and nurses responsible for the Operating Block, the bed manager and representatives from the pharmacy and the sterilization center. Any critical issue regarding daily surgical activities was evaluated and discussed during the meeting. The SPO also ensured the collection of key performance indicators to monitor the surgical activity, in accordance with up-to-date scientific literature (Agency for clinical innovation, 2014). Data were collected through an electronic patient record system (DIGISTAT by UMS-Unterberger Medical Software, Florence) and then centrally elaborated. Standardized reports, with different reporting rates (daily, weekly and monthly), were produced and provided to the surgical units as a feedback to their activities.
Another function attributed to the SPO was the management and maintenance of the surgical waiting list. Data cleaning activities were introduced in order to remove errors and duplicates from the waiting list. The waiting list itself was re-organized and split in two functionally distinct folders: one folder for patients ready for surgery (the surgical waiting list) and one folder for patients not yet ready for surgery (the recruitment list). The surgical waiting list was the basis for the scheduling of surgical patients. The recruitment list allowed to manage any treatment or investigation needed prior to surgery, without interfering with the surgical waiting list and the surgical scheduling. Periodical and standardized reports about the state of the art of the lists were processed every month and feeded to the clinical departments. Monthly meetings were held to make a participatory discussion of the contents of the reports, together with surgeons and administrative staff.

Indicators
In order to monitor the effects of the aforementioned organizational changes, key performance indicators were collected throughout the years 2017 and 2018. Performance indicators included: total number of surgical procedures performed, number of hip replacement interventions performed, number of hip replacement interventions performed within due date (i.e. 180 days). Scores were compared between the years 2017 and 2018.

3. Results
The overall number of surgical procedures performed at ROI went from 10.745 in 2017 to 10.915 in 2018. The increase was mainly related to an enhancement in elective surgery, both institutional and private (n=9.265, 86,2% in 2017 vs n=9.427, 86,4% in 2018), with a stable demand for urgent surgery (n=1480, 13,8% in 2017 vs n=1.488, 13,6% in 2018).

The number of hip replacement procedures performed as institutional elective surgery went from 1.386 in 2017 to 1.474 in 2018 (**Table 1**).

	N. of procedures		N. of procedures within 180 days		N. of procedures within 180 days (%)	
Surgical Units	**2017**	**2018**	**2017**	**2018**	**2017**	**2018**
Orthopedics 1	655	656	322	435	49,0	66,3
Orthopedics 2	182	293	76	168	42,0	57,3
Orthopedics 3	135	197	133	184	99,0	93,4
Orthopedics 4	95	104	27	34	28,0	32,7
Orthopedics 5	75	76	58	65	77,0	85,5
Orthopedics 6	147	72	136	67	93,0	93,1
Orthopedics 7	67	56	63	53	94,0	94,6
Orthopedics 8	30	20	28	16	93,0	80,0
Total	**1386**	**1474**	**843**	**1022**	**60,8**	**69,3**

Table 1. *Number of hip surgery procedures, by year and surgical unit.*

The number of hip replacement procedures performed within due date (i.e. 180 days) also increased, from 843 in 2017 to 1.022 in 2018. The percentage of hip replacement procedures performed within 180 days went from 60,8% in 2017 to 69,3% in 2018. Almost all surgical units increased their percentage of hip replacements performed within due date in 2018, with only two of them showing a decreasing trend. The surgical unit identified as "Orthopedics 1" was the one performing the largest number of hip replacement procedures. Although the number of procedures remained stable (655 in 2017 vs 656 in 2018), the percentage of procedures performed within 180 days increased by 17% (49,0% in 2017 vs 66,3% in 2018).

4. Discussion

Health systems operate nowadays in a rapidly changing environment, because of demographic, technological and socio-political transformations occurring at an ever growing pace (Labontè et al, 2007). Surgery represents one of the most expensive and most critical activities which can impact on health systems in terms of sustainability, accessibility and equity. Some of the italian regions, among which Emilia-Romagna, tried to respond to environmental changes implementing strategies for an effective ORM.

Our study describes a case-study developed at the local level in a mono-specialistic scientific research hospital located in Bologna. The main constraints in our setting were represented by economic constraints (no additional resources were available to develop the project) and by regional regulation which defined the legal framework for action. Our results show positive achievements obtained through organizational changes.

Overall productivity increased, as the total number of surgical procedures went up by 1,6% in 2018. It is important to highlight that this result was obtained with the same amount of resources dedicated to surgery (the same number of surgical session was allocated in 2017 and in 2018), and can therefore be considered an improvement in terms of efficiency of the surgical process. The increase in productivity can also be observed in hip surgery procedures, which also increased in 2018.

Another positive result was the improved compliance with waiting times. Although the regional goal (≥90% of hip replacement procedures performed within 180 days) was not achieved, we observed a significant increase in compliance with waiting times for almost all the surgical units. Waiting times are considered a main issue in publicly funded health systems as long waiting times can have detrimental effects on patients' satisfaction, patients' health status and effectiveness of treatment (Lynch et al, 2008; Koopmanschap et al, 2005; Barone et al, 2009). Moreover, inadequate waiting times can compromise equity of access, which is considered one of the main values at the base of the NHS.

We ascribe the positive achievements to relatively simple organizational changes, such as the strengthening of multiprofessional collaboration, the introduction of high-quality data collection and participatory data-analysis, and the inception of ORM skills within the medical directorate.

ORM skills played a major role in the reorganization of the surgical process, through a re-engineering of the surgical path. The application of these skills mainly relied on already available knowledge and did not need specific or expensive technologies. In our experience it was enough to embed available knowledge from

international scientific literature (Agency for clinical innovation, 2014; Macario, 2014) in a real world context, whereas it was not previously applied. Changes were introduced gradually, as suggested by several authors (Carvalho et al, 2014), in order to avoid resistance from professionals. The involvement of several and different stakeholders was a key element in our study. Since relevant stakeholders belonged to different professional groups, whose perspective and goals did not necessarily overlap (Young et al, 2008), their involvement required particular attention and expertise. It must also be acknowledged that hospital setting is typically characterized by an high degree of individualism, competition and aggressiveness among professionals, with a low level of integration among different specializations or different professions. This is known to have detrimental effects on professionals themselves and on quality and safety of care (Bradley et al, 2015; Riskin et al, 2015; Welp et al, 2016). Many of the changes implemented at ROI required a close multiprofessional collaboration among different actors, with periodical meetings, information sharing, and participatory management. Soft skills (including conflict resolution, diversity awareness, flexibility, networking, emotional intelligence) can be learned and may foster collaborative practices and facilitate teamwork (Gibert et al, 2017; Seemann et al, 2016). In other words organizational culture represents a key element that must be acknowledged and taken into account when dealing with organizational changes (Rocha et al, 2014). ORM skills and soft skills represented the main tools for the implementation of our project and also constitute the main basis for its transferability in other contexts. In particular, we claim that our experience could be easily exported to other context characterized by serious economic constraints, since the low need for additional financial resources.

5. Limitations

This study analyses data collected during a two years time frame, while the organizational process was ongoing. Although the results show a positive trend, an analysis on a longer time period would be useful to allow a before/after comparison.

6. Conclusion

Hospitals performing surgical activity in Italy are facing complex challenges, mainly related to financial and economic constraints, and need to strive in order to provide efficient, effective and safe care. Effective ORM represents a key strategy to improve optimize the surgical process without increasing resources consumption. Significant organizational changes can lead to improved outcomes in terms of productivity, efficiency and equity. Furthermore, soft skills and tools aimed at modifying the organizational culture, open to changes and collaborative practices can facilitate the implementation of the desidered changes and the involvement of professionals. These changes mainly rely on already available scientific knowledge and low-cost solutions, and could therefore potentially be transferred to other similar contexts with limited economic resources.

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THE INTERACTION OF LEAN MANUFACTURING - INDUSTRY 4.0 AND A SECTORAL ANALYSIS

Ceyda UNAL[1], Huseyin TUNA[2], Cihan CILGIN[3] and Yılmaz GOKSEN[4]

[1] *Dokuz Eylul University, Department of Management Information Systems Campus of Dokuzcesmeler, Buca- Izmır,Turkey, ceyda.unal@deu.edu.tr*

[2]*TEKA Group, Aegean Free Zone, Izmır, Turkey, huseyin.tuna@simeco.com.tr*

[3]*Abant Izzet Baysal University, Department of Management Information Systems*

Gerede School of Applied Sciences, Gerede- Bolu, Turkey, cihancilgin@ibu.edu.tr

[4] *Dokuz Eylul University, Department of Management Information Systems Campus of Dokuzcesmeler, Buca- Izmır,Turkey, yilmaz.goksen@deu.edu.tr*

ABSTRACT

Lean Manufacturing is a collection of concepts, systems and techniques aimed at perfecting the value offered by purifying and simplifying the process of creating products and services, and thus increasing the profitability of the enterprises. Waste in lean thinking (also called Muda, Muri or Mura), beyond its known meaning, is everything that the customer does not accept to pay extra which does not constitute a value for the customer. In the context of lean thinking, seven types of wastes are defined including transport, inventory, motion, waiting, overprocessing, overproduction and defects. In order to eliminate waste, several Lean Manufacturing techniques have been developed and analyzed. The basic philosophy of lean manufacturing offers a framework where the layout of the factory environment, which is constructed by lean thinking, is planned to minimize the unnecessary movement of humans and materials.

In recent years, with the emergence of the concept of Industry 4.0, new applications of Lean Manufacturing methodology have been made possible. In particular, the use of Industry 4.0 technologies such as Internet of Things (IoT), Cloud Computing and Big Data to increase the efficiency and effectiveness of lean manufacturing has led to the emergence of the concept of Lean 4.0. In the research, the relationship between lean manufacturing techniques and Industry 4.0 was analyzed with respect to Jidoka and IoT technology. Besides that, suggestions and evaluations were presented. In addition, it has been suggested that Industry 4.0 technologies will facilitate the implementation of the lean manufacturing philosophy. In order to realize this, the positive aspects of Lean Manufacturing and Industry 4.0 interaction were tried to be shown in a consecutive operation in an international company. With the application part of the study the complementary role of lean manufacturing and the interaction of the accelerator role of Industry 4.0 were highlighted. From this point of view, it is thought that Industry 4.0 and lean manufacturing will interactively provide competitive advantage for enterprises.

KEYWORDS

Lean Manufacturing, Industry 4.0, Jidoka

JEL CLASSIFICATION CODES

M11, M15, O14.

1. INTRODUCTION

The main philosophy of Lean Manufacturing is to reduce costs by eliminating wastes from production and service processes in organizations, to increase customer satisfaction and to ensure continuous improvement. Lean Manufacturing does not realize only continuous improvement, but aims for also perfection of value offered to customers by sustaining continuous improvement. In recent times, the use of Lean tools and techniques in Industry 4.0 transformation has gained increasing attention by both academics and practitioners. This novel

approach to integrate lean techniques with new generation Industry 4.0 technologies is considered as a new viewpoint to eliminate waste in production.

The concept of Industry 4.0- also called Fourth Industrial Revolution- was first used in the Hannover Fair in Germany in 2011. Since then, it has been underlined that Industry 4.0 has showed the emergence of a new paradigm in production processes. The aim of Industry 4.0 is to connect and integrate traditional industries, especially production areas, to realize flexibility, adaptability and productivity, and to enhance effective communication between producers and consumers and their internal dynamics. In addition, with the concept of Industry 4.0, several new technologies has gained new application areas in different organizations especially in manufacturing industries. The use of new technologies including autonomous robots, simulation, system integration, internet of things, cybersecurity, cloud computing, additive manufacturing, augmented reality and big data will make the application of lean techniques easier in terms of reduction of defects, increase in the productivity of machines, decrease in costs and so on. Therefore, it is inevitable for Industry 4.0 to support lean production by further simplifying the production process.

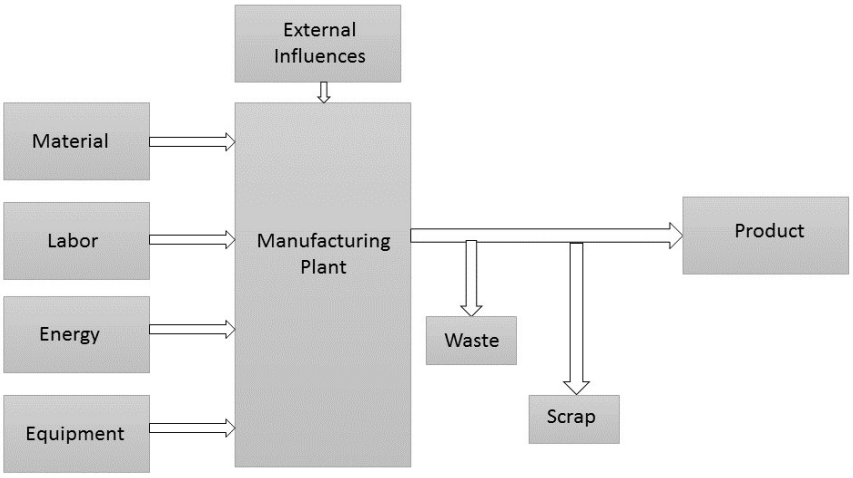
Finding out how Lean Manufacturing and Industry 4.0 support each other in the context of Lean 4.0 plays a significant role in elimination of waste. Although attention has been given to this area, researches are limited.

In this research, firstly the concepts of manufacturing systems, lean thinking and lean manufacturing was reviewed. Afterwards, the links between Lean Manufacturing and Industry 4.0 was tried to explain with the help of the sectoral application. The application focused on one of the Lean Manufacturing techniques called Jidoka in Industry 4.0 perspective. It is expected to help industries, applied in Lean principles, in the process of creating a new and novel roadmap in Industry 4.0 transformation.

2. LITERATURE REVIEW

Manufacturing is defined very broadly as the process by which material, labor, energy, and equipment are brought together to produce a product having a greater value than the sum of the materials put in (Kumar, 2002). In Figure 1, basic principles of a manufacturing system has been summarized.

Figure 1. Manufacturing System



Source. Sharma & Bhargava, 2014.

According to Kumar (2002), manufacturing systems must fulfill basic requirements several key requirements listed as follows:

- Full integration of hardware and software used within an enterprise,
- Open system design to accommodate new subsystems (software or hardware) or separate existing subsystems,
- Efficient and effective communication environment and cooperation among departments within an enterprise and among other enterprises,
- Personification of human factors into manufacturing systems,

- Quick response to rapidly changing orders and sudden disturbances from both internal and external manufacturing environments,
- At the system & subsystem both levels full tolerance, as to easy detection and recovering from system failures and minimize their impacts on the workflow environment.

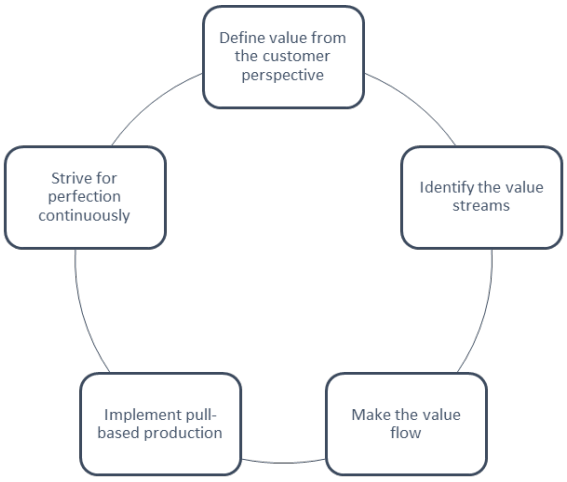
Recently, with the advance use of technology, modern manufacturing systems have emerged and a new concepts of manufacturing has been started to emphasize. These systems include Lean Manufacturing, Just in Time (JIT), Computer-aided Design, Computer-Integrated Manufacturing, Flexible Manufacturing Systems, Cellular Manufacturing Systems, Group Technology and Industrial Robot Systems. However, lean manufacturing approach is still one of the most relevant approaches in the sector for approximately past three decades. According to Herzog and Tonchia (2014), with present market conditions, especially companies competing through production cost, lean approach is central and crucial.

The concept of lean was first emphasized by MIT professors to analyze Toyota's new production system which abolished mass production (Womack et al., 1990). Lean philosophy is a holistic approach based on eliminating waste in production systems and continuously improving system efficiency. Before putting emphasis on lean manufacturing, it is significant to understand the lean thinking. In the next section, lean thinking was mentioned in detail.

2.1 Lean Thinking

The main purpose of Lean Thinking is to reach the final customer rapidly, starting from the first raw material, by continuous flow through the value creation process. In order to achieve this, it is necessary to focus on the whole value chain in a framework of integrity, to eliminate waste and to direct all activities to create the perfect value for the customer. Five key principles of lean thinking were introduced. In Figure 2, it can be seen in detail.

Figure 2. Key principles of lean thinking model



Source. Thangarajoo & Smith, 2015.

- The critical starting point for lean thinking is the concept of value. The value can only be defined by the end customer, but only when it is expressed in terms of a particular product (a good or a service and usually both) that meet customer needs at a certain price at a given time.
- The value stream is a set of concrete actions required to obtain a particular product (a commodity or a service or a combination of the two) and is achieved through three critical management functions in each business. These are known as; problem solving task, starting from concept through detailed design and engineering to the process of the product; the task of information management in the process starting from order taking through to detailed programming and the physical transformation task in the process starting from the raw material until the product is completed and received by the customer. (Womack & Jones, 2012).
- It is considered that providing rapid flow of unwanted products will be waste. Instead of pushing the products that the customer does not want, allowing the customer to pull the product when s/he wants, will eliminate many sources of waste. It is also stated that when continuous flow is applied,

product development, order taking and physical production will be completed in a short time (www.lean.org.tr).

- In a pull production (Kanban) system, the next process is to request the parts that they need from the previous operation at the exact time and in the amount they require. Pulling is the inability to produce products or services in any way without customer demand (Seker, 2016).
- In the lean system, everyone is able to see, to make it easier to find better ways to create value because all of the individuals have comprehensive and holistic knowledge about the processes. The system can provide immediate feedback to those who perform improvement. According to Tekin and Zerenler (2013), It is impossible to achieve perfection. However, efforts to be made in this way are necessary to achieve better. Perfection should be imagined.

The application of lean thinking philosophy in manufacturing revealed the Lean Manufacturing. In the next section, Lean Manufacturing principles was summarized.

2.2 Lean Manufacturing

Lean manufacturing or lean production was first put forward at Toyota as "Just in Time Manufacturing (JIT)" or "Toyota Production System (TPS)". However, the concept of "lean manufacturing" or "lean production" was first used Womack et al. (1990) in their book "The Machine that Changed the World". Lean manufacturing describes the profound revolution that was initiated by Toyota against a mass production system (Taj, 2008). The Machine that Changed the World (Womack et al., 1990) compared and contrasted the Mass Production System seen in the US and Europe, with the Lean Production System, seen in Japan, within the automotive industry. In Table 1, it can be seen the comprehensive summary of the differences between the two production systems.

Table 2. Comparison of Mass Production and Lean Production

	Mass Production	**Lean Production**
Basis	Henry Ford	Toyota
People-design	Narrowly skilled professionals	Teams of multi-skilled workers at all levels in the organization
People-production	Unskilled or semi-skilled workers	Teams of multi-skilled workers at all levels in the organization
Equipment	Expensive, single-purpose machines	Manual and automated systems which can produce large volumes with large product variety
Production methods	Make high volumes of standardized products	Make products which the customer has ordered
Organizational Philosophy	Hierarchical- management take responsibility	Value streams using appropriate levels of empowerment- pushing responsibility further down the organization
Philosophy	Aim for 'good enough'	Aim for 'perfection'

Source. Womack et al., 1990.

In addition to all differences mentioned in Table 1, the main purpose of lean applications is to try to reduce and eliminate the wastes frequently experienced in the organizations. In other words, lean manufacturing can be defined as "manufacturing without waste".

Waste means is everything that the customer does not accept to pay extra which does not constitute a value for the customer. Waste (also called "Muda" in Japanese), includes two types. Muda Type 1 does not create

value, but is indispensable in the context of existing technologies and production assets. One of the examples of Muda Type 1 can be inspecting the welded parts after welding in production to ensure that it is reliable. Muda Type 2 does not produce any value and can be destroyed immediately. An example is a process that has discrete steps in the process villages. Such a process can be rapidly reconstituted in a cell so that no waste-containing movements of materials and inventory are needed.

Value stream actions that really create value that the customer perceives are only a small fraction of total operations. Destruction of a large number of operations involving waste is the largest potential source for total performance of the organization and improved customer service (Lean Enterprise Institute, 2008). Seven types of waste was defined including overproduction, waiting, transport, inventory, overprocessing, motion and defects. In Table 2, seven types of wastes was explained with example symptoms in detail.

Table 2. Seven Types of Waste

Type of Waste	Description	Within the Process Industry	Example Symptoms
Over production	Product made for no specific customer	Large campaign large batch and continuous large-scale manufacturing processes	-The extent of warehouse space needed and used -Development and production organization imbalance
Waiting	As people, equipment or product waits to be processed it is not adding any value to the customer	Storage tanks acting as product buffers in the manufacturing process—waiting to be processed by the next step	The large amount of 'work in progress' held up in the manufacturing process—often seen on the balance sheet and as 'piles of inventory' around the site
Transport	Moving the product to several locations	Raw materials are made in several locations and transported to one site where a bulk intermediate is made. This is then transported to another site for final product processing	-Movement of pallets of intermediate product around a site or between sites -Large warehousing and continual movement of intermediate material on and off site rather than final product
Inventory	Storage of products, intermediates, raw materials, and so on, all costs money	Economically large batches of raw material are purchased for large campaigns and sit in the warehouse for extended periods	Large buffer stocks within a manufacturing facility and also large warehousing on the site; financially seen as a huge use of working capital
Overprocessing	When a particular process step does not add value to the product	A cautious approach to the design of unit operations can extend processing times and can include steps, such as hold or testing, which add no value	The delay of documents to accompany finished product
Motion	The excessive movement of the people who operate the manufacturing facility and excessive movement of data, decision and information is wasteful	People transporting samples or documentation	-Large teams of operators moving to and from the manufacturing unit but less activity actually within the unit -Data entry being seen as a problem within MRP systems

Defects	Errors during the process—either requiring re-work or additional work	-Material out of specification; batch documentation incomplete -Data and data entry errors	- Missed or late orders -Excessive overtime

Source. Melton, 2005.

In order to eliminate waste in manufacturing systems, a number of lean manufacturing techniques were developed such as JIT, Kaizen, Jidoka, Poke-Yoke, SMED, 5S, TPM and SPC. According to Lean Institute (2008), these techniques were explained like below.

JIT: JIT can be defined as a manufacturing system which produces and delivers exactly the desired product at the exact desired time and at the exact desired. JIT is mainly based on Heijunka and includes three functional components such as pull system, takt time and continuous flow. JIT aims to eliminate all possible waste for the best possible quality, the lowest possible cost and resource utilization, and the shortest possible production and delivery flow times. Besides that, in this production principle, the pulling system is applied instead of the classical pushing system. Production order shall be given as customer demand is received. In this way, inventory quantity is reduced and one-piece flow is provided.

Kaizen: Kaizen can be explained as continuous improvement of a value stream or a single process to create more value with less waste. Put it differently, Kaizen (continuous improvement) is the regular and continuous improvement of each process in the organization. According to the lean philosophy, there is no perfect process, improvements can be made for each process, but these improvements should be sustainable.

Jidoka: Jidoka means that machinery and operators have the ability to detect and stop work immediately when an abnormal situation occurs. Jidoka draws attention to the causes of the problems, because the work stops when a problem first arises. This eliminates the root causes of errors and guides improvements that create quality in the process.

Poke-Yoke: Poke-Yoke is a method that prevents operator from errors during manual working processes. In other words, this technique aims to prevent, correct, or reveal human errors before they occur.

SMED: Setup times must be reduced in order to realize JIT. Moreover, SMED (Single-Minute Exchange of Dies) is one of the Lean Manufacturing techniques that provides flexibility and agility in production by reducing setup times (Oksuz et al., 2017). SMED is based on the goal of reducing equipment changeover times to the single-digit or less than 10 minutes.

5S: 5S is a workplace organization method that helps lean manufacturing and provides visual control and management. It includes five phases like Seiri (Sort), Seiton (Set in Order), Seiso (Shine), Seiketsu (Standardize) and Shitsuke (Sustain/Self Discipline). Some lean practitioners add an sixth S called "Safety". However, Toyota traditionally applies only 4S.

- Seiri- reviewing everything in the workplace to separate and discard any unnecessary.
- Seiton- organizing the items required for regular and easy use.
- Seiso- cleaning workplace, equipment and any kits.
- Seiketsu- Cleanliness and organization resulting from applying the first three S in a disciplined way.
- Shitsuke- Ensuring that the organization continually improves and sustains its success.

TPM: TPM is a holistic approach that focuses on proactive and preventive maintenance to maximize equipment uptime. TPM eliminates the distinction between maintenance and production, giving importance to training operators to maintain their equipment.

2.3 Lean Manufacturing and Industry 4.0

Manufacturing and Industry 4.0 are two intertwined concepts. Therefore, it is necessary to re-examine existing production methodologies within the framework of Industry 4.0. From this perspective, economies of scale leave their place to the economies of scope that can adapt to the changing demands of the producer instantly (Tuna, 2019). Thus, the aim of Industry 4.0 to accomplish is not be only smart, intelligent and cognitive manufacturing systems or factories, but it produces also smart products and services at the same time (Rauch et al, 2016). For this reason, with the new industrial evolution, product development processes need to change. The paradigm of Lean Manufacturing have become the main approach in order to provide high-efficient processes from the early 1990s to the present (Kolberg & Zühlke, 2015). The purpose of developing lean products is to decrease waste in production processes and focus on the value-added operations (Rauch et al., 2016). Both

Industry 4.0 and lean manufacturing use decentralized control and aim to increase efficiency and flexibility (Buer et al., 2018). Therefore, how these two production approaches exist together and how to support each other become a significant topic in recent times.

Mrugalska and Wyrwicka (2017), presented about how Lean Production and Industry 4.0 link each other with several case studies. They revealed that smart product, smart machine and augmented operator can support Lean principles and these two approaches can support each other.

Singh (2017) underlined that Lean Production and Industry 4.0 meet visions of each other and they are compatible to each other. It was also emphasized that cyber-physical systems will not be the only solution that integrate two concepts. It is also believed that cyber-physical systems will provide the decentralized production control that is missing in lean production and deployment of Industry 4.0 will provide more sustainability.

Oksuz et. al (2017), showed that, Lean Manufacturing techniques need to be integrated with the advanced technologies provided by the Industry 4.0 transformation in order to be successful in today's competitive environment. Besides that, new applications of Lean Manufacturing methodology will be possible thanks to the Industry 4.0 technologies. As a result of this, it was stated that, these two systems could not be independent from each other and Industry 4.0 technologies would facilitate the implementation of the Lean Manufacturing philosophy.

It is an inevitable process for lean manufacturing to keep technological developments within its structure by considering all processes that do not create added value are waste and focuses on quality production in time. Especially, the use of new technologies that emerged with the Industry 4.0 revolution in production systems brings a process that provides data to the Lean concept, supports and purify defects by automating the manufacturing processes and as a result of this, improves the production processes. In fact, this process will affect the development of Lean automation, which is about developing automation solutions that have a level of complexity suitable for lean manufacturing environments, which has been gradually introduced in the late 1990s (Jackson et al., 2011).

Table 3. Industry 4.0 impact on Lean Production Systems

	Data Acquisition and Data Processing				Machine to Machine Communication (M2M)		Human-Machine Interaction (HMI)	
	Sensors and Actuators	Cloud Computing	Big Data	Analytics	Vertical integration	Horizontal integration	Virtual Reality	Augmented Reality
5S	+	+	+	+	+	+	++	+++
Kaizen	+	++	+++	+++	+++	+++	+++	+++
Just-in-Time	++	++	+++	+++	+++	++	+	++
Jidoka	+	+++	+++	+++	++	++	+	+
Heijunka	++	++	+++	+++	+++	++	++	+
Standardisation	++	+++	+++	+++	++	++	+++	+++
Takt time	+	+	+++	+++	+++	+++	+	+
Pull flow	++	+	+	+	+++	+++	+	+
Man-machine separation	+	+	+	+	+	+	+++	+++
People and teamwork	+	+	+	+	+	+	+++	+++
Waste reduction	+	+	++	+++	+++	+++	+	+

Source. Wagner et al, 2017.

As illustrated in Table 3, the impact matrix of Industry 4.0 and Lean Manufacturing systems put forward by Wagner et al. (2017), suggests how information and communication systems provided by Industry 4.0 balance the Lean principles. In Table I, the relationship between Industry 4.0 technologies, categorized by three main concepts as Data Acquisition and Data Processing, Machine-to-Machine Communication and Human-Machine Interaction, and Lean Manufacturing principles are underlined. In the same context, as Rauch et al. (2016) demonstrate in their methodological studies, Lean principles can be realized in a better and more consistent manner thanks to new and advanced technologies and concepts outlined under the term Industry 4.0.

Kanban systems, also known as e-Kanban systems that are currently used and virtualize the system using RFID technology, replace traditional kanban (Lage & Filho, 2010). In the same context, the efforts to integrate automation technology with the U-shaped assembly lines, also known as the Chaku Chaku lines by toy manufacturer LEGO, LINAK and STRECON companies as well as the University of Southern Denmark, are also a good example of the interaction between Lean Manufacturing principles and the concept of Industry 4.0 (Bilberg & Hadar, 2012).

Toyoto Production System of Taichii Ohno is based on the two main philosophy called Just-in-Time and autonomation (Ohno, 1988). Autonomation is automating manual processes to include control. In other words, when a problem occurs, the operation should stop automatically and not allow defects to move along the line.

When only defects are detected, human intervention is required. Therefore, automation in production has played an important role since the beginning of lean production and it is possible that the technologies provided by Industry 4.0 can be considered as progress in this field (Sander et al., 2016).

Implementing Industry 4.0 in the principles of Lean Manufacturing can reduce the risk of integration and also become the manufacturing processes in Lean Production more standardized and transparent (Kolberg & Zühlke, 2015). Moreover, Rüttimann and Stöckli (2016), in their studies, have shown that Industry 4.0 technologies cannot go beyond the dreams of engineers unless the researches about how to integrate Lean Manufacturing and Industry 4.0. In addition, they underlined that otherwise, Industry 4.0 will not emerge as a revolution, but it should be a part of the comprehensive Lean Theory framework. At the same time, with the integration of Lean Production and Industry 4.0, Industry 4.0 will contribute to the development of a highly customized product with one of its main objectives: consumer-oriented production or, in other words, consumers' participation in production.

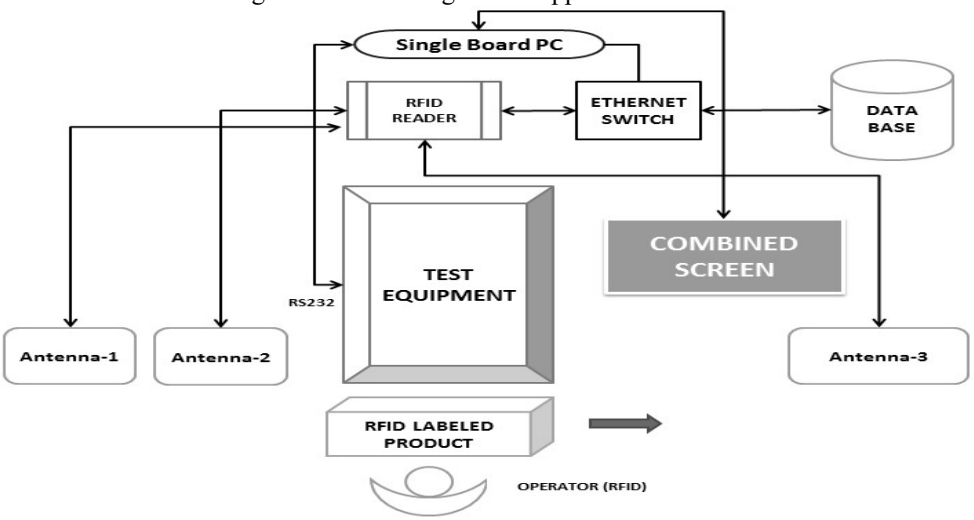
At the same time, with the integration of Lean Production and Industry 4.0, Industry 4.0 will contribute to the development of a highly customized products with consumers' participation which is its main objective in production also called as consumer-oriented production. The high level of customized product development process, which is very difficult to implement with the principles of Lean Manufacturing and which are not in line with the Lean principles, directly needs technologies such as IoT and CPS brought by Industry 4.0.m

3. METHODOLOGY

The VTC 307 - Product Test Station, selected within the scope of the application, is the system modeling that appears with the external equipment added when considered within the project objectives as seen in Figure 3.

When the system model is taken into consideration, it is seen that a single card computer is connected to the system via RS232 serial port for controlling the device. At the same time, this single-card computer has been installed with a mission of critical integration between the cyber part of the project and the part of the physical world. With this critical mission, single card computer, user screen, RFID reader and database operations in the algorithm continues. According to the general structure of the system in Figure 3:

Figure 3. Block Diagram of Application Station



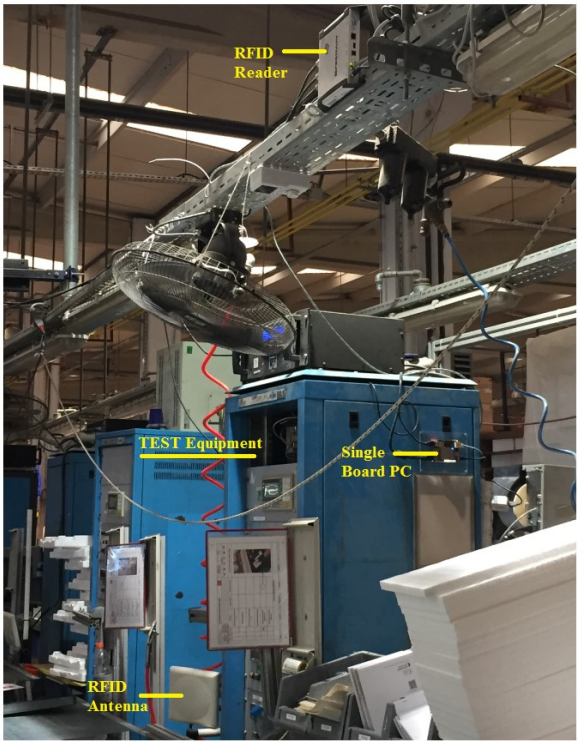
Source. Authors

The single card computer network connection features are considered as the control center of all devices and in this context, device connections are provided through ports. In other words, this step allows devices to be connected to the network to be handled within the context of the Internet of Things. The operators in the other group, including the operator and the product, can neither produce nor carry digital data. For this group, digital identification is performed by using RFID tags and network connection is provided.

In summary, a transition infrastructure for cyber-physical systems is targeted as all devices in the model are connected and manageable in the cyber world. Thanks to this infrastructure, the prevention of losses is achieved by using lean techniques, especially Jidoka.

As a result, when these three systems come together on the production site, the integrated system of the project appears in Figure 4.

Figure 4. System View



Source. Authors

APPLICATION

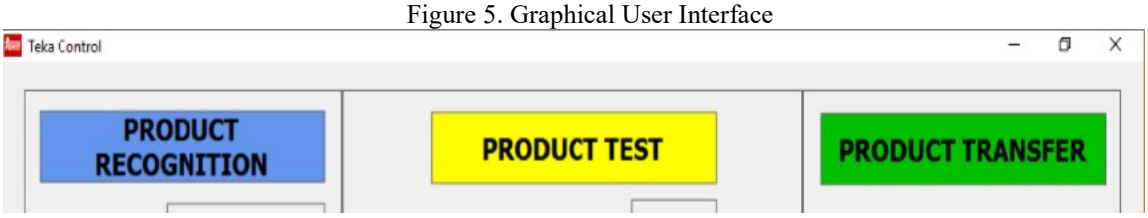
For the application area, one of the factory which has been producing cooking appliances since 2002 in Turkey of TEKA group that was established on 1924, was selected.

The production plant of SIMECO has 8 production lines in terms of production infrastructure and the annual production volume is 700.000 products on average. As scope of the project, the VTC 307 band, which produces multiple products from two VTC production lines taking into account the above-mentioned competencies of SIMECO has been selected to determine the application station.

This application is about the Cyber Physical Production Systems which include many of the technologies that dominate the digital transformation process, also called Industry 4.0 and the application of lean thinking to the production operation by Cyber Physical Production Systems. In parallel with these aims, the application will raise awareness of the industry about efficient resource management and efficient process management by the use of the technlogies from Industry 4.0; internet of things, big data analytic and cloud computing. It is also aimed to contribute to the enterprise in which the application is carried out in micro perspective and to lean thinking to the national industry in macro perspective. In order to achieve the target project outputs, the application is carried out by installing the components in the field in a way that will not affect the current workflow of the company.

Validation tests of the application were performed in the test station in the VTC-307 production line. Therefore, the system functionality is emphasized beyond the hardware during the tests. The critical part of the tests that are not included in the hardware part is the digital identification of the product and the operator. In this way, the location and identity of a product or an operator within the project area can be detected and included in the algorithm. The status of the tagged product is easily monitored by the user interface of the system which is passed through the antenna area and which process is performed in the algorithm. For this reason, the functional characteristics of the stations have been controlled through the graphical user interface shown in Figure 5 with five main questions.

Figure 5. Graphical User Interface



Source. Authors

In short, if the integrated display of the interface program is addressed; 'Product Recognition' introduces the image and code information contained in the database of the product information read by the first antenna. The 'Product Test' product shows that the test device has been adjusted according to the relevant test configuration information in which it enters the second antenna area, the operator authorization information, the test steps passed during the test period and the test performance information on the labeling process. In this last step, 'Product Transfer' shows the reason for not being dispatched if the product will not be transferred from the label information on the product.

Field validation tests can be made through the following five questions:

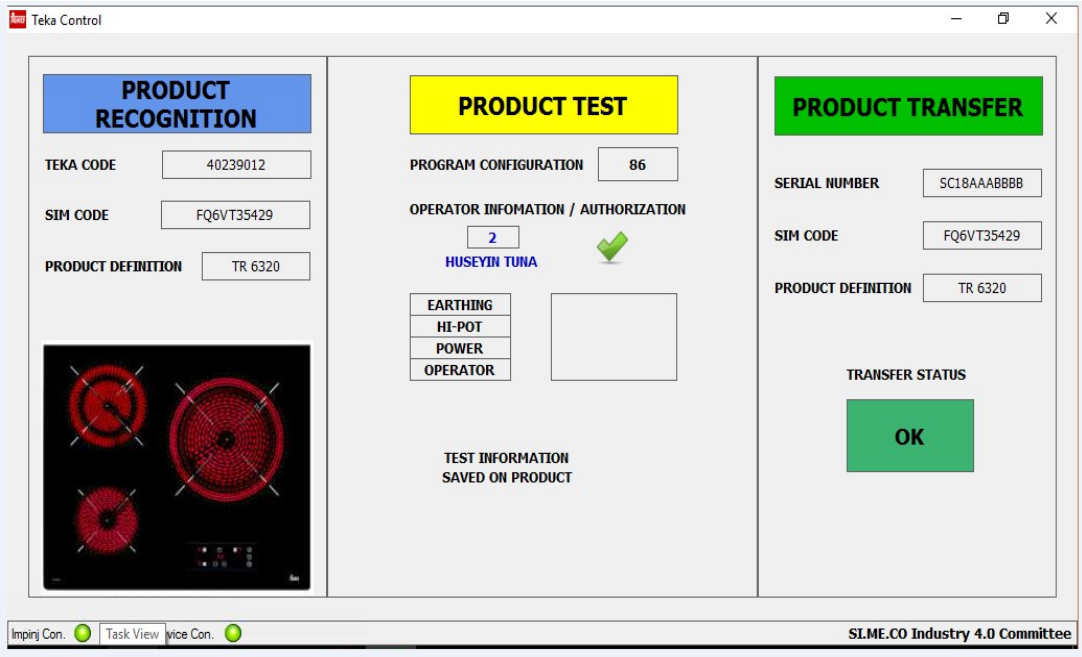
1. Is communication established between the computer, test equipment and RFID reader?
2. Is the RFID structure on the 'Product Recognition' station working?
3. Is the RFID structure in the 'Product Test' station working?
4. Is the RFID structure in the 'Product Transfer' station working?

In the last step, the product dispatch status that passes through the fields 'Product Recognition' and 'Product Test' is tested at this station, but more importantly, whether the data can be printed from the previous station to the label is also tested in this step. The following screen has been tested in this connected system.

5. Is the system running when there is more than one product on the belt?

This system has been designed independently in the number of products while providing a significant flexibility in production. In this context, three products and one operator have been tested and successfully completed.

Figure 6. User Interface of the System (Complete View)



Source. Authors

The application which was passed from the five steps above, completed the process of product identification, automatic configuration of the test device with the help of RFID tags, control of the operator competence, processing of test data on the label and final shipment of the product before shipment. In other words, the processes taking place at the operator initiative prior to the application were completed by the use of RFID tags, digitalized and single-card running software on the computer. At the same time, the application provide Poke-Yoke and Jidoka in case of faulty product, digital polyvalence with operator authorization control from lean point of view.

5. CONCLUSION

Nowadays, when interest in lean manufacturing systems is increasing day by day, the use of these systems for different purposes especially in manufacturing enterprises provides advantages to organizations. Lean manufacturing techniques have gained a different dimension with the use of Industry 4.0 technologies in terms of efficiency and effectiveness in production. Today, the principles of lean manufacturing have begun to evolve towards the automated systems dominated by high technology. It is believed that these new technologies will support the lean manufacturing concept in eliminating waste, and will lead to wider application areas for lean manufacturing.

The following tables will summarize the subject matter if both the literature and the applications are discussed in terms of lean and Industry 4.0.

Table 4. Application and Benefits form Industry 4.0 and Lean Perspective

Application	Benefit	Lean Tool	Technology (of Industry 4.0)
Test result are recorded on RFID label, Product configuration is defined by RFID label, Station transation and down time can be measured easily,	Reliability of process and application	Statistical Process Control	Internet of Things (RFID) Cloud Computing Big Data Analytic
Parameters of test equipment can be received from server thanks to RFID label,	Elimination of operator initiative	Poke-Yoke	Internet of Things (RFID) Cloud Computing
Antenna-3 check the test result and in case of detection faulty, it can trigger Andon system and stop the line.	In case of faulty product shipment, the authorization to stop the line and trigger Andon	Jidoka	Internet of Things (RFID)
The gathered data will be analyzed and result of analysis will show new improvement potential on line.	Ensuring visibility of continuous improvement potentials	Kaizen	Big Data Analytics

Source. Authors

Table 4 shows an analysis based on benefit and practice. The following table can be taken into account if the subject is taken from the perspective of loss, on which lean thinking is based, unlike the above.

Table 4. Application and Benefits form Industry 4.0 and Lean Perspective

Waste	Industry 4.0	Application

Faulty production	Cloud Computing	Test result evaluation is done according to the parameters which are defined on system.
Unnecessary Operation	Internet of Things (RFID)	Barkod technology is required optic scan. But RFID technology is using area scan with radio frequency signal. So, there won't be needed any extra scanning operation by operators.
Transportation	Cloud Computing	Normally product configuration information is being moved to production from design stage and also test results is being recorded on paper. Thanks to the digital structure, all related information is transferred via RFID on the server.

Source. Authors

In the future researches, the developed system can be improved through the integration of different lean tecniques and Industry 4.0 technologies to provide more consistent results.

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THE DIGITALIZATION OF THE ORGANIZATION

Stavros Valsamidis[1], Ioannis Petasakis[2], Foteini Perdiki[3] and Vasilios Ferelis[4]

[1]*Department of Accounting and Finance, International University of Greece, Campus of Kavala, Agios Loukas, 65404 Kavala Greece, svalsam@teiemt.gr*
[2]*Department of Accounting and Finance, International University of Greece, Campus of Kavala, Agios Loukas, 65404 Kavala Greece, Kavala jpetasakis@hotmail.com*
[3]*Department of Accounting and Finance, International University of Greece, Campus of Kavala, Agios Loukas, 65404 Kavala Greece, fperdiki@teiemt.gr*
[4]*Department of Accounting and Finance, International University of Greece, Campus of Kavala, Agios Loukas, 65404 Kavala Greece, ferel@teiemt.gr*

ABSTRACT

Nowadays, digital technology proliferate contemporary organization and the relationship between organization and 'digital' continues to be of particular interest to many researchers. This reflects the significant relationship between organization and digital technology that has developed over the last decades. On one hand, digital technology is now part of organization in ways that would have been difficult to imagine even a few years ago. A variety of portable and personalised digital devices offer unprecedented access to information and communication to unlimited number of users. On the other hand, digitalization creates excessive dependency with possible problems.

The main obstacles for organization digitalization are the organizational resistance to change, the lack of a clear digital customer value proposition, the ineffective gathering and leveraging of customer data, the inflexible technology stack and development processes and the engagement to legacy business models.

The aim of this study is to deepen knowledge and understanding of the digitalization theme. More precisely, our intent is to provide the reader with an overview of the phenomenon and offer the insights whether factors, such as customer experience, improvement of operations and reinvention of business models can determine the digitalization of an organization. The objectives of the study are the evaluation of the digitalization through techniques such as factor analysis, correlation and regression analysis, in order to discover possible dependencies of the data based on these factors and some demographics data.

We posed the following hypotheses: (1) the Customer Experience leads to the digitalization of the organization, (2) Improvement of operations contributes to the digitalization of the organization, and (3) Reinvention of business models plays an important role in the digitalization of the organization. The hypotheses are based on the four factors.

A questionnaire that consists of 20 questions was completed by 200 respondents of organizations in the area of Eastern Macedonia and Thrace. In the questionnaire, we chose closed-ended questions for quick response and data processing. Moreover, the questions were multiple choice ones, so as to be chosen easily among several predefined answers, and most of them were questions of scale of preference, where the degree of preference of the respondent is stated. We applied the factor analysis with the method of principal components and with varimax rotation. We investigated the relationship among a number of items and group them in factors. Thus, the four factors, based on the 20 questions of our questionnaire, were used for factor analysis. Before proceeding, we checked the Kaiser-Meyer-Olkin measure of sampling adequacy (KMO) value to be suitable for factor analysis. Chi-square value for Bartlett's test of sphericity was also checked, so that we could be able to continue the process of factor analysis. For the factor analysis and descriptive statistics, correlations and reliability validation, the statistical package SPSS 22 was used.

KEYWORDS

Digital technology, Digitalization, Factor analysis, Correlation, Regression.

JEL CLASSIFICATION CODES

L86, M15

1. INTRODUCTION

Organizations nowadays are being pervasively permeated with digital technology (Yoo et al., 2012). Digital technology is radically changing the nature and form of organizing.

Digital technologies are transforming the global economy. In his pioneering book Being Digital (1995), technology futurist Nicholas Negroponte (1995), described how the old industrial economy would be eaten away by a new digital economy. Moreover, digital technology makes it possible for members of an organization to self-organize and thereby avoid the delays, distortions, and other damaging effects of hierarchically organized systems (Benkler, 2002). Established companies recognize that digital technologies can help them operate their businesses with greater speed and lower costs and, in many cases, offer their customers opportunities to co-design and co-produce products and services (Sambamurthy et al., 2003).

The essence of the digital revolution was concisely described by Brynjolfsson and McAfee (2014). They explain that technological progress in the digital era is due to three characteristics of technology: it is exponential, digital, and combinatorial. The exponential aspect of technology means that its power and usefulness are getting better and better all the time and that *"what's come before is no longer a particularly reliable guide to what will happen next"*. Digitization turns various kinds of data and information into bits – the ones and zeroes that are the language of computers. Advances in digitization have resulted in *"... new ways of acquiring knowledge…and higher rates of innovation"*. Lastly, digital innovation is combinatorial: *"Each development becomes a building block for future innovations"*. Coupled with human ingenuity, these three characteristics allow digital technologies to be developed and applied at a rapid rate.

The digital transformation continues to maintain its relevance and solidify its reputation as a change agent. Digital technologies are changing the face of organization – and this unavoidable, rapid change often exceeds the pace of transformation organizations are equipped to undertake (Kane et al., 2015). Digital technologies play a role in all aspects of operating, controlling, and coordinating the activities of organizations (Setia et al., 2013). Digital Transformation is partly fueled by the convergence of mobile computing, consumerization of IT, cloud computing, big data, and advanced data mining technologies. It has been noted that we are currently living in at least three eras that build upon digital data: the information era, the social era, and the Big Data era (Collin, 2015).

Technology is constantly evolving and being applied. Today's digital transformations must be built on the understanding that today's technology will be progressively replaced with digital solutions that are currently non-existent (Sine, 2019). Rather than intimidate organizations, this fact should inspire team members to create and recommend new technology solutions, knowing that their organization is interested in constantly adapting to new tools that further its mission. This area is certainly a challenge for many organizations, especially those with complex legacy systems, but one that must be overcome (Langer, 2017).

As an agile organizational form (Alberts, 2007), the digital organization will be populated with individuals and teams who are facile with technology and who can collaborate both inside and outside the organization to make process improvements and develop new solutions.

Digital organizations are increasing in both numbers and sophistication. Digital technologies are integrated into organizations and have shown how actor-oriented principles and designs can be used to organize and perform activities (Snow et al., 2017). Digital organizations need technologically aware and adept leaders who can set the digital agenda and create the context for the digitization of every relevant aspect of their organizations. Digitization is occurring at an accelerating pace; successful leaders need to synchronize their organizations to digital clock speed.

According to Deloitte and MIT Sloan Management Review research (2019), the three principles underlying the truly digital organization include: Digital at the core, Developing an enabling environment and culture, Taking action, not just promoting a vision.

Grant Freeland of BCG (2019) proposes five rules to help their organizations adapt for transforming into a digital organization: Learn from the outside but stay true to their DNA, follow the map, trust the terrain, place many bets, digitize the organization and build a talent pipeline.

Technological innovations lead to disruptions, but when we talk about transformation, it is not just about innovations and their disruption on the organization, it is also about how these technological innovations are adopted and used. To maximize digital value, organizations must first determine where they are on their digital journey-beginning with enabling IT agility and operational effectiveness; then using digital technologies to differentiate their strategy through new products, services, and business processes; and finally, harnessing digital capabilities to reimagine their industry with new business models (Cisco, 2015). Limitations of current IT systems and lack of IT resources or skills to implement digital technologies are also frequently cited as a barrier to embracing digital transformation.

As digital disruption will only accelerate in coming years, organizations must look to begin the process of implementing change now. Delays or a failure to respond may result not only in loss of market share, but also in obsolescence over the longer term. In some situations, the more critical barrier is the cultural resistance to new ways of doing business, which was identified as an issue by 30 percent of respondents. This version generally

stems from a lack of skills within the organization, and from fear over how organizational change will impact individuals and their roles. Addressing this barrier needs to be part of the organization's vision, along with determining whether the enterprise has the right people in the right roles to deliver on the digitization strategy. "Legacy people" can become barriers as much, or more than, legacy systems if their apprehension around change hinders or stalls the process (KPMG, 2016).

Digital transformation provides industry with unparalleled opportunities for value creation. Digital technologies are creating new profit pools by transforming customer expectations and how companies can address them. At present, digital transformation is not well understood, and a number of myths are obscuring the path to realizing its potential for value creation. The initiative demystifies some of the most common myths about digital, revealing, for example, the true extent of disruption by digital start-ups and how the impact of automation on employment is likely to be very different from today's received wisdom on the subject. Yet, the benefits of digitalization will not accrue automatically to industry or society, and there is a risk that the promise of digital transformation will go unfulfilled. Moreover, organizations do not always understand what impact their digital initiatives will have on different aspects of society – from employment to the environment and beyond – or what responsibility they should bear for addressing any unintended consequences of digitalization (World Economic Forum, 2016). The digitalization of society is affecting customer needs, product and service properties and delivery mechanisms, and organization design (Langer, 2017).

The aim of this study is to investigate the factors that affect the digital transformation of the organization. For this aim, some objectives have been set. It is checked whether (a) Customer experience plays an important role to the digital transformation of the organization, (b) Reinvention of business models leads to the digital transformation of the organization and (c) Improvement of operations contributes to the digital transformation of the organization (Berman & Bell, 2011; Vey et al. 2017).

The main task is to examine the above in real terms, beyond the theoretical part. The questionnaire is based on a survey by Westerman et al. (2014) and was adopted and adapted appropriately to the respondents of the current survey.

2. BACKGROUND THEORY

Digitization and digitalization are two conceptual terms that are closely associated and often used interchangeably in a broad range of literatures. There is analytical value in explicitly making a clear distinction between these two terms (Brennen and Kreiss, 2014).

Digitization is used in several meanings but it has two meanings which are closely related with each other. Digitization is creating a digital (bits and bytes) version of analog/physical things such as paper documents, microfilm images, photographs, sounds and more. So, it's simply converting and/or representing something non-digital into a digital format which then can be used by a computing system for numerous possible reasons. Digitizing doesn't mean replacing the original document, image, sound, etc.

Digitalization means the use of digital technologies and of data (digitized and natively digital) in order to create revenue, improve business, replace/transform business processes, not simply digitizing them, and create an environment for digital business, whereby digital information is at the core (I-scoop, 2018).

In business, digitalization most often refers to enabling, improving and/or transforming business operations and/or business functions and/or business models/processes and/or activities, by leveraging digital technologies and a broader use and context of digitized data, turned into actionable, knowledge, with a specific benefit in mind. It requires digitization of information but it means more and at the very center of it is data. While digitization is more about systems of record and, increasingly systems of engagement, digitalization is about systems of engagement and systems of insight, leveraging digitized data and processes. It's in this meaning and information-rich context that we mainly use it.

A second aspect that is often mentioned is the digitalization of a specific 'environment' or area of business. Take the digital workplace. Often you strive towards a minimum of paper. But a digital workplace is about other things as well. It also means that your workforce works differently, using digital tools such as mobile devices and technologies that make them mobile and/or using social collaboration and unified communication platforms, which are digital systems, enabling them to work in a more "digital way". This, in turn, creates new opportunities to engage differently. And it requires more than just digitized data. Digitalizing business leads to digital business. The list of what you can digitalize (supply chains, leading to digital supply chains, etc.) is long. In general, digitalization is seen as the road of moving towards digital business and digital transformation, as well as the creation of new – digital – revenue streams and offerings while doing so. And that requires change. This is why many people interchangeably use digitalization and digital transformation.

A third meaning of digitalization goes beyond business and refers to the ongoing adoption of digital technologies across all possible societal and human activities. For instance, the increasingly digital customer, the rise of digital healthcare, the growing digitalization of government, of marketing, of customer service, etc. In other words: more digital (in various possible areas) (Robledo, 2017).

Digital transformation, as we use it today, is broader than digitalization as a way to move to digital business. It requires far more bridges to be built in an encompassing digital transformation strategy (I-scoop, 2018). The reason why we say 'as we use it today' is that originally digital transformation was used to describe the transformation of, for instance, paper into digital information. Today, some people, mainly active in the document and scanning business, still use the term digital transformation while they mean the digitization of documents and of processes. However, the vast majority defines digital transformation as an enterprise-wide phenomenon. But some only look at specific aspects, thus often creating silos or having a view that's too technological or too much focused on one aspect of business, you name it.

Digitalization leads to digital business, digital transformation requires digital business and digitization. Summarizing we can say that digital transformation requires digitalization 'en route' to digital business (capabilities) and requires digitization, since the glue and a core business asset of digital transformation (and of digitalization) is obviously (digital) data, leading to information, knowledge, intelligence, action and business model changes. Digitization is the transformation from analog to digital or digital representation of a physical item with the goal to digitize and automate processes or workflows.

Digital change creates the so-called digital disruption (Evans and Forth, 2015; McQuivey, 2013). According to Gartner (2017), *"digital disruption is the result that essentially changes expectations and behaviors in culture, market, industry or process and is caused or expressed through digital competences, channels or property data"*. Digital disruption is the effect that changes the fundamental expectations and behaviors in a culture, market, industry or process—caused by, or expressed through, digital capabilities, channels, or assets (Caudron and Peteghem, 2014).

3. RESEARCH METHODOLOGY

3.1 Research problem and procedures

In this study, an approach to the impact of Customer experience, Reinvention of business models and improvement of operations will contribute to the digital transformation of the organization (IBM, 2014). The 10 lessons in Digital Transformation are the main axes of this research (Kousisis, 2016).

The approach that the research addresses is depicted as follows:

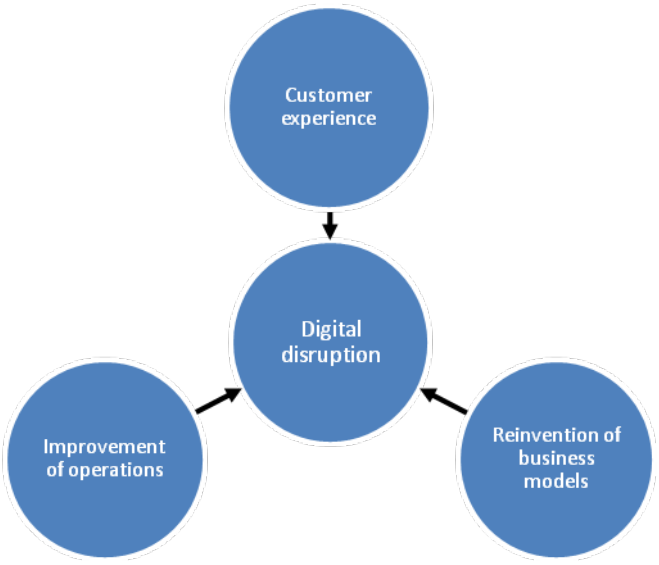

Figure 1. Link of digital disruption of organization with customer experience, improvement of operations and reinvention of business models

The aim of this study is to answer the research problem posed in the introduction, concerning which factors affect the digitalization of the organization. In order to achieve this, we have composed a questionnaire to collect primary empirical data from current or former employees in organizations in the area of Eastern Macedonia and Thrace.

To ensure the appropriateness of our questionnaire, this was tested for Content validity, Construct validity and Reliability. Furthermore, the intensive review of the literature and the discussion with professionals and academics ensure the validity of the contents and make the meanings more understandable.

3.2 Research hypotheses

In order to derive to a conclusion on the combination of the above concepts, this study is based on three (3) research hypotheses. These hypotheses are analyzed on the basis of the Research Methodology. The results are assessed and compared with the corresponding previous surveys.

The aim is for the results to lead to a more in-depth analysis and correlation of these concepts, as well as to focus on the needs and particularities of the research target.

The research hypotheses are the following:

Hypothesis 1

- Customer experience plays an important role to the digital transformation of the organization.

Hypothesis 2

- Reinvention of business models leads to the digital transformation of the organization.

Hypothesis 3

- Improvement of operations contributes to the digital transformation of the organization.

3.3 Data collection

The aim of this research is to answer the research problem posed in the introduction as well as to verify the research hypotheses that have been formulated earlier. In order to achieve this goal, we have composed a questionnaire for the purpose of collecting empirical data from organizations in the region selected for the research.

The questionnaire consists of five sections and 20 items. In section A, there are 4 items about Customer experience. In section B, there are 4 items about improvement of operations, in section C 2 items about Reinvention of business models, in section D there are 5 items about Digital disruption and in section E five items about demographics (age, gender, education, employment-experience and income). All items in sections A, B, C and D are in 5 point Likert scale where 1 corresponds to "Fully disagree" and 5 to "Fully agree". The aim of the study is to find out whether there is a relationship between the digital disruption and the customer experience, improvement of operations and reinvention of business models. The questionnaire is structured since it has a strict order of questions. Furthermore, we attended the questionnaire marked by clearness and clarity. The questions were short and clear. The negative questions were avoided because they are often misunderstood, since the negative keyword is ignored and the respondent gives an answer that is contrary to his/her real opinion. We did not also include questions with double meaning, because they require the respondent to answer two separate ideas with a single answer.

The research was conducted with the process of submitting, completing and collecting the questionnaire by the participants. The questionnaire was shared in two (2) ways / forms:

Electronic: The questionnaire was filled online by sending it via popular social media tools such as Facebook, Twitter, Google Plus, LinkedIn, Instagram, classic email, etc. When the questionnaire was published, it was clear to the respondent that this is collection of statistical data concerning a study. The purpose of making the questionnaire available online was to cover a wider range. The sample number included people independently of their age, marital status, income, educational attainment and occupation, and was addressed to both, in order to collect a more reliable sample, which in turn led to an objective survey.

Printed: The questionnaire was distributed personally. The purpose of the individual distribution of the questionnaire was to cover age and financial strata that do not use electronic means of networking.

3.4 Research Instrument Validation

To ensure the appropriateness of our questionnaire it was tested for Content validity, Construct validity and Reliability.

According to Zikmund et al. (2013), Content Validity is the most basic type of validity. The test of content validity should include among the others, the review of the literature for the subject that researched, a pilot test from professionals and academics and a sample of people that is different in number from the sample that was used in the pilot test. At the present study the Content Validity of the questionnaire was ensured by the fact that the variables, the instruments and the items were used from previous researchers at various studies. Furthermore, the intensive review of the literature and the discussion with professionals and academics ensure the validity of the contents and made the meanings more understandable.

Cooper & Schidler (1998) suggest that the Construct Validity is an attempt for the definition of constructs that simultaneously determine the degree that the control represents them. Furthermore, Construct Validity is widely used to describe the correspondence between a construct and a purported measure. The construct is at a conceptual level while the measure is at an operational level. Construct validity includes a test of unidimensionality, using Exploratory Factor Analysis (EFA). The factor analysis has as general target to summarize the information included in a number of variables into a set of new factors that is smaller, with the lowest possible loss of information. For the extraction of the factors, the Principal Component Analysis Method was used and for the rotation, the Varimax with Kaiser Normalization method. Hair et al. (2009) suggest that Varimax is considered among the most popular orthogonal factor rotation methods because it focuses on simplifying the columns in a factor matrix. For the test of the degree of suitability of the data it was used the Kaiser-Meyer-Olkin Measure of Sampling Adequacy, which is considered the most popular measure. The value of KMO in order to be accepted has to be above 0.7, however values above 0.6 generally are considered accepted. Furthermore, the Bartlet's test of sphericity is a statistical test for the general significance among all the correlations in a correlation matrix. In order to be considered satisfactory and statistically significant, it has to include loadings with values above 0.50 and furthermore the total variable that is explained by the factor has to exceed the 50% of the total variance.

After the factor analysis for all the items, three factors (components) were recognized as it was initially hypothesized, and all the items belonged to the factors that were initially selected. As we can see from the data of the table all the loadings are at very satisfactory levels and above the value of 0.5. Furthermore, as we can see in the table the value of Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) is equal to 0.790 that is above 0.7 and considered generally accepted value. Moreover, as we can see at the following table the total variance explained has a value of 62.861% and it is at satisfactory levels above the value of 50%.

4. RESULTS

At the beginning, the reliability was tested with Cronbach's Alpha index, whose values should be higher than 0.700 so as to be considered satisfactory and to indicate the reliability of the factors (Cortina, 1993; Nunnally & Bernstein, 1978). In table 1, the results of reliability analysis are presented. The value of Cronbach's Alpha index for all four factors that come from the literature are higher than 0.700, thus these factors are considered reliable.

Table 1. Reliability test for four factors

Factors	Items	Cronbach's Alpha
A. Customer experience	A1. Technologies such as analytics and social media to be used to understand the customers better. A2. Digital channels (online, social media) to be used to market the products & services. A3. Digital channels to be used for selling products & services. A4. Digital channels to be used for customer service.	0.828
B. Improving operations	B1. Technology to be used to link customer with the operational processes they face. B2. The core processes have to be automated. B3. An integrated view of the key information regarding operations and customers has to exist. B4. The analytics to be used to make better business decisions.	0.722
C. Reinvention of business models	C1. The digital technology to be used for improving performance and/or the value of existing products and services. C2. New business models based on digital technologies have to be launched.	0.738
D. Digital	D1. Venture capitalists are increasingly interested in companies related to your	0.719

disruption	industry/sector. D2. Technology is used to cut costs rather than to improve or innovate customer experiences. D3. The organization you work/worked has an aging customer base with few new customers. D4. The organization you work/worked uses hands-on customer service with few digital touch-points. D5. Customer satisfaction is low in your industry.

As a next step, since all factors are reliable, we create a new variable for each one of the factors, the values of which are the average of the items that constitute each factor. Table 2 presents the average values and the corresponding standard deviations of these new variables.

Values higher than three, denotes perspective for agreement and lower than three denotes perspective for disagreement. We observe that the respondents have positive perspective for all factors, except the "Digital disruption" one.

Table 2. Description of the factors

Factors	Mean	Standard Deviation
A. Customer experience	4.19	0.71
B. Improving operations	4.17	0.65
C. Reinvention of business models	4.15	0.78
D. Digital disruption	2.86	0.62

The next step is to test whether the factor "Digital disruption" is affected and how by the other three factors. This is accomplished using the linear regression method with dependent variable the "Digital disruption" and independent variables all the other factors.

From the final model we excluded the A variable because it was found to be not significant at 5% level (t-statistic = 0.742, p-value = 0.459). The model that will be adjusted is:

$$\text{Digital disruption} = b_0 + b1 * \text{Customer experience} + b_2 * \text{Improving operations}$$

Checking for collinearity was done through the VIF test. All VIF values are lower than 5, thus we can safely conclude that collinearity is not a problem for our model. The value of Durbin-Watson test is 1.718, very close to value 2, thus the condition of independent errors is satisfied. Regression is significant at 5% (F(2.196) = 3.333, p-value = 0.038). Test for normal error distribution (Normal Probability Plot) showed that errors follow the normal distribution (figure 2). Test for stable variance of the residuals showed that there is steady variation (figure 3).

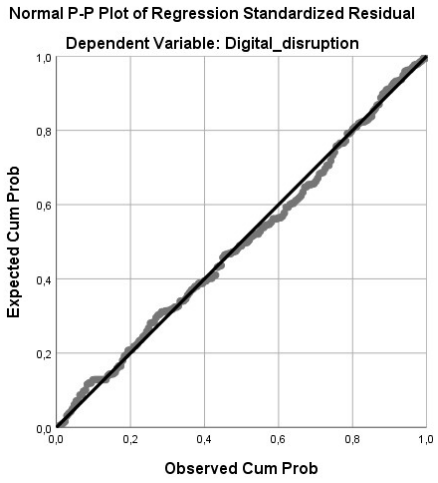

Figure 2. Normal Probability Plot

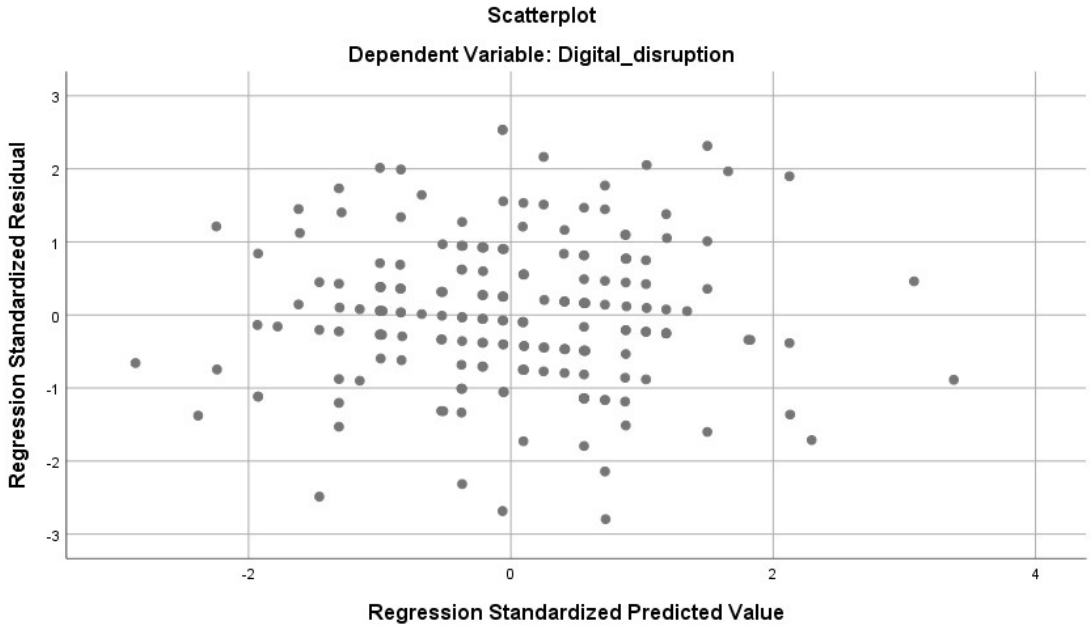

Figure 3. Test for stable variance of the residuals

Due to the very small R square value, we tested the square and the logarithmic transformation of the independent variable, to check for a possible curved relationship. For none of the two transformations the p-value was improved

The final model is

"Digital disruption" = 2.677 - 0.153* "Customer experience" + 0.197* "Improving operations"

Table 3.Linear regression model with unstandardized coefficients

	B	Standard error	t	p-value
Constant	2.677	0.308	8.682	<0.001
Customer experience	-0.153	0.074	-2.066	0.040
Improving operations	0.197	0.081	2.438	0.016

According to the regression model that presented in Table 3, the only factors that affect "Digital disruption" are "Customer experience" and " Improving operations".

This equation could not be used for prediction of "Digital disruption", since R square is quite low. From the above equation, we conclude that the predictive factor "Customer experience" affects negatively the "Digital disruption" since the corresponding regression coefficients are negative and the predictive factor "Improving operations" affects positively the "Digital disruption" since the corresponding regression coefficients are positive.

More specifically, since all the other factors remain stable, for each unit growth of "Customer experience", the "Digital disruption" decreases by 0.153 units and for each unit growth of "Improving operations", the "Digital disruption" increases by 0.197 units.

5. DISCUSSION AND CONCLUSIONS

The aim of this study was to investigate the factors that affect the digital transformation of the organization. For this aim, some objectives had been set. It was checked whether (a) Customer experience plays an important role to the digital transformation of the organization, (b) Reinvention of business models leads to the digital

transformation of the organization and (c) Improvement of operations contributes to the digital transformation of the organization. It examined the above in real terms, beyond the theoretical part.

The findings disclose that the only factors that affect "Digital disruption" are "Customer experience" and " Improving operations".

Digital technologies, however, often disrupt established ways of organizing and require adaptation through collaboration as well as self-organization around situation awareness and knowledge commons. Self-organization and collaboration, as an adaptive response, is faster and more effective than a hierarchical response.

Digital organizations are increasing in both numbers and sophistication. Digital technologies have to be integrated into organizations and used to organize and perform activities. Digital transformation is profoundly changing the ways in which value is created and captured. New organizations with new, innovative business models are born. Existing organizations need to rethink their business models when transforming to the digital era. The development of organizational capabilities occurs through a managed learning process in which individuals, technology, and organizational culture evolve together.

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A LEGAL AND ADMINISTRATIVE EVALUATION OF ROBOTS AND AUTONOMOUS VEHICLES

Kutan Koruyan[1] and Bedirhan Bedir[2]
[1]*Dokuz Eylul University, Dokuz Eylul University Faculty of Economics and Administrative Sciences Department of Management Information Systems İzmir/Turkey, kutan.koruyan@deu.edu.tr*
[2]*Dokuz Eylul University, Dokuz Eylul University Graduate School of Social Sciences Department of Management Information Systems İzmir/Turkey, bedrhan94@gmail.com*

ABSTRACT

Developments in robotic and autonomous vehicle technology have shown an incredible acceleration in recent years. The aspects of this acceleration can be characterized as intention, recognition and investment. Endeavors and large investments of companies are indicative of the importance and value of autonomous vehicles and robots. The European Union's initiatives like RoboLaw and the sizeable investments in robotics show the popularity of the topic in the last decade.
The inadequacy of the existing legal infrastructure for high-cost but potentially lucrative and efficient robots and autonomous vehicles is currently a hot topic of debate. Furthermore, it is essential to develop a legislation for these systems, and investigating legal deficiencies and misapplications is important to finding solutions for future problems.
Case studies and experiences show the legal imperative of robot law. Although robots may appear to act on their own with artificial intelligence, there is actually a programmer, manufacturer or user in the background. For instance, there is a risk of patient injury and even death with surgical robots, confirmed by past incidents. In addition, unfortunately there is no legal system for robotic surgeries in case of patient death during operations.
Autonomous vehicle accidents are another topic of discussion. For example, an autonomous vehicle was involved in a fatal accident. Although the test operator was in the vehicle, she did not focus on the road, falsely believing there was nothing to pay attention to. In this case, the identity of the responsible party (test operator, programmer, manufacturer or vehicle) is still a question that needs to be answered.
The purpose of this study was to investigate robots and autonomous vehicles under the current European, American and Turkish laws. In addition, the study has made administrative recommendations for improving existing laws and identifying responsible parties for criminal cases. This study examined the legal implications of robots and autonomous vehicles in view of the developing technology and its potential economic benefits in a global world.

KEYWORDS

Robots, Autonomous Vehicles, Robotic Law, Information Technology Law

JEL CLASSIFICATION CODES

K39, O31, G38

1. INTRODUCTION

Application and development of technology are significant elements of contemporary life and business world. Particularly technological development has created new employment opportunities and enabled increased productivity, as well as, reduced cost. As a result of this development, *dark factories* where *robots* have replaced the human labor force is a salient outcome of Industry 4.0, referred to as the new industrial revolution.

Although robots may physically be perceived as machines, a machine must primarily have sensors to sense its surroundings, mobility, an energy unit and intelligence to be characterized as a robot. Robotic intelligence is defined as the ability of a robot to make independent decisions without intervention from a second party regarding the necessary action to take after analyzing data it gathers from its surroundings without an external factor. Robots are able to determine own operations without any command, whereas devices that continuously perform the same operations are referred to as machines, not robots. Artificial Intelligence (AI), developed by programmers, provides autonomous decision-making and movement in robots. Humbe et al. (2014) explains

AI's purpose as recognizing objects in the surroundings and making a decision by analyzing data collected from these objects.

Robots and AI products are two distinct artifacts. Robots are frequently employed to facilitate daily life challenges (e.g. jobs that require manpower, meeting personal needs and patient care), whereas AI is rather used in ameliorating a condition or predicting future events (e.g. patient diagnosis and performing predictions in banking systems).

Robots have become a part of both factory and daily life, and are used to fulfill medical, military and domestic functions. The development, popularity and prevalence of robotics have captured the European Parliament's attention. The European Union have set up the Scholarly Publishing and Academic Resources Coalition (SPARC), a public-private partnership. SPARC is currently the largest civilian research programme with an overall investment of €2.8 billion, including €700 million EU funding plus private investment (European Commission, 2017). In addition, the EU has granted a €3 million funding in GiraffPlus for research on how robots can contribute to a safer and more independent life for elderly people (European Commission, 2014). The current size of the robotics market and the projected market growth promote further public and private interest and investment in robotics.

Robots already have extensive application fields and robot-human interaction increases rapidly, which has already led to injury or death. The first robot-induced death occurred at the Ford Michigan plant in 1979 (Young, 2018). The second case took place in 1981 when Kenji Urada, an engineer at a Kawasaki plant was pushed into a grinding machine by the broken robot he was working on (Turner, 2010). According to US government data, robots have caused 26 deaths in the last 30 years (Huggler, 2015). This raises the question whether laws currently in effect are completely adequate to deal with injury or death resulting from robot-human interaction.

As stated by the IEEE Robotics and Automation Society (n.d.), although robot ethics is an interdisciplinary structure researched by many countries, there is no mention of what to do in case of injury or death.

The case for autonomous vehicles, also known as robot cars, is even more complicated. In comparison to interstate laws or ethics, in the US, even autonomous vehicle descriptions differ between states (Table 1).

Table 3. Autonomous vehicle descriptions in some states in the US (Palmerini et al, 2014).

	Nevada	California	Michigan	Florida
Means	Vehicle is also enabled with AI and technology that	Vehicle equipped with technology that	A motor vehicle on which automated technology has been installed, either by a manufacturer of automated technology or an upfitter that	Any vehicle equipped with autonomous technology
Purpose of the means	Allows the vehicle to carry out all the mechanical operations of driving	Has the capability of operating or driving the vehicle	Enables the motor vehicle to be operated	That has the capability to drive the vehicle on which the technology is installed
Way of operating the means	Without the active control or continuous monitoring of a natural person	Without the active physical control or monitoring of a natural person	Without any control or monitoring by a human operator	Without the active control or monitoring by a human operator

In Table 1, the term natural person mentioned in Nevada and California laws refers to the human in the operator seat (State of California Department of Motor Vehicles, 2018). Furthermore, the State of Nevada requires a certificate of compliance for operating a vehicle in autonomous mode (Nevada Legislature, 2017). California adopts a similar terminology for autonomous vehicles as Nevada. In Michigan, the human operator must be attentive to the road, as well as, the vehicle under any circumstance (Michigan Legislature, 2014). Florida legislation similarly mentions the presence of a human operator who is to pay attention to the vehicle and the road and not to perform any other action in the vehicle (Florida Legislature, 2018).

Each of these states characterizes autonomous vehicles in a similar manner and emphatically stipulates the presence of an operator in the vehicle. In some states, the operator is only tasked with monitoring, while other states require that the operator be at the steering wheel. The legislation especially stresses that the operator must not engage in any other action. Autonomous vehicles are also subject to state certification services: the

manufacturer and the driver must attend certification training and comply with test and usage regulations, which demonstrates the critical importance of the human factor, even for autonomous vehicles.

Recent incidents have demonstrated that it's possible for autonomous vehicles to be involved in accidents, which necessitates further legislative efforts by lawmakers to ensure the judicial process functions properly when faced with such an incident. Law research on health- and life-threatening incidents caused by robots and autonomous vehicles is a vital issue. Therefore, this study examined robots and autonomous vehicles, as well as, the deficiencies in the current European, American and Turkish laws regarding robots and autonomous vehicles.

2. ROBOTS AND AUTONOMOUS VEHICLES

2.1 Robots

Richards and Smart (2016) characterizes a robot as a non-biological autonomous agent that displays both physical and mental activity.

The term *robot* was coined in the 1921 play *Rossumovi Univerzální Roboti* (Rossum's Universal Robots) by Czech science-fiction writer Karel Čapek (Roberts, 2007). The word *roboti* is a derivative of the Czech *robota*, meaning forced labor (Adams et al, 2000). In the play, robots with human intelligence replace humans in factories. The play on robot-human conflict also has important connotations for the contemporary world. Čapek explored robot and human interactivity before the dawn of robotics development. Isaac Asimov, whose stories defined the line between robots and humanity and explored the distinction between robots and humans in social life, is another important figure in robotics who postdates Čapek.

The Three Laws of Robotics devised by Asimov (1950), known as the father of robotics or robot science are as follows:

- First Law: A robot may not injure a human being or, through inaction, allow a human being to come to harm.
- Second Law: A robot must obey orders given it by human beings, except when such orders conflict with the First Law.
- Third Law: A robot must protect its own existence as long as such protection does not conflict with the First or Second Law.

However, the cumulative growth of technology over time has demonstrated the inadequacy of these laws (Wells, n.d.).

Robots attained a particular level of intelligence only in the recent past, and robots gained autonomy and decision-making capacity with AI. AI integration has allowed robots to perform their own actions without human command.

Military or surgical robots fulfill their functions without human intervention with AI integration (Tripodi and Wolfendale, 2011; Pagallo, 2013), which minimizes human error to almost zero by eliminating human-robot interaction.

2.2 Autonomous Vehicles

Autonomous vehicle technology is mostly US patented. Various denominations are employed to refer to autonomous vehicles, depending on project objectives, such as *driverless car*, *unmanned ground vehicle*, *autonomous car*, *uncrewed vehicle*, *self-driving car* and *robotic car*, but the most suitable term is *autonomous vehicle* as the fundamental objective is to eliminate the driver factor. This term encompasses not just automobiles, but all land vehicles. However, as the main notion at the dawn of this technology was to produce automobiles without drivers, the term *driverless car* is also used frequently in international literature (Yetim, 2016).

The most essential characteristic of autonomous vehicle development is the elimination of human error, where a perfect technology which does not err and determines actions through data analysis replaces fallible humanity.

Interest in the automobile industry has propelled the popularity and prevalence of autonomous vehicle technology, and the integration of new technologies such as Anti-Lock Braking System (ABS), park sensors, lane-keeping systems, emergency brake assist systems has created the autonomous vehicle phenomenon. Even after the development of these systems, human factor was found to effectively impact vehicle operation. Therefore, there are two options for the customer to choose from (Yetim, 2016):

- The vehicle operates autonomously. The person in the vehicle may only operate systems that does not impact autonomous driving, such as route designation or music systems.
- In addition to the presence of an active driver, the AI may autonomously use features, such as accident prevention, tracking distance maintenance, LIDAR (Laser Imaging Detection and Ranging), automatic braking, camera or RADAR (Radio Detection and Ranging) in case of danger.

The growing investment of automobile manufacturers like Google and CISCO Systems, Generals Motors, Ford, Mercedes Benz, BMW, Volkswagen, Audi, Nissan, Toyota and Volvo is another popular topic (Walker, 2019).

3. PAST CASES ON ROBOTS AND AUTONOMOUS VEHICLES

3.1 Past Cases on Robots

Robots have multi-purpose operation; they do not perform a single function but can be reprogramed for different operations and services. With the enormous increase in robotic presence in daily life, human-robot interaction will never cease. Therefore, accidents may occur during human-robot interactions.

According to the news article by Telegraph, a worker was killed by a robot at a Volkswagen car factory in Germany. Police launched an investigation regarding the death of the man who was crushed against a metal plate by a robotic arm. Initial reports suggested human error, rather than a problem with the machine. Even the scenario in which the death was due to human error is irrelevant as emphasis must primarily be placed on loss of life (Huggler, 2015).

A similar case took place in India. The Times of India reported the death of a worker while adjusting a metal sheet. The injured worker was rushed to the hospital but could not be saved. The company management was charged with causing death due to negligence (Singh and Yadav, 2015).

Another life-threatening incident occurred at the da Vinci Surgical Systems. After a surgical robot started displaying error messages and the team failed to fix the robot, the doctors were forced to resume surgery manually. The patient suffered a serious hemorrhage followed by abdominal pain one week after the operation and filed a lawsuit against both the manufacturer and the hospital (Pagallo, 2013).

3.2 Past Cases on Autonomous Vehicles

Autonomous vehicles are swiftly becoming a part of daily life. The rapid rise of the competition between manufacturers has expedited the development and testing of autonomous vehicles, leading to various accidents.

The Uber test vehicle accident in 2018 is the first recorded case of pedestrian fatality involving an autonomous vehicle. According to the news article by BBC (2018), the Uber test vehicle detected Elaine Herzberg 6 seconds prior to the crash, first identifying her as an unknown object, then as a vehicle and finally as a bicycle due to the bicycle in her hand. The system failed to respond to this unknown situation, resulting in the accident, whereas emergency braking system should have engaged in the presence of any obstruction on the road. Although there was a human safety backup driver in the vehicle at the time, the driver of the autonomous vehicle was careless and busy with what appears to be a phone on the footage. Thus, autonomous vehicle error and human safety backup driver negligence resulted in loss of life.

A Model X vehicle of electric and autonomous vehicle manufacturer Tesla was also involved in a fatal accident. Euronews reported that the self-driving car failed to detect the barrier. However, 5 seconds prior to the accident the vehicle alerted the driver to take control of the steering wheel, which the driver did not heed, leading to the crash (Saatci, 2018).

4. PRIVACY ISSUES WITH ROBOTS AND AUTONOMOUS VEHICLES

The intrusion of robots into daily life has caused greater emphasis on privacy. Domestic utilization of robots and their presence in environments where people feel the most comfortable and safe raises the possibility of trespassing by malicious parties.

Robots and autonomous vehicles can be remotely controlled by hackers and private information can be shared with the outside world any time without the knowledge of the user due to the presence of sensors and/or

cameras, as well as, the exchange of information over the Internet. For instance, a study conducted in the University of Washington stressed the home security vulnerabilities caused by robots (Denning et al, 2009).

In human-robot interaction, robots must not make decisions in place of humans and their function should be limited to providing better alternatives or reducing work burden. Furthermore, depressed or suicidal individuals should be precluded from owning or using robots (Villaronga and Roig, 2017).

AI or robots can access the personal information of their users, create a user profile or track user moods (e.g. happy, sad, angry), all of which are data for robots or AI to use. However, a hypothetical scenario proposed by Villaronga and Roig (2017) raised the topic of profiling depressed or suicidal individuals. In this case, AI or robots should be prohibited from making decisions in the user's place rather than employing profiling and prediction to assist user decision-making. The hypothetical scenario and its interpretation are as follows: The user of the robot is a suicidal individual. Although the robot is able to predict that the user is going to attempt suicide, it must not interfere as any interference would be a violation of the user's free will. Consequently, new laws and legislative amendments, as well as, user responsibilities and liabilities are needed for profiling issues to eliminate this dilemma.

Military robots are a whole different problematique: Unmanned aerial vehicles, drones and surveillance robots signify a complete disregard for the privacy of individuals and other countries.

The case of autonomous vehicles does not differ from that of robots. Sensors and the constant flow of data over the Internet create critical risks. Malicious hackers may attempt to reroute or even crash the vehicle via remote control.

5. STATE LAWS ON ROBOTS AND AUTONOMOUS VEHICLES

5.1 State Laws on Robots

"What is AI?" and "What are robots?" are long-standing debates. Legally, there is no consensus as to whether robots have free will, consciousness, rights, juridical capacity and liabilities. Pagallo (2013) asserts that the guilty party cannot be determined in the event of a crime.

A robot or AI was created and/or developed by a human, which means it is an object and a property. In 2017, the possibility of granting robots the status of electronic persons was discussed in Europe. The report by the European Parliament (2017) has two important aspects. First of all, granting a status to robots was expressed for the first time. Secondly, the report suggested that the manufacturer's liability was not abolished in any case and that the manufacturer had to assume responsibility in a scenario where the AI has unlimited decision-making capacity. However, on the contrary, Calo (2009) argued that it was not rational to hold robot manufacturers responsible for every action of robots, stressing the distinction between robots and guns, which can be easily modified.

There is an obvious gap in robot law in the US, where robot law exists only in the states autonomous car manufacturers are either located or test their vehicles (i.e. Michigan, Florida, Nevada and California). However, even the laws in these states are not within the scope of robot law and only cover autonomous vehicles. Calo (2009) emphasized the immobility of the opinions of American judges that robots were unable to operate outside the limits of their programming. Moreover, considering the developing technology and innovations in AI, as well as, the fact that robots are incapable of acting outside the limits of their programming, the inadequacy of this attitude is quite apparent.

The situation in Turkey is no different than the one in the US, but legislation that could function as a substitute for robot law exists in Turkey (Demir, 2017) and although robots have not been exactly granted the status of juridical persons, there are laws that provide and/or could provide a substitute. According to the news article by Anatolian News Agency, Burhan Uyan, Coordinator of Artificial Intelligence and Law Committee in Samsun Bar Association, stated that the penal, judicial and legal liabilities should already be in effect in case robots harm human beings and public life. The Committee currently works on a draft law called "Civil Code 2.0" for including androids in the Turkish Civil Code alongside real and juridical persons. The draft law is expected to be submitted to the Turkish Parliament in 2023 (Sağıroğlu, 2017).

5.2 State Laws on Autonomous Vehicles

It is possible to mention the existence of some regulations in the US, where autonomous vehicles were first manufactured and used. However, these regulations are at state level rather than federal. Nevada was the first

state to legislate for autonomous vehicles (Barringer, 2013), allowing the operation and testing of autonomous vehicles in public open spaces, followed by California, Florida and Michigan. There is no clear consensus or legal regulations agreed upon by every state across the world on the concept of autonomous vehicles. State laws in the US emphasize the presence of a human in the car, independent of whether the vehicle is operated in autonomous mode or not.

There is no general legal agreement regarding autonomous vehicles in Europe. Most European countries are parties to the Geneva Convention on Road Traffic and the Vienna Convention on Road Traffic. The most noteworthy emphasis is on autonomous vehicles being operated by a human without exception (Brizzolara et al, 2015).

Germany, France, United Kingdom, Netherlands and Switzerland, as well as, Sweden, the country of origin of Volvo operated in the Uber accident, have made laws on autonomous vehicle use (The Department for Transport, 2015; Eckert and Hitz, n.d.).

Research indicates Netherlands as the most autonomous vehicle-ready country (KPMG, 2019). In Netherlands, the draft that stipulated the presence of a human operator in autonomous vehicles to take control when necessary was passed into law in 2015, and the 2017 amendment allowed testing of unmanned autonomous vehicles (Hartholt, 2017). Sweden allowed autonomous vehicle trials as of July 2017 (Peng, 2018). British authorities announced the launch of intensive legal efforts to ensure readiness for the introduction of autonomous vehicles and to determine liable parties (Gov.uk, 2018).

There is no mention of autonomous vehicles in the Turkish judicial system. Although the Highway Traffic Law No. 2918 (1983) characterizes vehicle and driver, it does not address autonomous vehicles. Like many European countries, Turkey is subject to the Geneva Convention on Road Traffic and the Vienna Convention on Road Traffic, which stipulates the presence of a human in the vehicle.

6. DISCUSSION AND CONCLUSION

Robots and autonomous vehicles have undergone substantial technological development and are currently used in daily life, as well as, in numerous fields like industry, military and health services. The inclusion of robots and autonomous vehicles into human life has increased human interaction with smart machines and brought along advantages such as a higher quality of life, higher efficiency and lower costs. On the other hand, the impact of this interaction on human health and life has become a hot topic of debate. Several incidents resulting in loss of life have occurred during the operation of robots and autonomous vehicles.

Autonomous movement and decision-making capacities of robots and autonomous vehicles with AI are only possible through the processing of human (or partially human) data. At the present, most companies use data – particularly personal data – for commercial benefit. Moreover, the processing of personal data by malicious parties is another significant issue. Data used by robots and autonomous vehicles must be processed within the framework of privacy and confidentiality. Unauthorized data processing or abuse is another issue that requires caution to prevent any unfavorable outcomes for human health and life.

Although several states have made some regulations for robots and autonomous vehicles, the enacted laws are still not adequate or in agreement. Whether robots have free will, consciousness, rights, juridical capacity and liabilities and whether, in case of an incident, the robot or the manufacturer is responsible are still debated. Furthermore, in some judicial cases in which the subject was a robot, American judges perceived that robots were unable to operate outside the limits of their programming. Due to the nature of robots and their ability to make decisions and move autonomously, the verdicts appear to be quite inadequate.

The legal situation for autonomous vehicles is slightly more optimistic in comparison to robot law. Some US states and European countries have laws on autonomous vehicles. Some of these laws allow driverless vehicles, whereas others stipulate the presence of a human being inside the vehicle without exception (e.g. Geneva Convention on Road Traffic and Vienna Convention on Road Traffic). In addition, there is no concurrent international regulation on autonomous vehicles.

It is highly possible that humans will frequently interact with robots and autonomous vehicles in the near future. Therefore, lawmakers must draft and adopt laws and regulations on robots and autonomous vehicles in accordance with international conventions and national legislations as soon as possible. These regulations must be in conformity with globalization and acceptable throughout the world, thereby eliminating the possibility of court adjudications that might create international problems. Future laws must protect privacy and human life, avoiding any legal uncertainties regarding incidents caused by robots or autonomous vehicles, and provide a clear and optimal characterization of the distinction between humans and robots.

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