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FOREWORD

*No doubt that we are all living in a world of technology and let information sciences and technologies shape our environment and livings. Information has long become the key element to provide sustainability in every field, and its proper management is extremely import*ant. *As the needs vary and increase, the information technologies also go through rapid changes and advance to ease our lives day by day. So, we follow and depend on the paths that the information sciences and technologies lead us.*

To create a collaborative and more effective way for this development, learning and sharing the knowledge, ideas and the know-how becomes more and more significant for our common future. From this point, the 1st International Symposium on Advancements in Information Sciences and Technologies, which was held in Podgorica, Montenegro, between 5th-8th September 2018, constituted a common platform for the scientists, professionals and the public from a wide range of different disciplines from all over the world to share their works on information sciences and technologies.

Within the event, fifteen presentations were made, and this book of proceedings include most of the full papers of these precious works, which I hope will also be helpful for all the participants and the readers to enhance their visions, and get inspired to create new ideas and innovate. I also hope this book to be a valuable source for you all to contact and collaborate with the authors, institutions and the professionals to move strongly on your paths.

With regards

Assoc. Prof. Dr Saye Nihan Çabuk

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Canbey-Özgüler, V. & Kocabaş, F. (2018). Home-Based Women's Entrepreneurship Education Through Open and Distance Education in Turkey. *International Symposium on Advancements in Information Technologies and Sciences, Montenegro, 5th-8th September2018*

Home-Based Women's Entrepreneurship Education Through Open and Distance Education in Turkey

Prof. Verda Canbey-Özgüler[1]; Assist. Prof. Fatma Kocabaş[2],

Abstract

From the early writings of Joseph Schumpeter to the present day, much of the research on entrepreneurship has focused on answering two questions: Who is an entrepreneur, and what does an entrepreneur need to do to start a successful business? Establishing a business from home can offer women opportunities to progress successfully in self-employment. Working from home can offer flexible employment to those unable to access formal waged work due to childcare and family responsibilities. Given the current socioeconomic norms, women dominate this group. Therefore, the opportunity to balance work and family motivates many women to begin home-based enterprises.

Lack of information on the functioning of markets, advertising opportunities, and customer relationship management are generally the most significant problems that home-based female entrepreneurs face. Based on information technology education in basic subjects that were mainly designed for female entrepreneurs in Turkey, this study analysed the distance learning model using that information and the communication technologies that are currently available for reaching female entrepreneurs in Turkey.

Keywords: Women's entrepreneurship, Home-based women entrepreneurs, Self-employed women, Distance education

1. INTRODUCTION

Technological innovations and globalisation create transformative effects on work life. Today, when the concept of work changes and transforms, there are developments that concern all employees. Despite these changes in the mode of production and technology, home-based businesses continue to involve women heavily. Women's home-based entrepreneurship, which can be either employer dependent or a solo venture, is a concept that is used to describe women who create jobs and income in their homes. In addition to working in areas like handcrafts, beading, and home cooking, this concept includes women who use technology, especially information and communication technologies, to establish a business and employ both themselves and others. In recent years, the Turkish Employment Agency (İŞKUR) through their training and support with "vermicompost" production in

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Turkey, including goose farms and milk production, have stood out as examples of successful female entrepreneurial projects. [3]

This study mainly focuses on female entrepreneurs who are engaged in small-scale production through their efforts and who have limited capital and family support in carrying out home-based activities. Results from field studies that were conducted on women working in home-based ventures show that women who engage in small-scale, home-based production and who can enter the traditional self-employment type encounter problems arising from traditional family structures as well as problems related to work-life (Aktaş, 2013). Therefore, support for home-based women entrepreneurs is vital. Providing the proper training for the entrepreneurs in question, such that they can carry out their activities more effectively and efficiently using distance education, is a critical support activity.

2. HOME BASED WORK

There are great variances among the many types of home-based work. For example, childcare is quite different from cleaning and requires different skills[4]. Although it has been suggested that the economy will end with the transition to modern forms of production, home-based work has expanded regarding both persons and places. Turkey, along with other countries that are in the process of globalising their informal sector, is expanding and diversifying informal home-based jobs, which are the majority. Home-based work takes place at the intersection of informal production processes and women's labour.

As the main unit of family production during the feudal order, domestic labour was also an important part of general production. Women were responsible for domestic production as mothers and spouses. Traditional labour, which was formed in cities and towns before the Industrial Revolution, kept men outside the home as craftsmen and women in the home axis. The separation of everyday life and work has changed through the Industrial Revolution. Today, home-based work is an informal way of working and one in which women's labour is regularly employed. Home-based work seems to define a wide area, from electronic work to bead processing. The literature shows that these different types of work have many different goals, working conditions and returns, which are handled in the distinction of working from home and home-based work. Employees in traditional production are defined as home workers 'who use new home-based employees and new

[3] For example, the Kayseri Provincial Directorate of Agriculture carries out a series of projects to improve organic agriculture. The Organic Worm Manure Production Project, which lasted for two years, attracted great interest among female farmers. Fifty women entered entrepreneurship within the scope of the project and produced products for two organic agricultural markets. The Vermicompost Project Kayseri Provincial Directorate of Food, Agriculture and Livestock started to operate in 2015 (*Dünya Gazete*, 2016). 'Kayserili 50 Kadın Çiftçi Girişimciliğe Adım Attı', Dünya Gazetesi, 01.03.2016.

[4] Laundry, childcare and cleaning are home services. These activities are generally carried out by gardeners, day labourers and governesses who work within a house contract and according to the Code of Obligations. Those engaged in these activities are excluded from the application of the Labour Law.

technologies in modern sectors'. The transformation of production along with globalisation has led to significant changes in the concepts of work. New types of work, such as part-time work, working on the street and working on the Internet, have reduced the number of employees working in factories and offices and have led to an increased number of home-based employees. In this sense, informality and low labour costs due to cheap labour constitute the demand-related dimension of home-based women's labour. On the supply side, there are costs related to social gender roles, child and elderly care and other monetary costs of going to work, such as transportation and meals.

The decisive factor in working from home is the ease of location. A person who works from home can be self-employed, a subcontractor or an employee working on behalf of a company. Because these employees are generally not registered, they are difficult to label and count. These various types of work are intertwined with home-based work. While self-employment is considered an independent work type, subcontracting and working on orders for companies are considered dependent work (Feldstead ve Jewson, 2000: 16). The reasons why women choose such work are many and varied:

- Their education and qualifications are unsuitable for working in the labour market.
- Their household has a low level of income.
- They need to fulfil responsibilities, such as elderly and child care, in the household while earning an income.
- They are not allowed to work in the labour market (outside) due to the gender perspective.
- There are inadequate child care services (Bergan, 2009; Aslan, 2016; Özer ve Biçerli, 2003-2004; Toksöz, 2013).

3. WOMEN'S ENTREPRENEURSHIP

Entrepreneurs are moulded by their social environment, as a product of the socio-economic environment in which they live, rather than their talents. In this context, traditional value judgments and ancestral structures could be some of the determinants. Women are becoming entrepreneurs at a faster rate than men. Notably, the motivation for home-based entrepreneurial women is a separate study (Loscocco ve Smith-Hunter, 2004: 164).

An entrepreneurial woman is one who has created one or several establishments on her own and out of the house, who works with the people she employs, who carries out all work-related risks and activities that are related to the production of any goods or services and who has the right to direct her earnings (Hancı, 2004: 5).

The issue of women's entrepreneurship in Turkey has been discussed extensively over the last 25 years by advocates of various approaches and in different contexts. While all these groups encourage women's entrepreneurship, they have different perspectives on and

approaches to why women should be entrepreneurs. These approaches are reflected in the advocates' practices, policies, and strategies (Ecevit ve Yüksel-Kaptanoğlu, 2015:7).

The content of the training should be prepared according to specific characteristics, such as age, education level, marital status, previous work experience, sectors and business lines, the decision to start a business, steps in starting a business, the execution phase and institutional support.

Also, these training should consider the following five characteristics, which are critical areas in women's entrepreneurship that require improvement:

- Access to information and counselling for education and vocational training
- Access to capital; many women face gender-based barriers and lack formal training in finance
- Access to markets and information on international as well as local business opportunities
- Access to business networks, such as industry-related and general collaborations
- Approval of requests to act like business owners

A social and cultural environment that stereotypes women's roles was a common problem found in the research results on women entrepreneurs in Turkey. These cause a lack of education and family support, which result in excess workload, financial difficulties and a lack of support by men in general (Can ve Karataş, 2007: 253).

4. HOME-BASED WOMEN'S ENTREPRENEURSHIP

Globalisation has led enterprises to create a fiercely competitive environment. The closed economy period has been replaced by a state-protected management approach against external competition. The business environment has become customer-focused, flexible and fast with regards to production, and many traditional management concepts have disappeared. The way to apply this understanding to all economic life is through the study of effective entrepreneurship activities (Soysal, 2010: 84). Inequalities in world income distribution, regional disparities regarding economic development, increasing unemployment and impoverishment, inadequate growth and the formation of an effective competitive environment have brought vital importance to the entrepreneurial factor in today's world

Until the Industrial Revolution, the duties of women were identified as home and handiwork; in later periods, there were significant changes in place of women in society. Looking at international figures, 25–33% of companies in the registered economy are run by women (Schindehutte, 2010: 94). In a study conducted by the World Bank in seven Middle Eastern countries, it was determined that 13% of the owners of 4,000 companies were women (Prifti, 2008).

A home-based working style not only provides a living for a household but can sometimes provide work for more than one person in the home. Part-time work can be undertaken as well as a neighbouring dowry order. Even though it takes more than one shape, the work of children in the home is considered normal (Turgut, 2006: 64).

A Total Global Entrepreneurship survey conducted in 42 countries (2007) found that participation by women in the labour force in Turkey in 2006 was 30%, and it declined to 24% in 2007 (Özçelik, 2008:2; Soysal, 2010: 85).

The most general characteristics of entrepreneurship can be defined as the courage to see opportunities that others cannot and the ability to turn them into business ideas while taking the risk. Entrepreneurship is also thought to be a product of four variables: demand, government effect, the impact of the private sector and political effects. In this sense, the concepts of home-based women's entrepreneurship and self-employed home-based work are used interchangeably (Soysal, 2010: 87).

In Turkey, women's entrepreneurship activities generally result from cases of declining household incomes leading to structural adjustment policies in the family, and 'women setting up their own small business' is based on this initiative.

In Turkish studies relating to female workers that have been conducted since the 1990s, the results have found that more than half of the businesswomen are entrepreneurs in the trade sector, most are in the 30–39-year age group, half have a high school education and most live in urban areas. The basic features of entrepreneurial women in Turkey include self-confidence, courage, patience, and caution. Compared to men, women attach more importance to social reputation, and they are willing to take more risk than men.

5. HOME-BASED WOMEN'S ENTREPRENEURSHIP EDUCATION THROUGH OPEN AND DISTANCE EDUCATION

Information communication technologies[5] (ICT) have now become increasingly important owing to rapid developments in computers and computer network structures. ICT has greatly influenced people's daily life and work and their relationship with the state. ICT has become a new key factor promoting rapid growth and prosperity in the global economy. In this transformation, the production, storage, and transmission of knowledge are of great importance. The advancement of ICT can change the public and society. The integration of computer networks in contemporary institutions and enterprises have

[5] ICT sector consist of; hardware, software, services and equipment. According to OECD Classification main ICT products; office, accounting and comminutions machinery, insulated wire and cable, electronic valves and tubes and other electronic components, instruments and appliances, instruments and appliances for measuring, checking, testing, navigating etc. industrial process equipment. Relating to ICT services, equipment, wholesale, retail, telecommunication and computer services.

enabled activities to be run quite rapidly and in a coordinated manner. Therefore, ICT is expected to have several beneficial effects on the economy in the long term (Norris, 2006).

However, the current global information age is also characterised by increasing disparities in Internet and ICT access. Developed western countries have been able to successfully incorporate ICT in their educational, social, and economic activities and their democratic process, with the Internet penetration reaching 25% in such countries and as high as 50% in the US and the Scandinavian countries. In developing countries, Internet penetration is lower, with scientists, academicians, and students enjoying greater access compared with ordinary citizens. In these countries, the Internet could enable vital access to global information resources including full-text databases and e-periodicals (Canbey–Özgüler, 2007).

Historically, ICT covers many infrastructural systems that are developed and operated independently of each other. The 'Internet of Things (IoT)' standard published by the International Telecommunication Union (ITU) in 2005 indicates that many new elements can be connected to telecommunication networks. The 'Big data' produced by numerous connected IoT devices can result in new applications in many areas such as agriculture, healthcare, climate change, and disaster management. IoT, defined as a 'global infrastructure for the information society' by the ITU, enables various ICT (physical and virtual) devices to be connected.

The Internet has expanded quite rapidly. Radio took 38 years to gain 50 million users and become a mass medium; television and the telephone system respectively took 13 and 74 years. By contrast, the Internet took only four years. No other industry has grown as quickly and created as much wealth in such a short time (Canbey-Özgüler and Aşan, 2007). ICT and the Internet, a concrete manifestation of ICT, have reshaped the public and trade. With the redefining of the social and economic statuses of countries, the term, 'fourth-world countries' has emerged to describe countries that are underdeveloped regarding both capabilities and resources. Despite the rapid expansion of the Internet, it cannot be considered universal. About ICT and Internet access, polarising issues such as Internet access ownership and the number of Internet users are not debatable.

In the studied context, Internet-based open and distance learning is also used as an effective tool in the social policy context of disadvantaged groups.

The question of female entrepreneurs in Turkey was studied in 'Applied Entrepreneurship Education' (which was conducted by TC. Small and Medium Enterprises Development Organization - KOSGEB and supported by national and international projects and training that were organised by various institutions and organisations) and supported by the new entrepreneur Business Development Centre (İŞGEM) and municipalities, higher education institutions, special administrations, and professional organisations. Guidance

for women entrepreneurs with supportive education materials should be implemented through open and distance learning techniques (with or without Internet-based formats). However, compared to men, the use and ownership of ICTs in women's education is low due to the overall low education level of women compared to men. Negative attitudes towards female students in science and mathematics learning and lack of sufficient monetary power to access ICT tools and services are also critical issues. Therefore, policies should be determined to remedy these inequalities.

6. CONCLUSION

While the workforce of the home-based labour force is expanding rapidly, the statistical information is insufficient because women constitute the majority of the working population in this sector, and they are generally unrecognised in the statistics. For this reason, awareness of the labour regulations of women working in home-based fields must be made visible by making the labour of women working in this scope visible.

The fact that female entrepreneurs cannot be sufficiently involved in economic life causes undesirable results in local development efforts. A lack of financial support and education are keeping women's entrepreneurship from being developed sufficiently. Microfinancing is one option for the financing problem. The role played by women entrepreneurs in the local economy in Turkey is neglected by the majority of society, even though entrepreneurs are seen as effective, positive and remarkable individuals.

Women's entrepreneurship is related to the position of women in society and the role of entrepreneurship in the same society. Women entrepreneurs are faced with many obstacles that need to be overcome to give them access to the same opportunities as men, especially in the labour market.

With the increase of women's entrepreneurship will come economic empowerment, an improved standard of living, realisation of self-esteem, a sense of achievement, increasing social interaction, interaction in political activities, improvement in leadership skills, participation in the solution of problems related to women, and society and greater decision-making capacity in both family and society, which will positively affect women's development. These developments will be reflected in the education of children and have a multiplier effect for future generations.

Also, providing entrepreneurship education to women through open and distance education is also an important component regarding lifelong education, which is a top priority of the European employment strategy.

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Ecophysiography as a Landscape Characteristics Tool

Assist. Prof. Saye Nihan Çabuk[1], Talha Aksoy[2], Prof. Alper Çabuk[3]

Abstract

Landscape characteristics are very important inputs for the development of plans. In this framework, Global Ecological Land Unit (ELU) maps/data provide a significant basis for the determination of landscape characteristics of any region, and thus, vital for the development of plans for a variety of purposes which are ecologically friendly. As Montenegro becomes a very popular tourist destination for many visitors from all over the world, the development of tourism plans has also become a hot topic in the country's agenda. There are some important reasons for that. The first and perhaps the most important one is the national ecological approach, which has also been emphasized in the constitutional law of Montenegro. The country is proud of its natural heritage and focuses on protecting this valuable resource for its sustainable future. On the other hand, however, increasing tourism activities and the number of visits each year also increases the burden on the resources and the environment. Most popular tourist destinations such as Budva, Kotor, and Bar have already been going through a rapid development process, which is claimed to have already degraded the current carrying capacities and the resources. Consequently, and accordingly, with the national strategies, landscape characteristics of the country should be determined in the first place to produce the basis and the inputs for the tourism development plans. In this study, the ecophysiographic characteristics along the Adriatic coastline of the country, which is the main touristic region, were determined using the ELU data and sample maps were produced to present the landscape characteristics in the area regarding bioclimate, landform, lithology and land cover. Thus, a framework to start an ecologically friendly tourism planning process for the protection of Montenegro's natural heritage was proposed.

Keywords: Landscape characteristics, Ecophysiography, Tourism

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2. INTRODUCTION

Physical planning is a multidisciplinary, inclusive and holistic process, which requires a huge number of natural and cultural data to be understood, gathered, prioritised, analysed and evaluated. Among the mentioned data, the ecophysiographic characteristics of the geographic context play an important role. Ecophysiogpraphy focuses on the investigation of ecological and physiographical characteristics (Sayre et al., 2014). Szopinska and Kwiecien (2013, p. 604) explain ecophysiography as a term referring to the natural and geographic features of the land, which provides data for the analysis of the natural environment. Çabuk et al. (2016, p.3) and Değerliyurt et al. (2016) relate it with the ecological/landscape land units (ELUs) and underlines the necessity of ecophysiographical features for the description of the landscapes. These features help determine the landscape characteristics and thus, develop a landscape plan, which is inevitable for any spatial planning process (Bazan-Krzywoszańska, 2018, p.135). The complexity of the planning, dynamic structure of the landscape, which is subject to everlasting changes occurring as a result of the natural and anthropogenic factors, and the resulting amount of the data representing this geographic context in landscape plans explain the efforts to develop approaches, frameworks, software, and methodologies to facilitate the process. In this sense, the global ecological land unit maps have become a significant input.

In 2014, Esri and the United States Geological Survey (USGS) produced the highest resolution ELU map, namely the Global ELU Map, for the first time. This has been followed by various updates in 2015, 2017 and 2018. The major components of the ecological or the landscape land units are bioclimate, geomorphology (landform), lithology and land cover. For each of these components, global raster maps with 250m resolution with the given values in Table 1 were produced. The 47650 combinations of the four inputs revealed 3923 terrestrial ELUs. (Esri, 2014; ArcGIS, 2015; Data.Gov, 2018). Sayre et al. (2014) address the components as the key elements that define the ecosystem and remark that bioclimate, landform, and lithology drive the soil formation and vegetation distribution, while land cover in a landscape is the resulting phenomena of the others. Along with the other assets and approaches, ELUs, no doubt, are vital and necessary to perform a spatial planning process aimed at the sustainability of the environment, resources, resilience, and man's survival on the planet.

Table 1. Values for ELU components

Bioclimatic	Landforms	Lithology	Land Cover
Arctic	Plains	Undefined	Bare Area
Cold Dry	Hills	Unconsolidated	Sparse Vegetation
Cold Semi-Dry	Mountains	Sediment	Grassland, Shrub, or
Cold Moist		Carbonate	Scrub
Cold Wet		Sedimentary Rock	Mostly Cropland
Cool Dry		Mixed Sedimentary	Mostly
Cool Semi-Dry		Rock	Needleleaf/Evergreen
Cool Moist		Non-Carbonate	Forest
Cool Wet		Sedimentary Rock	Mostly Deciduous
Hot Dry		Evaporite	Forest
Hot Semi-Dry		Pyroclastic	Swampy or Often
Hot Moist		Metamorphic Rock	Flooded
Hot Wet		Acidic Volcanics	Artificial or Urban
Warm Dry		Acidic Plutonics	Area
Warm Semi-Dry		Non-Acidic Volcanics	Surface Water
Warm Moist		Non-Acidic Plutonics	Undefined
Warm Wet			

Source: ArcGIS, 2015

From this point of view, this paper aims to present a sample application in the Adriatic region in which ELUs are referred as the main resources to understand the variation in the landscape, evaluate the differences of the ecophysiographic characteristics and their effects on the planning applications. A tourism planning process was adopted as the focus, since the region, has become a popular international destination with its unique and outstanding natural features, especially the coasts, as well as interesting and rich cultural heritage. However, this fact also bears its very own risk and brings along various threats to its sustainability. The rapid and intensive advancements in the constructions in some of the popular touristic destinations in Montenegro, for example, reveals the urgent necessity to develop a more holistic and interdisciplinary tourism planning based on the delicate ecophysiography of the country. Consequently, this paper puts forward a sample planning basis or an input, which may be referred to as a starting point for the adoption of an ecologically based planning methodology.

3. MATERIAL AND METHOD

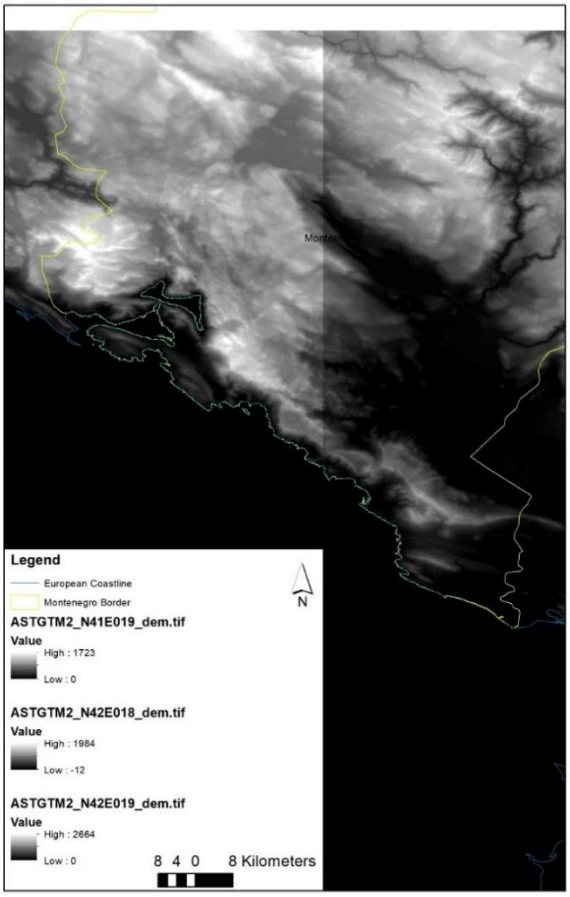
The main study area is the Adriatic coastline within the territories of Montenegro. The coastline along the country is 294 kilometres in length, and this border was used to create a buffer of 5 kilometres towards the inner lands to determine total study area.

The main material of the study consists of the global ELUs, European Coastline data and Montenegro border data provided digitally from online resources as follows:

- Global Ecological Land Units (ELUs): World_Ecological_2015.tif, Access Date (10.25.2018), https://catalog.data.gov/dataset/global-ecological-land-units-elus
- European Coastline Data: Access Date (10.25.2018), tips://www.eea.europa.eu/data-and-maps/data/EEA-coastline-for-analysis-1/gis-data/Europe-coastline-shapefile
- Montenegro Border Data: Global country boundaries, Access Date (10.25.2018), https://www.arcgis.com/home/item.html?id=2ca75003ef9d477fb22db19832c9554f

Also, digital elevation model (DEM) data of Aster were provided and used for producing aspect map of the study area. For the creation of the ELU map within the study area, bioclimate, landforms, lithology and land cover data were utilised. The ELUs within this area was extracted via ArcGIS spatial analyst tool. Figure 1 shows the DEM of the study area.

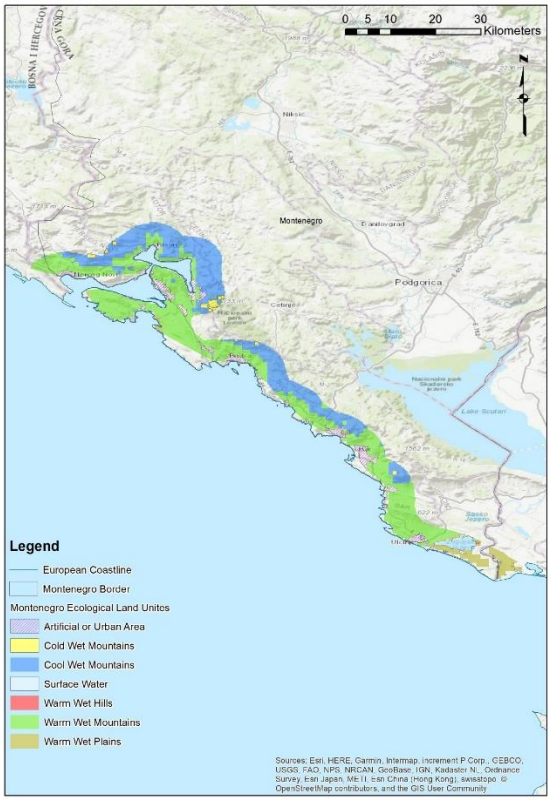
Figure 1: DEM of the study area



4. FINDINGS

The main output of this study is the ELU map of the Montenegrin Adriatic Coastline. ELUs within the study area were classified into five main categories, namely the Cold Wet Mountains, Cool Wet Mountains, Warm Wet Hills, Warm Wet Mountains, and Warm Wet Plains. Figure 2 illustrates the ELU map for the study area.

Figure 2: Montenegro Coastline ELU Map



Considering the ELUs illustrated in Figure 2, northwest and inner lands of the study area mostly comprise Cold Wet Mountains, while Warm Mountains are located at the northern parts as well as the regions close to the coastline.

Figure 3 shows the Cool Wet Mountains, while Figure 4 gives the Cold Wet Mountains in the study area. As seen in Figure 3, Kotor region, which is one of the most popular destinations in the country, comprises of sedimentary carbonate rocks with mostly croplands and deciduous forests. In the inner lands, deciduous forests and croplands can be seen. The other most visited touristic destination, Bar, on the other hand, hosts croplands and shrub vegetation. Lovcen National Park is mostly located on cold, wet mountains on sedimentary carbonate rock with mostly croplands. The topographic analyses reveal that

the 31% of the Cool Wet Mountain regions have southern exposures, followed with 19% western, 17% northern and 14% eastern. The exposure rates for the Cold Wet Mountains are 46% northwest, 46% east and 8% east.

Figure 3: Cool Wet Mountains

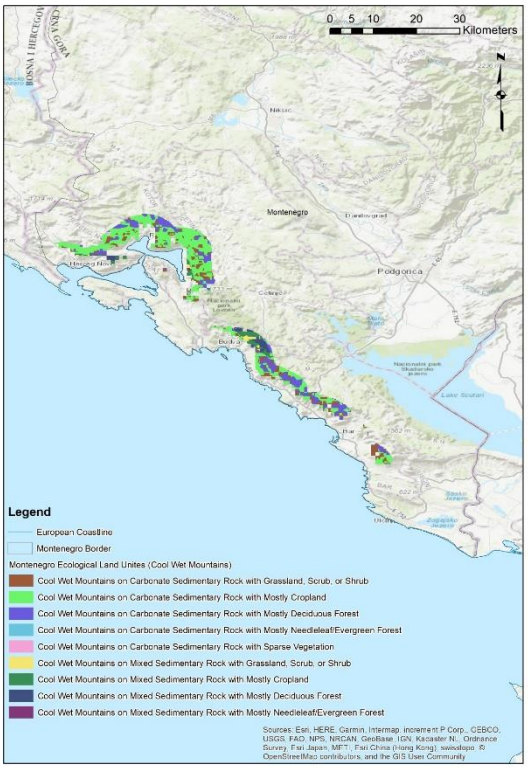
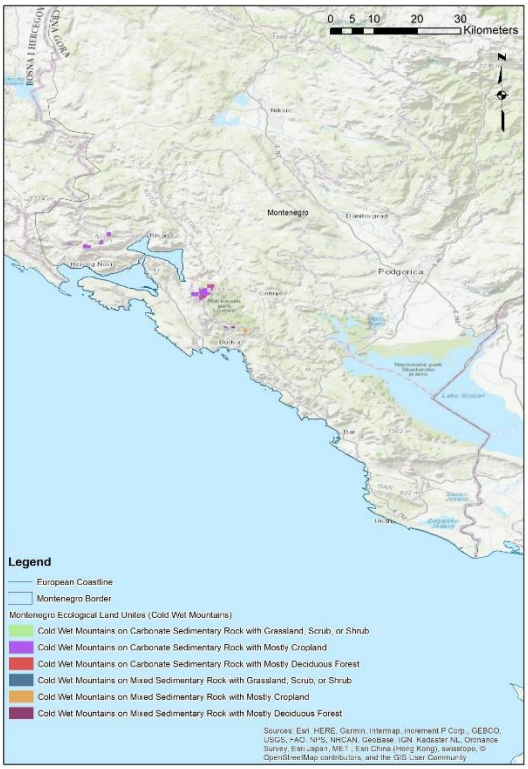


Figure 4: Cold Wet Mountains



5. CONCLUSION

The sustainability of the physical and natural environment, as well as the survival of humanity, depends on the accuracy and efficiency of spatial plans and their proper implementation. Considering the natural characteristics of the landscapes and the anthropogenic interventions and alterations, planning approaches should focus on the comprehension of the ecophysiographical features of the lands in the first place. There is no doubt that, today, such a process can be performed with the utilization of advanced technologies such as geographical information systems and remote sensing technologies, which enable us to obtain a wide range of spatial data about the planning territory, interrelate them, make detailed and complex analyses, and projections for the future (Innes and Simpson, 1993; Drummond and French FAICP, 2008). Besides, precious sources such as global ELU map, developed by Esri and USGS, play important roles in the facilitation of the

access to data and "understanding of patterns of environmental variation and biological diversity" (USGS, 2003), for performing planning application in various scales.

The unique and to some degree "untouched" natural and cultural heritage of the Adriatic region provides a huge number of advantages and opportunities for the development of the countries within the territory. No doubt, tourism and its effects in other related sectors are some of the major engines driving this development. However, unless an ecological based, interdisciplinary, holistic and sustainable planning framework is adopted, the region is likely to suffer from the devastating consequences of this unplanned and rapid development in the future. Montenegro, with its five national parks comprising 10% of its total lands, is amongst the countries in the region and welcome a great number of international tourists. Considering the ecology is located in the constitutional law of the country, it is of great significance for the governmental authorities, to proceed towards ecological planning and design a process to overcome the risks and sustain the current values in the country.

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Landscape Cognition towards the Urban Development Crisis Areas – Analysing Multimedia Texts

Lima Najjar[1] & Ayçim Fatma Türer Başkaya[2]

Abstract

This research proposes a methodological approach to reveal spatial characteristics pertinent to urban landscape crisis. The paper aims to explore the benefit of multimedia texts analysis in understanding the landscapes of human-made derived events that are led to urban development crisis. The term "multimedia texts analysis" means using visual texts of movies, videos, photographs, and all visual information with the support of sounds and other effects that may assist in the process of analysing the landscapes and their layers. This approach will be used to search the spatial alterations of specific landscape portions in the Beyoğlu district. Standing at the centre of Istanbul, this district is capable of representing the layers of landscape regarding the breaking points of its timeline. Various multimedia texts related to Beyoğlu district were analysed depending on reading visual characters of landscapes by using their indicators. The research will sum up by giving the ability, strength, and weaknesses of multimedia texts analysis to understand the landscapes and their roles within the crisis of urban development.

Keywords: Contemporary research methodologies, Multimedia texts analysis, Landscapes cognition, Urban development crisis.

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1. INTRODUCTION

This research suggests the multimedia texts analysis approach as a technique to understanding the landscapes of urban development crisis areas. The argument here is that multimedia texts have great potential as a tool of landscape character assessment for different time and circumstances within a specific area. Accordingly, this research aims to answer the question "to what extent would multimedia texts be efficiently used to understand the urban development crisis landscapes including their layers and timeline?". To do so, the research will start with the explanation of the main terms; multimedia texts and urban development crisis. We will then give a highlight of the study area of urban development crisis which is located in the historic part of Istanbul city. We then explain the methodology and discuss the results, and finally, the pros and cons of using the multimedia texts beside the recommendations will be mentioned.

1.1. Multimedia texts analysis

This research suggests the multimedia texts analysis approach as a technique to understand the landscapes of urban development crisis areas. The argument here is that multimedia texts have the potential as a tool of landscape character assessment for different time and circumstances within a specific area. Accordingly, this research aims to answer the question "to what extent would multimedia texts be efficiently used to understand the urban development crisis landscapes including their layers and timeline?". To do so, the research will start with the explanation of the main terms that are multimedia texts and urban development crisis. Then move to the study area urban development crisis which exists in the historic part of Istanbul City. After that, the methodology will be explained, the results will be discussed, and finally, the pros and cons of using the multimedia texts beside the recommendations will be mentioned.

1.2. Urban development crisis

Each area has different events happening through its timeline and during that time different layers form the landscape that emerged and caused by different circumstances such as natural and man-made events. This research will discuss the landscapes of the areas under the urban development crisis. Urban development crisis is mainly the result of man-made events which are political, social, and economic. Over the timeline of urban areas, they are affected by several breaking points that form the layers of the landscapes of through and after.

The timeline of the area refers to the period when different events take place. If these events are important and cause differences in this area in general and in its landscape, in specific, we call it a breaking point in the timeline. The landscape we see today has been formed by different layers which have accumulated through time. Some of these layers are physical such as the buildings, the means of transportation as well as green elements. Others

are soft such as sounds, experiences, and identity of an area. However, the urban population was 732 million in 1950, and it increased to approximately 3,475 million in 2010 which is an important amount considered as the crisis (Pieterse, 2008). This issue was affecting different issues in the urban areas including its landscapes.

1.3. Istanbul urban development crisis (Study area)

Istanbul has faced quite an increase in its population over the years. It had only about 983,041 inhabitants in 1950. The number rose to 13.120.596 inhabitants in 2010, nearly ten times increase within 60 years. This is a significant amount to be considered (İnceoğlu & Yürekli, 2011). This research considered the timeline from the establishment of the new republic of Turkey until today and included several breaking points from the establishment of the republic and many other historical breaking points. In these breaking points, this research studied the layers of the landscape both backward and forward. The specific area of the research will be Beyoğlu district in Istanbul City, and mainly the Taksim square. This area has historical richness beside the high number of events that took place there.

The main elements of Taksim square are the monument of the Republic of Turkey and the surrounding spaces and plazas, Gezi Park and Istiklal Street, which are available at the map below as **figure-1**.

Figure 1: Taksim square and the pertinent major landscape features

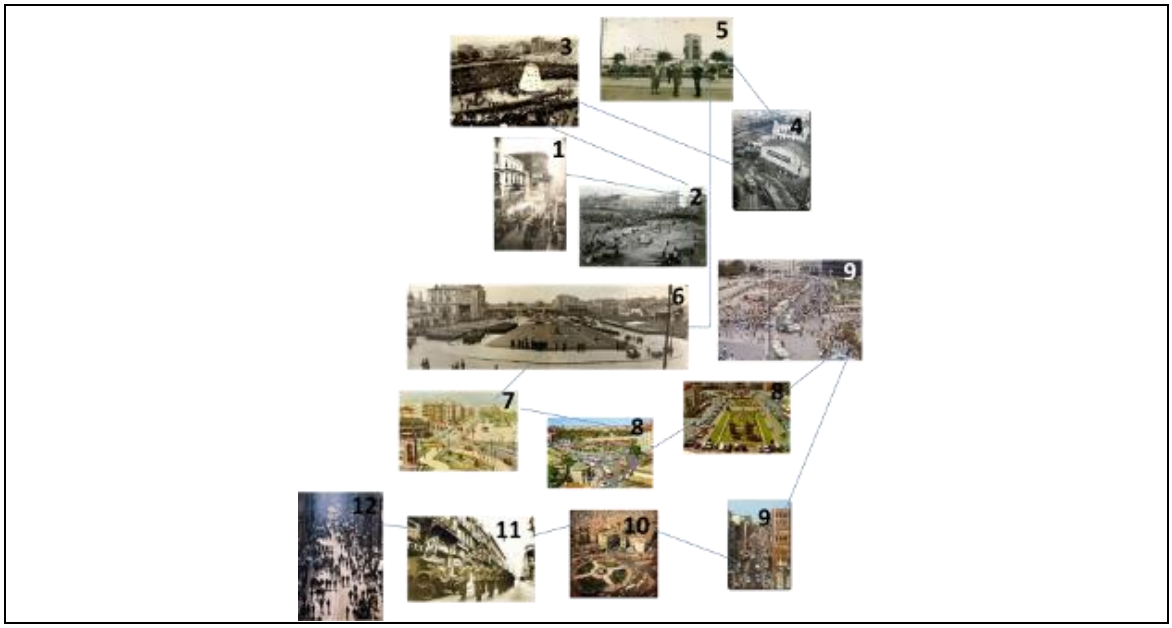
Source: Google earth (edited by author)

2. METHODOLOGY

Analysing multimedia texts is the suggested methodology in this research to be tested. This methodology could be considered as qualitative with interpretive historical research nature, but it goes further to discover how the contemporary current urban area was formed and affected by those past events (Groat & Wang, 2013). However, the multimedia texts in this research will be based on available internet photos, videos and other resources capturing different times through history about the study area which involves Beyoğlu district mainly, Istiklal Street, Republic of Turkey Monument and Gezi Park. In this study, the multimedia texts analysis will be supported by the tactics that are mentioned in two articles the first one suggested seven ways to read visual texts (reading visual texts by Walter Warner-2002). The second article discussed various indicators in order to capture visual characters of specific landscapes (Warner, 2002) (Ode, Tveit, & Fry, 2008). While the main steps of this research methodology are 1 - searching for multimedia texts, 2 - Classification, filtration, and organization, 3 - Timeline creation, 4 - Reading visual characters of landscapes using their indicators by applying backward and forward landscape analysis and 5 - make a comparison between this study's results and the other research results for the same area depending on another methodology.

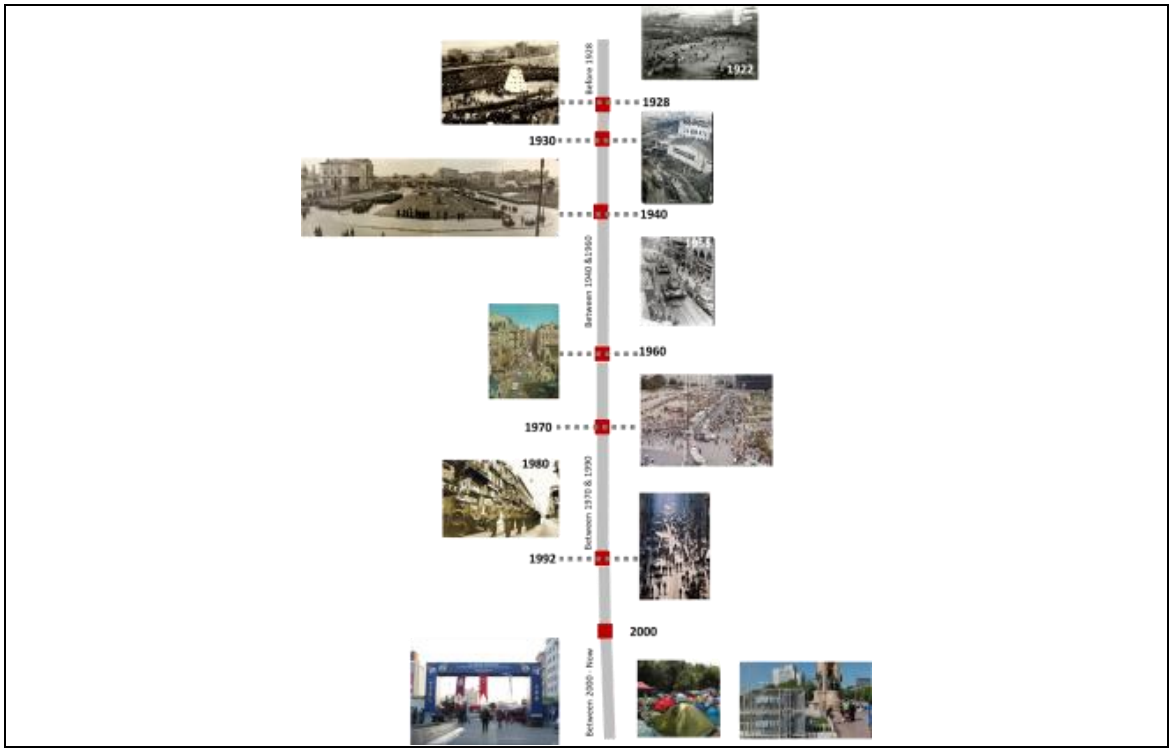
In the first step, the search for the multimedia texts and collection of all the related texts for the study area and surroundings. In the second step the classification, filtration, and organisation will be according to time and the critical event that occurred in these times the result will take us to the next step which is creating timeline figure-2. Then in the third step, the timeline created, and here the essential human-made events mentioned and visualised as breaking point figure-3. In the Fourth step, texts of the same area chosen from the past and present and analysed by layering them to the main indicators and components in the backward and forward step figure-4. In the last step, a comparison will be applied between this study result and "A Study on the Evaluation of City Identity in Terms of Spatial Quality Throughout History (Taksim Square)" by Hande Sanem research results to examine if the multimedia texts analysis leads to the same result of this study (Çınar Altınçekiç, Ergin, & Tanfer, 2014).

Figure 2: Classification, filtration and organization



Source: Different resources mentioned at the end of the paper (edited by author)

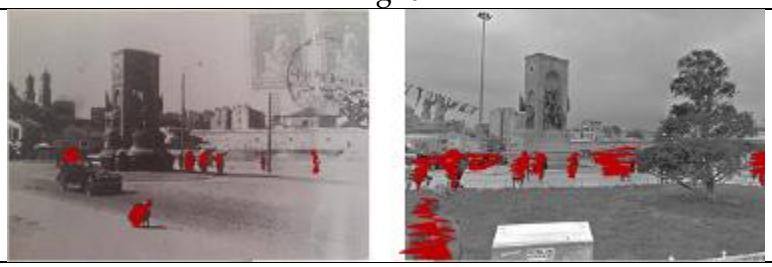
Figure 3: Timeline and breaking points through it



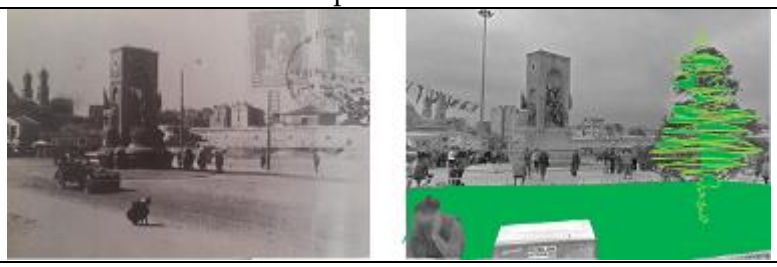
Source: Different resources mentioned at the end of the paper (edited by author)

Figure 4: Backward and forward analysis

Original photos – Statute the republic of Tukey in the thirties in the left and 2016 in the right



People densities



Green elements density

Other elements

Source: Çelik Gülersoy /Taksim: Bir Meydanın Hikayesi \ right side photo taken by the author (Edited by author)

2.1. General tips to apply multimedia texts analysis:

- During your research process of urban development within an area, you have to fix the area because this will help you understand the spaces enclosed within the area in a better way.
- Start from the map if you cannot understand the relation between spaces from the visual contents.
- If the visual texts have the known dates, it will help you if not, you need to use logical thinking to find out data from the available sources.
- If you cannot find logic, then you need to search in the objects' history like the type of clothes, models of cars and to which period it is belonging.
- It is essential to use different multimedia texts sources to take information about urban development. Additionally, for audio-visual sources first, you need to watch without sound and then with sound in case the text edited. For photographs, if there is any comment of normal text above it ignore the text for the first step and after that make a comparison between the different texts.

2.2. Study area analysis results:

Taksim square witnessed many events that led to its development to be what it is today. Below, how these events have had impacts on urban development, or how the development have affected the daily life will be mentioned.

- Before 1928: Istiklal Street was the livable part of the area while the monument part between Taskısla and the church were empty for different purposes mainly for training for soldiers and war issues.
- After 1928: the establishment of the Republic of Turkey Monument in the 5th anniversary of republic emergence occurred.
- Between1928-1930: the area was in the developing process and seemed like an abandoned area under construction. Later on, a kind of revolution happened, and the area examined a new period of urban development according to the uses that were emerged there. New buildings were established, and the area was going to be used as the city centre.
- In 1930: the area around the monument was developed and improved and became somehow as it is today as a public plaza, people used this space for entertainment.
- In 1940: a huge part of the kisla building demolished and a public park was established in the damaged area, and it has become a part of the square beside the monument which now called (Gezi Park).

- After 1940 and until the fifties: the area developed slowly and the new buildings were established in the surroundings; the multimedia texts of this period show protest activities.
- In 1960: vehicle dominated the views and Istiklal Street was opened to the vehicles' movement.
- Between1970-1990: the dominance of vehicles in the area was controlled, and a kind of balance appeared for people and vehicles presence. In this period Gazinos (nightclubs) and cinema building were increased, and people showed an increased interest for that. In the eighties emerging of political issues appeared in the photographs. The colourful market signs had dominancy in the area view at that time also.
- Between 1990-2000: it was like an extension for the previous years with no noticeable change.
- Between 2000-nowadays: in this period the number of tourists increased, and this had an effect on the landscape of the area either by the emergence of the new services to meet their need or by their direct effect visually and even in the soundscape, while during the audio-visual text analysis the dense sound of people changed in this area. Moreover, modifications appeared in Taksim square in this period mainly in the plaza close to the monument. In 2013 the square witnessed events related to a project to be done on Gezi Park that affected the landscape of the area at that time.

2.3. Results comparison

A comparison is conducted between the results of the square development in the previous section of this study by using multimedia texts analysis and the results of the article "A Study on the Evaluation of City Identity in Terms of Spatial Quality Throughout History (Taksim Square)" by Hande Sanem which depend on maps to study the development of the square. This comparison indicates that the results seem converged, which proves the efficiency of the multimedia texts analysis in studying the landscape and urban development issues.

3. DISCUSSION & CONCLUSION

This study suggested the multimedia texts analysis approach to reveal spatial characteristics pertinent to urban landscape crisis. This approach applied to study the urban development of Taksim Square. Then the results of using this approach compared with the results of another research study conducted on the same area by using a different research methodology. The results of studying Taksim square using this approach proves the ability of the multimedia texts analysis as a tool for landscape character assessment. Besides, this

approach also provides spatial characteristics of the studied area regarding varying issues such as socio-economic and political. Today, benefitting from the flux of multimedia texts available at different resources but mainly from the internet including social media; the multimedia texts would be an important source of information to study the landscape of urban development within the specific area. While the multimedia analysis approach controls the research process, otherwise, this analysis approach has several pros and cons points that will be mentioned below:

Pros:

- In maps, you can trace the physical urban development, but the multimedia contents provide the lifestyle, the soul of the place and the identity, the relation between the people and space.
- Multimedia texts afford answers to non-answered question because of the lack of information regarding some issue about the specific area.
- Multimedia texts can be an approach to study area either in the past or the current situation.
- Multimedia texts analysis can be an efficient tool to do researches in the future because of the enormous flux of multimedia contents.

Cons:

- Photos may not be available for all areas. Taksim, for example, is an essential historical area this is why many multimedia texts are available for it while for other areas may not be. Accordingly, it is suggested to conduct more research using the approach that suggested in this research but to study a small-sized and not significant areas rather than the city centre which is studied in this research.
- Sometime the bad quality of the photo may affect the results of photo analysis, but it could be avoided by the search for more quality photos from other sources.

This study highlights the importance of multimedia texts analysis within urban development studies, and it acts as an initial step for further studies not only for the benefit of the Istanbul megacity but the other urbanized areas with a rich historical background.

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https://www.youtube.com/watch?v=NfggzSZVgUE&list=WL&index=47

Distance-Learning Model Based on Information and Communication Technology for Refugee Children

Prof. Dr. Verda Canbey-Özgüler[1]

Abstract

Culture is transmitted across generations through education. Education also plays an important role in bringing people together and moulding them into competent participants in labour markets. In both developed and developing countries, however, education is confronted in all stages by significant problems. Some of these problems are immigration and migration, which negatively affect schooling in various ways. This is especially true for formal education as this type of education comprises many areas characterised by multi-dimensional structures.

Education is interrupted by the process of immigration/migration in different ways. For example, children who experience war and forced migration suffer from psychological problems and academic failure. Refugees and refugee children also generally face communication problems due to language differences, negative attitudes based on prejudice and discrimination as the most severe issues during their status as displaced populations. In line with these issues, the education of refugee children should be structured along two main objectives: to prevent their exclusion from the society and to shape them into citizens who will benefit their home countries if they can return.

Education is a crucial tool for refugee children, who make up almost half of the world's refugee population because it can prevent them from becoming the 'lost generation', unable to adapt to social life and the needs of labour markets. The current educational system for refugee children is fraught with challenges. In the context of Syrian refugees in Turkey, for instance, basic subjects are taught using Turkish as the medium of instruction. Such instructions could be carried out by remote teaching techniques. Accordingly, this study developed information and communication technology-based distance learning model that can be used as an educational tool for Syrian refugee children in Turkey.

Keywords: Refugee Children, Education, Technology

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1. INTRODUCTION

Education is the sum of processes through which people develop their abilities, attitudes, and other forms of behaviour in a positive society. Education is also a social process involving a chosen and supervised environment for facilitating individuals' personal and social development. In this context, education increases individuals' knowledge and understanding of themselves and the environment in which they live. Furthermore, education serves to create a more livable environment, prosperity, and justice in income distribution. Education is a living organism that grows and develops over time as it adapts to new requirements and conditions, making it difficult to define. Education varies by country and region as well as by year. Furthermore, theories and practices of education differ in developed and developing countries (Smith, 1967: 5-6; Çallı, 2009: 2; Akyüz, 2001).

This study focuses on the importance of maintaining and continuing formal education, despite issues such as migration, through Internet-based open and distance-learning methods.

2. RELATIONSHIP BETWEEN MIGRATION AND EDUCATION

Migration, whether voluntary or forced, is the movement of populations from one place to another and has many negative effects on individuals' lives. Education is one important aspect of individuals' lives that can suffer greatly owing to migration. The impact of education on immigration decision-making has been studied in the context of human capital theory and migration. Individuals typically cannot receive education or go to educational institutions in the desired manner owing to migration (Düzkaya ve Yazıcı, 2017: 35).

The main obstacles to refugees continuing their education include not knowing the official procedures required to benefit from the right to post-migration education, not being able to provide necessary documents, and not knowing which institution to apply to. In particular, the lack of official documents that can establish one's educational background but which are lost when fleeing conflict zones is a major obstacle faced by refugees in continuing their education. In this case, it is necessary to recognise the right of registration based on the declaration. However, citizens of the country may react negatively to this (Çopur ve Demirel, 2017: 23).

Refugees face difficulties in obtaining education owing to displacement, poverty, and lack of valid diplomas. Conflicts and the resulting displacement of people create a chaotic environment. In this situation, practices for educating school-age refugees include teacher

support, school construction, and provision of necessary literature. Nonetheless, many refugee children are still unable to access education (Yavuz ve Mızrak, 2016: 175)[2].

Refugees, especially children, cannot access education despite international conventions and regulations that protect their rights. They face obstacles such as the language barrier, poverty, trauma, violence, threats, and interruption of education. Even for those who can attend educational institutions, the expected benefits of education are not fully realized.

Education is often considered a secondary need in conflict zones. However, education should be considered a means to support both recovery and protection and rehabilitation and development, especially in conflict zones. Therefore, education should be the primary goal of all disaster and humanitarian aid efforts.

Access to education alone does not guarantee that children will benefit from it. Although enrolment rates are an important measure of success, it is equally important to ensure that the education provided is consistent with children's conditions and that continuity is maintained. The impact of the trauma and socioeconomic challenges faced by refugee children can last their entire lifetime. Therefore, it is essential to examine the quality, inclusiveness, and appropriateness of education as factors that indirectly affect access to education (Özer; Komşuoğlu ve Ateşok, 2016: 85).

The quality of education and its suitability for refugee children are evaluated regarding the following three factors.

- The infrastructure of schools (location of the school, size, and placement of classes, play areas, the distance between school and home, and transportation facilities)
- Curriculum selection (language and content)
- Educational practices (language training, pedagogy, and educational materials)

Language-related communication problems, negative and prejudicial attitudes, and discrimination are the most significant problems faced by refugees and refugee children in general. (Özer; Komşuoğlu ve Ateşok, 2016: 85).

The United Nations High Commissioner for Refugees (UNHCR) noted that before 2011, Turkey, Iraq, Iran, and Afghanistan had 10,032 Somali refugees and 6,715 pending asylum-seekers and stateless persons (UNHCR, 2011: 62). Since 2011, the Syrian conflict has resulted in the mass migration of refugees from Syria to Turkey. According to the Turkish Ministry of Interior's Directorate General of Migration Management, as of July 19, 2018,

[2] 72 million children worldwide are unable to continue their education, and half of them cannot even attend school owing to natural or man-made disasters.

among the 1,920,435 male and 1,631,137 female Syrian refugees, 541,572 had registered their biometric data in Turkey, and 235,006 were housed in 21 Temporary Accommodation Centers (camps) established in 10 cities[3].

Tablo1. Number of registered Syrians in Turkey

Age	Male	Female	Total
Total	1.920.435	1.631.137	3.541.572
0-4	272.312	254.351	526.663
5-9	246.675	231.456	478.131
10-18	348.268	302.313	650.581
19-24	312.487	221.922	534.131
25-34	357.659	261.922	619.581
35-44	191.408	159.745	351.153
45-59	136.665	130.872	267.537
60-90+	54.961	58.834	113.795

Source: https://multeciler.org.tr/turkiyedeki-suriyeli-sayisi

A large proportion of Syrians refugees in Turkey are children of age 5–18 years. Syrian children and youth show a higher rate of working in informal jobs if they are excluded from education. Syrian child labour is concentrated in industries such as agriculture, forestry, livestock, mining, construction, manufacturing, waste management, street sales, and vehicle repair (Akpınar, 2017: 22). According to the Ministry of National Education, more than 490,000 Syrian children are registered in schools in various parts of the country. However, it is estimated that 380,000 cannot attend school. Children who are forced to seek refuge in other countries owing to migration need guaranteed access to education as well as protection from child exclusion, discrimination, economic and sexual exploitation, and child marriage (UNICEF, 2017: 1).

The United Nations Children's Fund (UNICEF) is the world's leading advocate for children's rights. It collaborates with various partners to improve children's well-being and enable them to realise their full potential. At present, it is advocating long-term investments to meet the needs of Syrian children and youth. The 'Regional Refugee and Resiliency Plan'

[3] https://multeciler.org.tr/turkiyedeki-suriyeli-sayisi/ (31.08.2018).

(3RP) discussed under the 'No Lost Generation' framework is aimed at meeting the basic education and protection needs of Syrian refugee children and Turkish children.[4]

Around 7% of Syrian refugees in Turkey live in Temporary Accommodation Centers. Refugees living in camps can enjoy benefits such as food, healthcare, and education whereas those outside camps cannot. For example, 83% of children aged 6–11 years living in camps can access education, whereas only 14% of those outside camps can do so. A total of 22 schools with 850 classrooms have been established for refugees living in camps. These educate about 80,000 students at pre-school, primary, secondary, and high school levels. Nearly 3,000 Turkish and Syrian teachers work in the camps. These schools offer courses such as science, social science, mathematics, computer science, and foreign language education.

Education in refugee camps is delivered in Arabic. In 2012–2013, a revised Turkish-Syrian curriculum was created. In this curriculum, information and photos of the Baath Party, Bashar Al-Assad, and Hafez Al-Assad were deleted from the educational materials taught in Syria. Furthermore, some geographic maps were updated (Yavuz ve Mızrak, 2016: 189). Ultimately, political decision-makers of the country play a major role in determining the content of the education delivered to refugees worldwide (Eryar-Ünlü, 2016).

3. DISTANCE LEARNING MODEL BASED ON INFORMATION AND COMMUNICATION TECHNOLOGIES FOR REFUGEE CHILDREN

Information and communication technologies have shortened distances and removed borders in the world, thus making the world a global village. Communication technologies from the telegram to the Internet have shortened distances among people and enabled people to access more information more quickly. The computer and the Internet have fast become vital to daily life and are having an increasing influence even on world politics (Bozkurt, 2013).

Distance education can be used to meet the educational needs of people who cannot benefit from formal education for any reason. In this model, students and teachers are separated by a large distance, but they learn and teach, respectively, by using communication technologies and postal services. Another approach is planned learning, in which special lesson plans are used. Teaching is conducted in different environments using electronic or non-electronic systems for communication. Educational institutions have

[4] UNICEF; It works in close cooperation with the Ministry of National Education and other partners regarding the three pillars of education, namely strengthening the system and improving the quality of access to inclusive education.

started using distance-learning methods based on information and communication technologies to bring the innovations afforded by technology into education. Distance education systems afford various opportunities for both teachers and students.

Table 2. Advantages and Disadvantages of Distance Education Compared to Traditional Education

Advantages	Disadvantages
• Communication with a larger audience • Physical distance does not cause problems • Provides education to individuals who cannot attend school • Space and time become irrelevant • Students are more likely to understand subjects • Students can receive appropriate training according to individual speeds	• Initial investment cost is high • Technology systems may cause problems • Practical laboratory and workshop activities cannot be performed • Difficult to prepare curriculum • Students who cannot work on their own may be demotivated • Needs updates

Source: Altıparmak; Kurt & Kapıdere, 2011.

To educate Syrian refugees living in cities, the Ministry of National Education and other institutions and organisations are providing schools and other education centres. Some informal centres are supported by local authorities and non-governmental organisations and involve Syrian volunteer teachers and a Syrian curriculum (Yavuz and Mızrak, 2016: 191). Syrian private schools are also providing education through collaborations with international organisations and non-governmental organisations. Many of these private schools are not subject to supervision by the Ministry of National Education. As schools with good infrastructure are expensive, Syrian refugees have limited access to them. Syrians living outside camps have low school attendance rates. The number of Syrian schools is small, and Turkish schools pose problems related to the language barrier. Therefore, distance education could potentially become an important tool for educating refugee children.

Furthermore, both the host country and donors support accelerated informal education for Syrians. Syrian guests can participate in language courses offered by Public Education Centers and learn skills, hobbies, and vocational courses free of charge. Turkish

courses are also organised in camps for Syrians who want to learn Turkish. Turkish language and literature teachers who cannot be appointed for official Turkish schools often teach Turkish to Syrian students who live in camps.

The first problem faced by Syrians is the language barrier. Syrians have taken refuge in Jordan, Lebanon, Iraq, and Egypt, where Arabic is the main language, as well as in Turkey, where Turkish is the main language. In this case, language education becomes as important a problem for refugees as food and shelter. Considering that language is the main means for communicating and interacting with other individuals, the language barrier could cause many problems for both asylum seekers and citizens. The language barrier can result in the following problems: teachers cannot communicate with children, children can only communicate with their peers, children are alone in the classroom, and children cannot convey their problems to teachers and must face them alone. Families of children are not allowed to go to school and even if they do, they too face the language barrier.

4. CONCLUSION

Refugees face problems including lack of access to education, participation, and lack of teachers, coordination, physical infrastructure, curricula, and teaching materials. Children who are unable to continue their education may instead become child labourers. The ability of refugee children to continue their education is related to the degree to which they can enter the education system in the country they live in. Although the language barrier is considered the main obstacle, the educational institutions and curriculum may also pose problems. Distance-learning methods that are not limited by classrooms and that can reach students anytime and anywhere can be an important starting point in overcoming these challenges. However, a digital divide, another limitation in applications where information and communication technologies are used, may emerge. Therefore, educational institutions must evaluate and compare information and communication technology infrastructure regarding cost and feasibility and select the most suitable model to enable access to education for refugee children.

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Evaluation of Advantages and Creative Aspects of Blockchain Architecture

Arif Furkan Mendi[1], Alper Çabuk[2]

Abstract

The blockchain is a decentralised transactional database technology in which all transactions are encrypted on blocks, allowing the buyer and seller to make a secure exchange between themselves directly without requiring any third party to approve. In this transactional database technology, all transactions are recorded in a structure called "Distributed (Open) Ledger", where transactions are held and open to all users. As opposed to the traditional approach (central database), where the database is controlled by a third party, the copy of the database in the Blockchain approach is available to all participants. This prevents the data from being corrupted and destroyed. In order to be able to modify this distributed structure, the relevant changes must be recorded on all computers in the system. The success of any kind of cyber-attacks become impossible due to the necessity of accepting changes in the majority of the network. Advantages such as security, non-intermediation, and transparency in data acquisition make Blockchain technology attractive. Faced with these eye-catching advantages of Blockchain technology, companies are willing to work in this direction and tend to transfer their systems to Blockchain. However, without condition assessment, moving from the existing system to Blockchain technology may not produce positive results for companies. It is necessary to consider the necessity of fulfilling certain conditions before making such a move. In this study, the advantages of the Blockchain architecture and the opportunities created will be assessed.

Keywords: Blockchain, Blockchain System Architecture, Blockchain System Architecture Advantages, Distributed Ledger

1. INTRODUCTION

The fundamental concepts of Blockchain were developed in 1992 and used as the foundation of Bitcoin. While Bitcoin is the most popular and widely recognised cryptocurrency, the technology offered by Blockchain is used in many other currencies. It provides an incorruptible digital ledger of transactions that can be programmed to record not just financial transactions but virtually everything of value and importance. This could be everything that can be expressed in code like; title ownership, educational information,

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financial accounts, votes, medical reports and histories. Even marriage and birth certificates can be handled by Blockchain technology. Besides, exchanges of smart properties are another feature that can be managed successfully by this technology. With this wide range of application fields and examples, the attention on Blockchain technology is becoming more popular with applications. Blockchain has thus been said to be on its way to becoming the "New Internet". The reason for this assertive approach is about its revolutionary features. It is a secure "Distributed Ledger" that is shared by all parties participating in an established, distributed network of computers. It records and stores every transaction that occurs in the network, on every participating computer, essentially eliminating the need for trusted third parties such as payment processors (banks). It acts as a digital notary. Although it is a relatively new technology, the number of tasks and jobs it handles is increasing dramatically; big companies tend to work on the field.

In the Harvard Business Review, which focuses on Blockchain technology, Blockchain is introduced as an enabler that contracts are embedded in digital code and stored in transparent, shared databases, where they are protected from deletion, tampering, and revision. With this digitalisation; every agreement, process, task, and payment will have a digital record and signature that enables to be identified, validated, stored and shared. Therefore, the obligatory need of trusted third-party approvers like banks, lawyers, brokers will no longer be required. People, organisations, machines, and algorithms can individually interact and deal with each other with little friction. The immense potential of Blockchain comes from this understanding (Mooney, 2011).

2. METHODOLOGY

The main reason and attractiveness of Blockchain arise from its architecture. It is fully distributed; there is no central authority which controls what is written into the ledger. Blockchain uses advanced cryptography to ensure that the records in the ledger are never deleted or updated and that the source of the data is always identified. Blockchain systems used by cryptocurrencies are publicly available for everybody to read and write. However, it is possible to create private, permissioned Blockchain systems for confidential consortiums, where access is limited only to trusted parties. In cases where the data is sensitive, cryptographic summaries that do not reveal the data can be placed on the Blockchain instead. Hence, the system provides flexible configuration options with regarded to requirements.

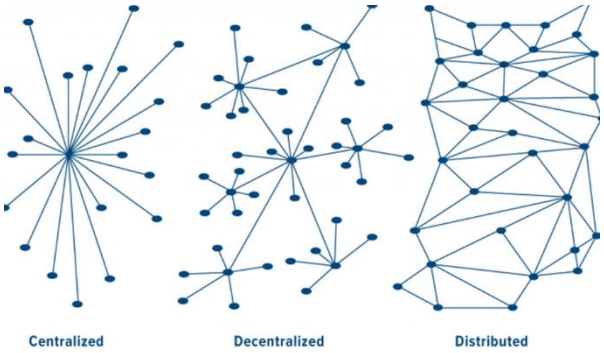
When we look into this transactional database technology, all transactions are recorded in a structure called "Distributed Ledger", where transactions are held and open to all users. While in the traditional approach (central database) the database is controlled by a third party, the copy of the database in the Blockchain approach is available to all participants. Hence the data is prevented from being corrupted and destroyed. In order to be able to modify this distributed structure, the relevant changes must be recorded on all

computers in the system. No type of cyber-attacks can be successful against the system because of the necessity of accepting changes in the majority of the network. Advantages such as security, non-intermediation, and transparency in data acquisition make Blockchain technology attractive. Faced with these eye-catching advantages of Blockchain technology, companies are willing to work in this direction and tend to transfer their systems to Blockchain. This technology is an innovation that moves with three insights. These include decentralised network architecture, public key cryptography, and distributed consensus. None of these concepts is new. A new model has been created by bringing together the three. In this study, the advantages of the Blockchain architecture and the opportunities created will be assessed.

2.1. Network Architecture

In an information system, computers are connected to make a network. In the network, various tasks are completed by different computers and data is shared among the computers. Every computer is controlled by different methods, and different ways of processing are utilised on the network: the types of networks to be preferred to vary according to the needs, and administration types. There are three types of network; Centralized, Decentralized, Distributed (See Figure 1).

Figure 1: Network Types



Source: Forbes, 2018

1. ***Centralised****:* A single authority controls, directs, and makes decisions (Tasca & Tessone, 2017). For instance; your bank can verify the singularity of transactions in a centralised network. Not only that, but the bank itself manages the fault tolerance. Imagine a customer that has $50 in the account. The bank will prevent this person from transferring $50 two times (Double spending problem) due to manipulation or a problem. If there is a problem in the system with regards to the transfer of the money, the bank will guarantee that the customer does not lose their money. The

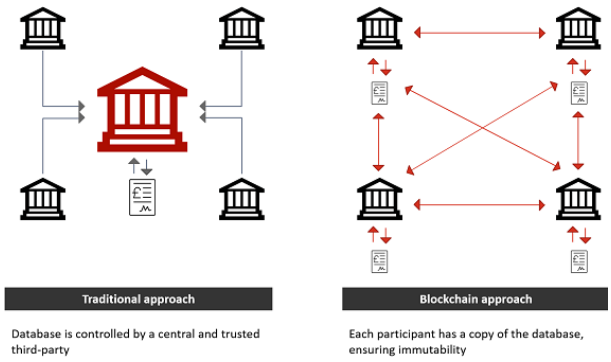
bank will also guarantee that this money can only be transferred by the customer himself. In this structure, the central organisation can be defined as a place authorised and trusted by all participants. Twitter is an example of a centralised network, where you deliver your information to a central authority, which in turn broadcasts it to the entire network within certain rules.

2. ***Decentralised****:* A system in which no single person, institution, or machine tells others what to do. Ethereum is an example of a decentralised currency, because money is no longer printed and given value by an institution, but rather created and given value by the community using it. In IT-related terms, this means there is no specific machine needed for the system to work.
3. ***Distributed****:* A distributed system is a model in which components located on networked computers communicate and coordinate their actions by passing messages (Coulouris, Dollimore, Kindberg, & Blair, 2011). With this definition, a decentralised system is also a distributed system. The distributed system is essentially the same as decentralised but can now be spread out on multiple machines. This does not mean that if one machine stops working the whole system does. A key point about decentralisation is that there's no central point of control. Large Internet applications and services are distributed, but most are centralised because the company running them can alter or stop the system. Ethereum is a distributed platform, as well as a decentralised platform. The platform allows developers to build decentralised applications, as opposed to distributed applications which run on some proprietary cloud.

As it's explained in the previous part, one of the most important features of Blockchain technology is related to its non-traditional network approach called "Distributed (Open) Ledger". Distributed ledger technologies (DLT) can be defined as the technology that allows users to modify records in a shared ledger without necessarily needing to use a central validation

A system that imposes its standards and processes (Pinna & Ruttenberg, 2016). The reason for this assertive approach is about the revolutionary features of it. "Distributed Ledger" is shared by all parties participating in an established, distributed network of computers. It records and stores every transaction that occurs in the network, on every participating computer, essentially eliminating the need for trusted third parties such as payment processors (banks). All nodes included in the system have access to this openly distributed ledger. Even a copy of this is given to all participants in the system. If we compare it with the traditional approach where the database (which is central) is controlled by a third party in the traditional approach, the copy of the database in the Blockchain approach is available to all participants. This prevents the data from being corrupted and destroyed (See Figure 2).

Figure 2: Traditional vs Blockchain approach



Source: Technology, 2018)

To summarise the database structure; While there is a "Central Ledger" created by "Central Approval and Calculation Mechanism" in traditional approach (before Blockchain), there is a "Distributed Ledger" concept created by "Decentralized Approval and Calculation Mechanism" with Blockchain approach.

2.2. Block Key Cryptography

In the decentralised network provided by the concept of "Distribute Ledger", the processes are kept on "Blocks". Chains are formed by the sequential insertion of these blocks one to another. The operations on the blocks are grouped, and there is a single chain that can be displayed for the entire network. Cryptography is used to prevent the manipulation of the blocks and add them to the end of the right chain. Controversial problems like double spending could also be eliminated with the help of cryptography whereby each agent is assigned to two types of keys. Each agent has both a private and a public key. A transaction is started when the future owner of the token sends its public key to the original owner. The tokens are transferred by the digital signature of a hash. Public keys are cryptographically generated address, and a transaction is simply a trade of tokens from one address to another (Pilkington, 2016). The stunning feature of the Blockchain is that public keys are never tied to a real-world identity which provides "Anonymity".

On the transparent network of Blockchain; each block in the chain is a reference to the previous one. The data to be kept on the block is packed with cryptographic encryption with the link information of the chain block to be added. If the data in the block or the address of the previous block connection is changed, this cryptographic code changes completely, which causes an unrecognised block in the system. This ensures the security and data integrity of the system.

2.3. Consensus

A blockchain is a ledger that contains facts and is copied between computers that are joined by the end-to-end network. There may be everything from real monetary transactions to signing. Members on the network are anonymous people called nodes. In all communications established in the network, cryptography is used to identify the sender and receiver securely. When a node wants to add a "fact" to the ledger, the consensus decides where this "fact" should be. The consensus is called block. The "Consensus Block" is the governing body and the decision maker There is the 'Distributed Consensus' method to agree whether a new block is legitimate and should be added to the chain (Charleer, Klerkx, Duval, De Laet, & Verbert, 2016).

The user who wants to send and receive in the system must have a private key and a public key attached to it. The "Private Key" is the key we need in the digital signing process we need to send someone the object we have. The public key associated with it serves both as an address for others to send objects to and allows us to open the encrypted message and check its contents with our private key while all other actors in the system check the validity of the transaction. If the message that we claim to encrypt by signing is not opened with our public key, it means that we do not have a valid claim and the transfer process is invalid.

The transfer transaction signed by the private key is broadcast to the P2P network. That is, the message is sent to all the nodes we are connected to, not just the recipient, but the entire network. The nodes receiving the message for the first time also check that the process is legitimate and valid, and then release it to the nodes to which they are connected. So, in a short time, the transaction spreads across the entire network, including our receiver. The nodes that receive the message use our public key to try to open the message content by decrypting and checking the content. If this validation fails, the message is rejected, and the transaction is considered unsuccessful.

Successful transactions are taken on a node called miner to a list defined as "Unconfirmed Transaction Pool". The "Unconfirmed" statement here should not be construed as conforming to the rules and its validity not being checked. It refuses to receive a message that is inappropriate for the rules. The intention here is that the transaction has not been added to the blockchain yet in a block. This transaction needs to be confirmed in order to add blocks to chain and complete the process. This confirmation is done by "Mining". There are two outstanding mining methods, "Proof of Work" and "Proof of Stake."

2.3.1. Proof of Work (PoW)

Distributed Consensus should be provided to agree whether a new block is legitimate and should be added to the chain. This requires a participant's computer to perform a significant amount of computational work before it can try to add a new item to the shared

Blockchain. To create a false Blockchain and get that accepted by consensus would be prohibitively difficult. Therefore, Proof of Work (PoW) and its method mining comes to play (Charleer et al., 2016).

Miners compete for unconfirmed transactions to create a list that does not exceed a certain size called a "block". They try to find a number (hash) for each block that provides a special condition that varies depending on all the transactions put into that block and references a previous valid block, which cannot be computed by a standard formula but can be found in a large number of brute forces. The miner who finds this value first publishes the new block, the hash value they find for the block, and another numerical value network called "nonce" which allows it to reach that hash at the end of trial and error to reach this hash.

The miner who completes this transaction first and adds the block at the end of the appropriate chain receives the reward of this transaction and the transfer fees called "transaction fee" specified by the senders in the transactions on that block. The process of finding the values of Hash and nonce checks the validity of transactions and ensures that valid blocks are generated from valid transactions. This process is called "Proof of Work" because it requires a lot of CPU power and needs is proved by finding a valid hash and nonce.

While it may be necessary to try trillions of "nonce" values to find the correct hash value of a block, confirming or rejecting the claim of another miner who claims to have found them is just one step. If the block, hash, and nonce values are consistent, the miners will accept this block correctly and start to work on a series of unconfirmed transaction orders from the pool again to add the next block to the end of this block.

2.3.2. Proof of Stake (PoS)

Another type of authentication for network operations is PoS. This method is not even mining, because users do not have to do anything to make any new money. For this reason, the name is not “Mining” but “Minting”. Hence, it is not mining but printing money. In this method, you need to keep goods in your electronic wallet to mint new money. Your winnings will be directly proportional to the number of goods you hold in your wallet.

Compared to the PoW method, it saves cost by a great margin. The cost of electricity consumption is almost zero. Also, investors are encouraged to invest more because the rewards are based on the number of goods in their wallet

The PoS method was first used in 2012 by some alternative crypto money. At the moment Ethereum is making preparations to switch from PoW to PoS. Most newcomers like Peercoin, Ohm coin, MorningStar, OkCash use the PoS method.

Different consensus models are also available in addition to PoW and PoS methods. Validation methods vary according to the needs of the Blockchain system to be installed. While PoW and PoS methods are predominantly preferred when a system with cryptocurrencies is involved, appropriate validation methods that fit for the application should be used when a different type of application is configured.

2.4. The Advantages and Usages

We discussed the advantages of Blockchain's decentralised database structure in previous chapters. We can summarise these basically under four headings:

1. ***No need for third-party approval:*** Due to the decentralised data structure, a reliable central authority is not needed. In this way, both the cost of operations is reduced, and the maintenance of the system can be done at lower costs.
2. ***Transparency:*** It is possible for all participants in the network to view all data in the system since all activity records are kept in the open ledger. All transactions on the network can be followed in a transparent manner, so data manipulation is prevented. It is an ideal platform to keep track source from which the entity in the system goes and which people pass by and where.
3. ***Privacy:*** Although all participants in the system can see all of the transactions, they cannot see the information that relates the transaction to the identities. On the one hand transactions are transparently displayed, on the other hand, the confidential information of users is not decrypted.
4. ***Security:*** The system is attack-resistant. Networks that are decentralised are often not economically beneficial to attack. The reason for this is the fact that there are no crucial central control points to attack. The economic size surrounding the system is much larger and therefore much more expensive to attack. Let's say that an attacker manages to control 51% of a Blockchain. It would not be economically beneficial for the attacker to harm the network as the value within the network would plummet. Also, **f**ault tolerance of the Blockchain system is pretty high. Decentralised networks are less likely to fail because there are so many different machines that make it up. It would be hard to target each system to bring down an entire network. As we mentioned above, even when cutting as much as half of the network apart, both would still be able to function without the other. If an individual or institution had 51% of control of a network, Attack Resistance would still be a protective factor.

With all these advantages, Blockchain has become popular in recent years. Lots of companies and organisations have decided to develop Blockchain based systems or move the existing systems to Blockchain. When we look at the developments on the wide spreading of Blockchain technology, we can see some examples like listed below:

- Big Dutch Banks like ABN Amoro, ING Bank, RaboBank started working on the topic of Blockchain at the end of 2014 (Petkovic & Arnab, 2018).
- Deutsche Bank and Golden Sachs gave a signal in a direction to move to Blockchain through emphasising the importance of Blockchain (GoldmanSachs, 2018).
- Master Card announced that they are continuing to work on Blockchain. They even have patent applications for instant Blockchain payment transactions which can be counted as strong evidence of their intention (Zhao, 2018).
- India's largest bank, the State Bank of India (SBI), has conducted studies on the use of Blockchain smart contracts and announced that they would be using them in the coming period (Agarwal, 2018).
- Akbank was the first Turkish bank to deal with Ripple, a technology firm that offers solutions that increase transparency and speed and reduce costs by using Blockchain technology for international money transfers ("Akbank Blockchain," 2018).
- The Central Bank of the Republic of Turkey announced that "Blockchain Working Group" will be set up soon and will consist of the Banking Regulation and Supervision Agency, the Capital Markets Board and the Treasury Department (Papuççiyan, 2017).
- In Canada, the Blockchain will be used for digital identities. The new digital identity was developed by Secure Key Technologies and was supported by IBM. It was announced that consumers would be able to sign up for this new digital identity system in the first half of 2018. In this way, users will be able to instantly verify their identity against bankers, telecom service providers, and even official authorities. Since the user information is not gathered at a single point, the possibility of hacking this new digital identity system will be greatly reduced (Alexander, 2018).

As can be seen from these examples, Blockchain is becoming more common. Faced with these eye-catching advantages of Blockchain technology, companies are willing to work in this direction and tend to transfer their systems to Blockchain. However, without condition assessment, passing the existing system to Blockchain technology has not produced positive results for companies. It is necessary to consider the necessity of fulfilling certain conditions before passing the existing system to Blockchain technology. GARTNER company has prepared a report related to Blockchain in which it is advocated that Blockchain Technology should be used in situations that meet the requirements of the application. The report says that Blockchain technology should not be used automatically because one needs to re-platform an existing application. The risks need to be analysed well, and a mitigation plan prepared. Then the critical decision about the Blockchain project could be taken as three types; beginning the project, terminating the use of Blockchain, changing the scope. If the benefits outweigh the costs and the project manager could handle the risks,

then beginning the project with Blockchain technology could be a good choice. However, if the costs are too high, the project manager may want to change the scope and then begin the project with Blockchain. Besides, Blockchain may not suitable for the project at that time, so the project manager may decide to wait for the technology to reach the maturity or may withdraw the demand of using Blockchain (Panetta, 2017).

The blockchain is a platform where stakeholders are managed on the same platform, where agreement is made, and after this reconciliation, the trade of the subject matter is made possible. Therefore, if these conditions are not met, choosing Blockchain will be very harmful because it will only be a fashion technology. In the existing system or the new system, we want to develop, if there are different stakeholders, if there is data transfer between these stakeholders with the need of agreement between them, then it would be sensible to use Blockchain technology after considering the risks. Otherwise, using Blockchain technology blindly without fulfilling these prerequisites may not be beneficial for the project, rather it may be financially damaging.

3. CONCLUSION

The blockchain is a decentralised transactional database technology in which all transactions are encrypted on blocks, allowing the buyer and seller to make a secure exchange between themselves directly without requiring any third party to approve. In this transactional database technology, all transactions are recorded in Distributed (Open) Ledger where transactions are held and open to all users. Contrary to the traditional approach (central database) where the database is controlled by a third party, the copy of the database in the Blockchain approach is available to all participants. This prevents the data from being corrupted and destroyed. While in the decentralised network provided by the Distribute Ledger, the processes are kept on blocks which form chains by the sequential insertion to one another. Public Cryptography is used to prevent the manipulation of the blocks and add them to the end of the right chain. Thus, double spending and other security-based controversial issues could also be eliminated with the help of cryptography. Besides, to be able to modify this distributed structure, the relevant changes must be recorded on all computers in the system. The success of any kind of cyber-attacks become impossible because of the necessity of accepting changes in the majority of the network. Advantages such as security, non-intermediation, and transparency in data acquisition make Blockchain technology attractive. With this attraction, lots of companies have decided to move their systems to Blockchain. Also, new systems have begun to use this technology. Although Blockchain is an eye-catching technology with all its advantages, the system requirement should be handled carefully to decide whether Blockchain is appropriate the system that desired.

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Blockchain Applications and its Future

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Abstract

Blockchain technology is one of the most popular technologies in recent technology trends, but we can see that the answer to be asked about the definition of Blockchain is largely on the bitcoin rather than Blockchain. Although Bitcoin is an application that has been developed using Blockchain technology, it has gained more and more recognition from Blockchain technology, along with the elevation that most people are not expecting from the financial standpoint. Blockchain technology enables clients and providers to operate securely with each other directly without the need for a third party to approve. All transactions are stored in a distributed database using cryptography so that this exchange between client and provider can be done securely. In order to be able to modify this distributed structure, the relevant changes must be recorded on all computers in the system. In order to succeed in any chain of cyber-attacks, it is necessary to verify over 50% of the computers, which makes the probability almost impossible. When we combine the reliability of Blockchain technology against cyber threats and the demands of clients and providers to make a secure purchase, many application areas for Blockchain begin to emerge. Many different field applications have been developed using Blockchain technology and are still being developed. Smart contracts, the Internet of Things (IoT) are the most popular of these areas. Up to date many applications have already been developed, and it is predicted that the number of applications will increase in the coming period. In this study, we will be reviewing the applications developed by the Blockchain technology and describing possible use scenarios in the future.

Keywords: Blockchain, Blockchain Applications, Blockchain Future

1. INTRODUCTION

The blockchain is a decentralised transaction and data management technology. Bitcoin cryptocurrency was the first to start using this technology. Interest in Blockchain technology has been increasing since the invention of Bitcoin in 2008. It is due to the decentralised characteristics that have helped boost the interest in the Blockchain. These features include security, anonymity and providing the data integrity without any third-party control of transactions.

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Currency transactions between persons or companies are generally centralised and controlled by a third-party. A bank or credit card provider is required as a means of completing a digital payment or money transfer transaction. Also, these agents charge for each transaction. The same process applies to many other areas such as games, music, software. The system of this process is centralised; all data and information from the two main entities involved in the transaction are controlled and managed by a third party. The Blockchain technology was developed to solve this problem. The goal of Blockchain technology is to create a decentralised environment in which transactions and data are not under the control of any third party.

The blockchain is a distributed database solution in which a list of continuously growing data records is stored, and the validation process is performed by adding the nodes (chains) to each other. The data are recorded in a "Distributed Ledger", where information on each completed transaction is included. Information on all operations completed in Blockchain is shared with everyone and can be used by all nodes. This feature makes the system more transparent than the central operations of a third party. Also, all of the nodes in Blockchain are anonymous, which makes it safer for other nodes to verify operations.

Blockchain technology enables clients and providers to operate securely with each other directly without the need for approval by a third party. All transactions are stored in a distributed database using cryptography so that the exchange between client and provider can be done securely. In order to be able to modify this distributed structure, the relevant changes must be recorded on all computers in the system. In order to succeed in any chain of cyber-attacks, it is necessary to verify at least 50% of the computers, which makes the probability almost impossible.

There are five basic principles that underly the Blockchain Technology (Mooney, 2011):

- **Distributed Database:** Each member in the network has access to data with the entire history. There are no single control points or central authority.
- **Peer to Peer Transmission:** Communication is directly between peers instead of through a central node. Each node stores and forwards information to all other nodes
- **Pseudonymity:** Every transaction and its associated value are visible to anyone with access to the system. Each node, or user, on a Blockchain, has a unique address that identifies it. Users can choose to remain anonymous or provide proof of their identity to others. Transactions occur between Blockchain addresses.
- **Irreversibility of Records:** Once a transaction is entered in the database and the accounts are updated, the records cannot be altered, because they are linked to every transaction record that came before them. Various computational algorithms and approaches are deployed to ensure that the recording on the database is

permanent, chronologically ordered, and available to all others on the network. In order to succeed in any chain of cyber-attacks, it is necessary to verify at least 50% of the computers, which makes the probability almost impossible.

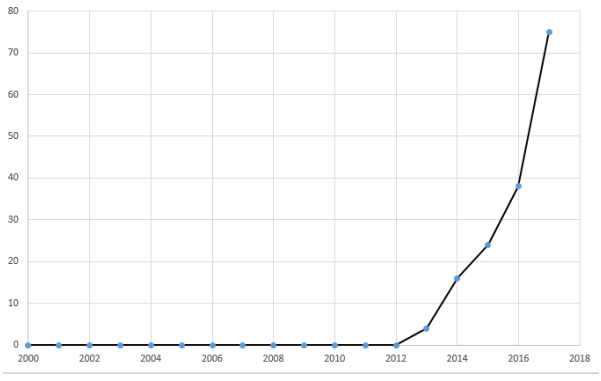
- **Computational Logic:** The digital nature of the ledger means that Blockchain transactions can be tied to computational logic and in essence programmed. Hence users can set up algorithms and rules that automatically trigger transactions between nodes.

After evaluating all these advantages, many companies start to develop new applications on Blockchain. When we combine the reliability of Blockchain technology against cyber threats and the demands of clients and providers to make a secure exchange, areas of application of Blockchain emerge. Many different field applications have been developed using Blockchain technology and are still being developed. Smart contracts, the Internet of Things (IoT) are the most popular of these areas. Up to date many applications have already been developed, and it is predicted that the number of applications will increase in the coming period. In this study, we will be reviewing the applications developed with the Blockchain technology and describing possible use scenarios in the future.

2. LITERATURE REVIEW

Blockchain technology can be said to be in the shadow of Bitcoin's popularity since 2008 when Bitcoin came into operation. However, especially in the last four years, awareness of Blockchain has increased, and many studies have been done in this area. When we look at the literature on Blockchain applications in large databases (such as Science Direct and Knovel), we notice that the vast majority of the studies done until 2012 are on Bitcoin. After 2012, studies on other areas of Blockchain started, especially after 2013 where we see a serious increase in the number of applications (Figure 1).

Figure 1: Blockchain Works in Literature



3. METHODOLOGY

Before we started this study, we had to be determined whether to include the studies related to Bitcoin or not. Although Bitcoin is a hot topic of today, it is not a new field of application, and it is the most popular usage of Blockchain technology. It can easily be said that Bitcoin and other cryptocurrencies are here to stay and continue on the Blockchain infrastructure. Thus, we decided to exclude Bitcoin from our scope.

With the growing popularity of Blockchain, the number of applications built on this technology is increasing. Although the application fields of Blockchain are pretty wide, Smart contracts and the Internet of Things (IoT) are the most popular of these areas.

3.1. Smart Contracts

Smart Contracts, Smart Ownership, Digital Content Distribution, are the areas where Blockchain is commonly used. Since smart contracts form the basis of all these applications, it would be more appropriate to think of it as an application platform instead of an application field. By using smart contract platforms, we can develop the above applications.

The idea of smart contracts was originally proposed by Nick Szabo in 1997 (Nick Szabo, 2018). However, the idea of using Bitcoin Blockchain to track ownership status and transfer of property was first described by Mike Hearn in the article about "Smart Property" (Mike Hearn, 2018).

Ethereum, Bithalo, Hyperledger, Filecoin, Electronic Contract Signing are some of the popular applications of Blockchain Smart Contracts.

3.1.1. Ethereum

When we look at popular applications that offer smart contract infrastructure, Ethereum appears as the first. Ethereum is a cryptocurrency like Bitcoin. It is also based on a decentralised database structure using Blockchain technology. Its main difference from Bitcoin is that it allows some smart contracts (Founder & Gavin, 2017). Ethereum was designed and coded by Vitalik Buterin and his team, and it was first announced on 30 July 2015 at the Bitcoin conference. Ethereum, which departed in August 2015, stands out with Ethereum protocols, which allow the creation of other sub crypto coins within the same operating system and over the same block of chains, especially through decentralised software protocols. Many of the sub coins we know of now are based on the Ethereum infrastructure. Ethereum offers the most widely used smart contract infrastructure. Therefore, it can be used as a computing platform (Huckle, Bhattacharya, White, & Beloff, 2016).

Short validation time needed while adding a new block is another advantage. It takes 10 minutes for a block to form in Bitcoin, while in Ethereum smart contracts this is only 12 seconds (Huh, Cho, & Kim, 2017).

In the light of advantages listed above; the need for less time to validate, a platform that is ready for development and successful examples using the application shows the attraction of Ethereum.

3.1.2. Bithalo

Bithalo regards itself as the mother of smart contracts. We can say that the service that is presented is a smart contract protocol (Bithalo, 2018).

What is the difference between Ethereum and Bithalo? Bithalo is a protocol for implementing agreements. If we need to use a business game theory protocol, we can say that even Ethereum will have to use it to implement its contracts. The Bithalo contract protocol presently in the market can be said to be the best there is. For this reason, we can say that there is no competitor in the field of contact protocol in the short term.

On the other hand, Ethereum allows users to develop smart contracts with flexible configuration. These developments are at the initiative of the developers. They configure the application and also do coding. Therefore, they need to consider issues such as data size and security that will arise due to flexibility.

When we look for an example of the usage of Bithalo; Bigi comes to the fore. Bigi has developed a decentralised smart contract protocol inspired by Bithalo. We can say that the feasibility of this protocol, based on Bitcoin's protocol, has been confirmed. The approach a combine's game theory and official models. After evaluating this example usage, contract system is a promising approach and is worth further study and development (Bodei, Ferrari, & Priami, 2015).

3.1.3. Hyperledger

One of the main problems of implementing Blockchain technology is that the standard does not exist. The open source system prevents many different software groups from creating a standard for different ideas to be constructed differently. In order to solve the problem of not being able to create a standard, a group of about companies including big technology companies like IBM, Cisco, Fujitsu, and financial institutions like J.P. Morgan, and Accenture came together and established an Open Source Code Group named "Hyperledger". Linux Foundation Group is behind the organisation. In July 2017, Fabric 1.0 was on the market. In February 2017, Sawtooth published the 1.0 version into the market. These two versions aim to create a mature version for developers with the feedback they will receive after use. With these consortium activities continuing to bring them to the mature level, companies are required to create a giant infrastructure that will provide transfer of funds between the sectors. With this infrastructure, it is thought that awareness can be created in the internet world and finance field (Hyperledger, 2018).

3.1.4. Filecoin

Filecoin is another application example of a smart contract. Filecoin enables users to rent out discs they do not use with smart contracts. Users earn Filecoin cryptocurrencies through hosting file. Also, exchange of filecoin with other currencies (USD, BTC, ETH etc) is also supported in the system (Filecoin, 2018).

3.1.5. Electronic Contract Signing Without Using a Trusted Third Party

Electronic contract signing is the other example where smart contacts could be used. Wan and others offer a method that allows two potentially distrustful parties to digitally sign an electronic document simultaneously across a network. Even though there are similar solutions for the electronic contract signing, they either require the involvement of a trusted third party or are complex and expensive in communication and computation. They propose an electronic contract signing protocol between two parties with no need of any trustful third-party approval and guarantees fairness between the two signing parties. This is achieved by employing a trustworthy timestamping service in the protocol (Chen & Walsh, 2015).

3.2. Internet of Things (IoT)

Although the concept of smart contracts is thought to be the basis of Blockchain applications, the concept of the internet of things (IoT) has become increasingly popular with the increasing number of smart devices. There is a need for solutions such as security, keeping the devices synchronised, and updating the software of the devices. The concept of "Blockchain of Things" emerges with the realisation that these constraints can be eliminated by the advantages of Blockchain.

IBM considers the Blockchain-IoT relationship to be the framework for communication and coordination between devices. Each intelligent device manages its roles and behaviours and consequently the concept of "Internet of Decentralized, Autonomous Things" emerges. It is indicated that this will enable the democratisation of the digital world (Brody & Pureswaran, 2015). With the excess number of IoT devices, the devices must be kept synchronised and they are not be affected by any problems on the server. Huh, et al. claims that IoT devices can be held synchronously. They also argue that Blockchain's distributed ledger data structure can solve these problems, and can also protect against cyber threats such as DOS attacks with the consensus model (Huh et al., 2017).

Christidis et al. point out different issues. They state that the centralised approach of IoT platforms has increased the cost of sustainability and that transparency and security have to be provided, which is why Blockchain is an important opportunity. In case of switching to Blockchain, manufacturers will send their latest firmware updates on the network with smart contracts. The devices receive this information and can be ordered according to the availability of the contract. After a certain period, the manufacturer may

stop supplying the firmware. All of this is done without any user interaction over the network. Also, service payments can be made through the layers where payments are made with crypto money, and the transfer process is performed (Christidis & Devetsikiotis, 2016).

Distributed network applications are described as Dapp. Huckle talks about the revolutionary features of the IoT and Blockchain systems working together and gives some examples of applications, adding that these applications will grow in the future and include examples of potential use (Huckle et al., 2016). Below are some up-to-date Blockchain Dapp applications and ideas.

3.2.1. Slock.it

With Slock.it application, Airbnb apartments become fully automated, the smart property can be rented on demand, and unused vehicles get a new lease on life (Slock.it, 2018). The users can rent out their homes and cars without third party involvement. The buyer can directly pay to the seller with Ethereum based smart contracts. After the deal is approved by both sides, the lock on the smart property (home, car etc.) is removed, and the buyer starts to use the property. This could be counted as a revolutionary application field of Blockchain. It can be predicted that this application will be spread all over the world.

3.2.2. Micropayment API Market Place

21 Market Place created a virtual marketplace where APIs were exchanged. In this market, which allows developers to make digital product purchases in the first stage, you need to have computers called "21 Bitcoin Computers" to be able to buy and sell (John Granata, 2018). We can call it a micro-payment marketplace where PayPal-like applications are made over bitcoin. It is the first micropayment API marketplace. It can be said that this application is guiding other micropayment applications.

The EtherAPI application is similar to the 21 marketplace application. API exchange with micropayment over a decentralised, secure network could be done on this Ethereum based application as well.

3.2.3. Energy

The energy sector is one of the areas where Blockchain applications are being used and are expected to increase in future use. With the peer-to-peer connection, machines can sell or buy energy. A look for application examples finds with a system in which energy generated from solar energy developed by Transactive Grid Company is made available through smart contracts. In practice, much of the energy generated in solar panels in New York is sold to neighbouring regions by smart contracts ("Blockchain-based microgrid gives power to consumers in New York | New Scientist," 2018). Therefore, this is the live example of Blockchain usage in the energy field.

3.2.4. Supply Chain Management

Supply chain management is at the forefront of the hot topics on the agenda, especially with the concept of Industry 4.0. The advantages of Blockchain applications also show that it can be used in supply chain management. The delivery process of a container that has been procured can be monitored by IoT devices without the need of any other participants. When the buyer and seller come together, the current delivery with smart contracts can be approved, and a new smart contract can be prepared for the next delivery step. Different uses of Blockchain can also be adopted in this area, and we will certainly be confronted with various applications in the future with the concept of Industry 4.0.

Filament company stands out with its Blockchain based supply chain tracking system. It creates mash nets with long-range radio sensors called '"Taps" ("Enabling the Future of IoT Filament," 2018). Through these networks, they leap through a protocol called Telehash, communicate securely with each other, and interact with each other through smart contracts on a common platform provided with Blockchain ("Telehash - encrypted mesh protocol," 2018). Sensors do not connect to the Internet to reduce deployment costs, but they can connect to the gateway nodes that provide this connection.

3.2.5. IoT Sensor Data Exchange

The purchase of IoT sensor data is a concept that has been repeated many times in the literature. Dominic Wörner proposes a system of exchanging sensor data for bitcoins. After the buyer and seller agree on the system in which it is presented, when the sensor data in the data warehouse is transferred to the buyer side, bitcoins are transferred to the account of the seller in the agreed amount of this data (Wörner & von Bomhard, 2014).

Zhang and Wen have taken this approach a little further, and based on the Bitcoin and Blockchain protocols, have designed a new generation of cryptocurrency called IoT coin. On the IoT cryptocurrency, People can use it to replace paid sensor data or smart property. IoT coins can be used to present ownership of many IoT products such as smart property, paid data and digitally controlled energy (Zhang & Wen, 2015).

3.2.6. IoT Energy Saving Application

When we look at the applications of IoT Blockchain applications in smart home systems, we see an energy saving application prototype using Ethereum smart contracts. A smartphone and Raspberry Pi 3 are used. Raspberry Pi 3 is used as a counter to measure high electricity consuming devices such as air conditioning, air conditioner, and light bulb. Using a smartphone, the user can set the policy. For example, the user can set the devices to turn on the energy saver mode when the power usage is 150 kW. When the user installs the configuration on a smartphone, the data is sent to the Ethereum network. In the meantime, devices such as light bulbs or air conditioners periodically receive policy values from Ethereum. The meter also monitors the electricity usage and updates it on Ethereum. Thus, three different processes occur simultaneously in the system (Huh et al., 2017). New

combinations or creations of such applications could be observed in the future with the increasing usage of smart devices at home. Thus, we can say that the number of smart home system applications will increase.

3.2.7. Storage Audit

Conoscenti argues that Blockchain can be used to enforce storage controls that are useful for detecting any unauthorised deletion or modification of data. These checks are performed by storing the hash code of the data in the Blockchain. The data owner then periodically sends a request to the server of the data and checks the correctness of the response using the hash value in the Blockchain. Any unauthorised deletion or alteration of data triggers an incorrect response so that any abuse can be detected (Conoscenti & Carlos De Martin, 2016).

3.2.8. Autopay

Blockchain's in-car usage can be seen in the "Autopay" application. With the application, the work route automatically appears when the user leaves the house to go to work with the "Journey Planner" module. If it is determined that fuel is needed, the route is updated to arrive at the most favourable fuel station. After the fuel is received, payment is automatically made by smart contract. Then, if the parking lot at the workplace is full, it is directed to the nearest car park and paid again by smart contracts. Besides, for the needs of the daily house needs "Smart Basket" module is used. Through the module, the most appropriate market is found, and order is given. It is also ensured that the market needs are at home at the time of the user's return home. Again, this is done with smart contracts to pay. In the Autopay application, it is also possible to disable or limit all of these features if the system is used by another driver (Huckle et al., 2016).

3.2.9. Currency Accepting IoT Enabled Smart Kiosk

When people return from their international travels, generally they are left with some amount of money from that country. The problem is about the type of currency because that currency becomes unusable after returning to home country. A 2015 travel weekly report recorded a %20 rise in international travel. Given the ever-increasing number of international travels, recycling of these foreign currencies becomes important. With the proposed Blockchain application, after he travels abroad, the remaining currency of that country is released to the smart kiosks which are located in the airport with smart contracts. The user who goes abroad and needs currency of the country will go to the kiosk where they will receive the amount of the money at an exchange rate that determined by the user who has left the currency. In this way, the commissions of third-party foreign exchange offices are removed from the market, enabling the buyer and seller to make profitable and reliable purchases. (Huckle et al., 2016). Although this is just an idea, it can become an application and used in the future.

3.2.10. Digital Right Management

Artwork owners mainly suffer from not getting the paid commensurate royalties even though their work is being used. The solution to this problem is provided by the use of Blockchain. For example, Kishigami and others provide a Blockchain based digital content distribution system and offer a prototype of the concept. The idea was presented to 100 people, including content creators, content owners, and content owners with digital content. The reviewers were most impressed by the decentralised mechanism for Digital Rights Management (Kishigami, Fujimura, Watanabe, Nakadaira, & Akutsu, 2015).

Similar to Kishigami's suggestion, Huckle suggests a Blockchain application for the protection of digital rights. In this way, the copyright will be paid seamlessly for both the works and the related expenses (distribution and mechanical expenses etc), and the payment will be made instantaneously (Huckle et al., 2016). With these kinds of Blockchain digital right management applications, the problem can be solved.

4. CONCLUSION

The blockchain is a decentralized transaction and data management technology. Interest in Blockchain technology has been increasing in recent years. The reason for this interest is due to the advantages accrued to the decentralization of the system. These are; security of transactions, anonymity, and integrity of data without any third-party control of transactions. With these advantages and more, the number of applications that are developed on Blockchain is getting higher. Although the application field of Blockchain is pretty wide, Smart contracts and the Internet of Thing (IoT) are the most popular of these areas. As far as smart contracts are concerned Ethereum seems to be the most conspicuous Blockchain applications which provide the platform to define smart contracts for users. In addition to this, Hyperledger started with the principle of being able to create a standard framework for Blockchain with the support of the Linux Foundation group. In future, it is expected that the number of applications developed on the infrastructure from these two organisations will increase. IoT is the other usage area of Blockchain with a lot of existing and model application ideas. The concept of "Blockchain of Things" emerged because of the huge amount of potential/active usage in this field. With the advantages of security, keeping the devices synchronised, and updating the software of the devices, Blockchain and IoT relation will increase. Due to the increasing need for the applications that enable the buyers and sellers to exchange goods securely without a third party, Blockchain-IoT applications will rise. In this manner, we predict that the number of applications like "Slock.it" that enables users to rent out their smart properties will increase. For example, it can be predicted that applications like UBER may consider using Blockchain technologies with their applications. Besides, the use of artificial personal assistants is also emerging as another potential area. With smart assistants, the daily work of the people can be planned and

carried out safely with smart payment possibility. We thus expect to see an increase in the number of "Autopay" style applications.

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Climate Change Impact Assessments on the Water Resources by Using Geodetic Techniques

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Abstract

In addition to the inadequacy of limited natural resources, efforts to find solutions to the natural and social repercussions of climate change have become a much more important issue by the day. In order to sustain the current living prosperity, it is necessary to effectively manage and ensure the sustainable use of limited resources, avoid the negative effects of climate change in the future and to anticipate the problems that may be encountered in the future. One of our limited natural resources is freshwater resources. Even though four quarters of the earth's surface is covered in water, the amount of fresh water suitable for human use is rather limited. The total amount of fresh water on Earth is about 35 million km3 / year. Only about 0.3% of this is suitable for ecosystem and human use. The hydrologic cycle is a complex structure that is affected by multiple environmental systems. It is necessary first to understand the processes of natural systems such as atmosphere, soil, vegetation, hydrologic cycle, and then understand the natural environment of these systems by grasping their interactions with each other. In this context, geodetic technologies, a multidisciplinary field covering all activities related to the collection, analysis and presentation of data referenced to a spatial coordinate system, are designed to simplify and model complex systems related to the earth such as the hydrological cycle, and to simplify the assumptions that are made possible by the combination of different systems to provide an understanding of the system by taking the environmental cycles as a whole. This study aims to examine, with examples, the contributions and the importance of geodetic technologies to the hydrological cycle modelling process.

Keywords: Climate Change, Water Resources Management, Environmental Modelling, Geographical Information Science.

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1. INTRODUCTION

Environmental deterioration not only endangers human living conditions and quality of life but also seriously restricts economic development. In order to protect the prosperity of about 7.6 billion human population and millions of species of living things in the world, the limited natural resources need to be managed effectively. In addition to the inadequacy of limited resources, efforts to find solutions to the natural and social repercussions of climate change, which has become a much more important issue day by day, are increasing.

The influence of climate change has attracted the attention of scientists worldwide. One case in point is that global warming was listed as an important issue for discussion in the 1992 UN Conference on Environment and Development (UNCED) (Lu et al., 2014). It is necessary to use limited resources effectively in order to prevent the current living prosperity from being affected negatively by climate change, to anticipate the problems that may be encountered in the future and to ensure the sustainable use of limited resources. In this context, one of our limited natural resources is freshwater resources. Even though four quarters of the earth's surface is covered with water, the amount of fresh water suitable for human use is rather limited. The total amount of fresh water on Earth is about 35 million km^3 / year (2.5% of the total world water), only 0.3% (about 105,000 km3 / year) of freshwater resources suitable for ecosystem and human use.

2. CLIMATE CHANGE

Studies show that the Earth’s climate is getting warmer. In the last 100 years, the earth’s temperature increased by about one degree Fahrenheit. Small changes in earth’s temperature can have big effects (NASA Earth Observatory, 2018).

Some effects are already happening. Warming of earth’s climate has caused glaciers to melt leading to a rise in oceans levels. These changes affect other related natural systems like fresh water resources and agriculture and lead to natural disasters like flooding, forest fires, drought etc.

In order to reduce and mitigate the negative impacts of climate change and to sustain the quality of life, we need to effectively manage our limited natural resources.

2.1. Climate Change Impacts on Water Resources

Water resources are important to both society and ecosystems. We depend on a reliable, clean supply of drinking water to sustain our health. We also need water for agriculture, energy production, transportation and recreation. Many of these activities put pressure on water resources, stresses that are likely to be exacerbated by climate change.

In many areas, due to climate change, while water resources will decrease, water demand will increase. Other areas will experience increases in water amounts leading to

runoffs, flooding, or sea level rise. These effects can reduce the quality of water and can damage the antrogenical activities (EPA, 2017).

3. IMPORTANCE OF UNDERSTANDING THE PROCESSES OF SYSTEMS

The hydrologic cycle plays a direct role in the function of healthy ecosystems. The hydrologic cycle refers to the movement of all the water on Earth. The Earth's water is always moving and changing states, from liquid to vapour to ice and back again. This cycle has been in operation for billions of years, and all life depends on its existence. Global warming affects major components of the hydrologic cycle negatively.

Impacts of climate change on water resources are not only related to the components of climate and hydrologic cycle, but also human interventions like an impact of land use. There is, therefore, the need to understand both the human and bio-geophysical earth systems. What are these factors, and their relationship and interactions with each other?

4. GEODETIC TECHNOLOGIES

4.1. What is Geodesy?

Simulation models provide an understanding with the earth system dynamics. With this regard, geomatics, which is the collection, storage, analysis and representation of georeferenced data, provides simplified and modelled complex systems related to earth. However, there is still a need for lots of spatial data. Especially in the hydrological modelling process, spatial and temporal resolution is very important for modelling accuracy. Geodetic technologies play an important role in providing earth data.

Geodesy is a sub-discipline of geomatics, surveying and mapping as well as geoscience (Lu et al.,2014).

Geodesy is the science of measuring and representing the size of the earth, and the study of its gravitational and magnetic fields (Mayyol and Rock,t.y.)

Geodesy is divided into terrestrial geodesy, space geodesy (satellite geodesy), and inertial geodesy. A modern geodetic technology system is centred on space geodesy (Lu et al., 2014).

4.2. Geodetic Technologies

The Primary contributions of the geodetic techniques in mapping the earth/ obtaining data process are;

- controlling the error accumulation,
- unifying the control system,
- resolving the conflict between an ellipsoid surface and a plane.

Also, the general contributions, modern geodetic techniques provide data with high spatial and temporal resolution than traditional techniques. Moreover, modern techniques allow rapid, large-scale mapping.

4.3. Applications of Geodesy

Climate alterations, natural hazards, biodiversity, water resources and other critical phenomena need to be understood at different spatial scales, from local to global.

Here are some examples of geodetic applications (UNOOSA, 2012);

Climate Change:

- How much is sea level changing here?
- How is the atmospheric circulation changing?
- How is the hydrologic cycle changing?
- How do the earth, atmosphere and oceans exchange energy?

lost in the Arctic/Antarctic?

Geohazards:

- Is stress building on this fault?
- Has a tsunami wave been detected?
- Is there an impending volcanic explosion?
- What are the ground and structural deformation?

Environmental:

- What is the mesoscale ocean circulation?
- What is the pattern of the atmospheric water vapour?
- How are the pattern of ground water and soil moisture changing?
- What is the volume of ice being in these studies, Reliable and long-term databases are indispensable?

4.4. Hydrological applications by using geodetic Technologies

Satellite geodesy is becoming increasingly important for observing the hydrological cycle and its effects on earth. Sensor systems acquire images from different spectral bands (visible, near, medium and thermal infrared and microwave), with a wide range of spatial resolutions (from 1 m to 3 km pixel size), and at different temporal intervals (from 15 min to several weeks). This information, which is obtained by sensor systems, can easily be integrated into the geographical database. Thus, it provides spatial analysis at different

spatial scales. Also, meteorological satellites provide loss of relevant information from geostationary and polar orbiting satellites (Chuvieco and Yang, 2010).

Here are the examples of the hydrological applications (Romaguera et al., 2010; Khanbilvardi et al., 2014);

- Satellite gravimetry (e.g., GRACE (Gravity Recovery and Climate Experiment) and GOCE (Gravity Field and Steady-State Ocean Circulation Explorer) provide an understanding of mass transport and redistribution.
- Natural hydrologically related deformation and monitoring anthropogenic groundwater extraction and recharge studies can be done by using GPS (Global positioning system) and InSAR (Inferiometric Synthetic Aperture Radar) measurements.
- Additionally, GPS reflectometry is used for monitoring soil moisture and vegetation conditions, and water level changes in water bodies and wetland.
- Satellite altimetry (e.g., radar/laser/SAR altimetry) measures the water level/storage variations in river-lakes and reservoirs, river runoff as well as deformations over the flat terrain.
- Radiometric remote sensing measurements (The Moderate Resolution Imaging Spectroradiometer (MODIS), Advanced Space borne Thermal Emission and Reflection Radiometer (ASTER) etc.), give information about water flux/storage components (e.g., precipitation, evaporation, runoff, soil water, etc).

Using data obtained by geodetic techniques will certainly make model outputs more versatile, precise and accurate. Using these data will advance our understanding of global and regional water cycling and climate extremes-climate changes. These technologies are now pushing the boundary or research into hitherto unimagined territories such as food security, protecting aquatic species, freshwater quality, safe residential areas etc.

5. CONCLUSION

Earth observation data will continue to be a critical source of spatial information to understand better and preserve our fragile Planet. Geomatics and geodetic techniques are important tools in managing the sustainability of multiple human activities and their trajectories for global development pathways. Geodetic techniques may provide an integrated qualitative and quantitative understanding of the implications of several selected issues, including climate change and mitigation, socioeconomic and technological developments on water scarcity, and water-energy-food interactions in a global context.

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Generalised Regression Neural Network for Coordinate Transformation

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Abstract

Coordinate transformation is an important subject for geodesy, surveying, photogrammetry, GIS, cadastral and other related professions. A large number of one-dimensional (1D), two-dimensional (2D) and three-dimensional (3D) transformations have been proposed and conducted using conventional techniques such as similarity, affine, projective and polynomial methods etc. Nowadays, artificial neural network (ANN) models seem to have contributed significantly to solve engineering problems. One of the biggest advantages of ANN is that it can determine the relationship between two coordinate systems without a mathematical model. The European Datum 1950 (ED50) and International Terrestrial Reference Frame 1996 (ITRF96) have been used as national coordinate systems in Turkey, which leads to the need of a coordinate transformation from one system to another. This study aimed to investigate the performance of the generalised regression neural network (GRNN) on two-dimensional coordinate transformations. Hence, a generalised regression neural network (GRNN) and feed-forward back-propagation (FFBP) models were used to conduct 2D transformation between ED50 and ITRF96 coordinate systems. To do so, we established 94 points whose coordinates were known. Of these points, 74 were used as reference points, and remaining 20 were used as control points. Transformation results obtained by the GRNN were compared against the FFBP results. The results indicated that the GRNN is a promising technique for two-dimensional coordinate transformation.

Keywords: Generalized Regression Neural Network, Coordinate Transformation

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1. INTRODUCTION

The Turkish National Geodetic Network (TNGN) was established between the years of 1934 and 1954 by the General Command of Mapping. All geodetic networks and cadastral maps have been produced in the European Datum 1950 (ED50) system since the ED50-based TNGN was first established. Deformations and distortions occurred in the ED50 coordinate system due to tectonic movements. For this reason, the Turkish National Fundamental GPS Network (TNFGN), which consists of 594 points, was established between the years 1997-2001 by the General Directorate of Land Registry and Cadastre and the General Command of Mapping, to avoid the deterioration and damage that may occur due to the tectonic structure of the country (TNUGG, 2003). The coordinates and velocities of the TNFGN points were determined concerning the International Terrestrial Reference Frame 1996 (ITRF96). Therefore, the ED50 and ITRF96 have been used as national coordinate systems in various geodetic studies. The obtained 1D, 2D or 3D coordinates on ED50 need to be transformed to ITRF96. Yang, 1999; Akyılmaz, 2007; Erol et al., 2008; Soycan & Soycan, 2008; Şişman, 2014 and Khazraei, 2016 are just some of the researchers who focused on coordinate transformation between different systems. Also, the artificial neural networks (ANNs) have begun to be used for one-dimensional (1D), two-dimensional (2D) and three-dimensional (3D) coordinate transformation (Kavzoğlu & Saka, 2005; Tierra et al., 2008; Güllü, 2010; Turgut 2010; Tierra and Romero, 2014; Konakoğlu and Gökalp, 2016; Ziggah et al. 2016a; Ziggah et al. 2017; Elshambaky et al. 2018; Kaloop et al. 2018). For instance, Çakır and Yilmaz (2014) utilised the polynomials, radial basis function (RBF) and multilayer perceptron (MLP) neural network to estimate the local geoid surface model. The authors concluded that the artificial neural network gave better results than the other methods used. In another study, Konakoğlu et al. (2016) performed a two-dimensional coordinate transformation with the feed-forward back-propagation (FFBP), cascade forward back-propagation (CFBP) and radial basis function (RBF). The authors found that the ANN methods can be used for 2D coordinate transformation with selected optimum model parameters. Ziggah et al. (2016b) investigated the capability of ANNs to transform geodetic coordinates (φ, λ, h) to cartesian coordinates (X, Y, Z). The results revealed that the back-propagation artificial neural network (BPANN) and radial basis function (RBF) methods were successful in estimating cartesian coordinates. This study aimed to investigate whether the GRNN was an alternative 2D coordinate transformation method between the ED50 and ITRF96. The coordinates estimated by the FFBP and GRNN methods were compared against reference values regarding the RMSE.

2. METHODS

2.1. Feed-forward Back-Propagation Neural Network

The feed-forward back-propagation (FFBP) neural network is one of the most popular ANN models used in engineering applications. Figure 1 shows the topology of a simple

FFBP neural network that includes an input layer, a hidden layer and an output layer. It is also possible to have more than one hidden layer. The input layer receives the input data, and the output layer produces results. The 'hidden' layer is located between the input and output layers. Selection of the optimum number of hidden neurons and hidden layers, and choice of the training algorithm and activation function play an important role in FFBP model constructions (White, 1992). Since there is not a standard formula used to compute the number of neurons needed, the optimum number of neurons in the hidden layer is determined after trying various network structures. According to Hornik et al. (1989), a FFBP with a single hidden layer containing sufficient neuron nodes is enough to approximate any continuous functions, which was the main reason for using a single hidden layer in the FFBP used in this study. Also, activation functions were needed to introduce the non-linearity between the input and output units. The hyperbolic tangent and linear functions were selected as activation functions of the hidden and output neurons, respectively. The reason for training the FFBP was to determine the optimal weights (w^*) that make predictions that are in close proximity to the target output as given by Eq. (1).

$$w^* = \arg\min E(w) \tag{1}$$

where w is the weight matrix and $E(w)$ is an objective function on w, which is to be minimized. The $E(w)$ is computed at any point of w. Equation 2 depicts the $E(w)$.

$$E(w) = \sum_p E_p(w) \tag{2}$$

where p is the number of examples in the training set and $E_p(w)$ is the output error for each example p given as;

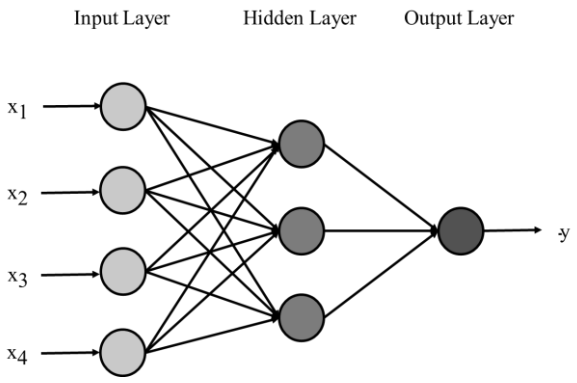
$$E_p(w) = \frac{1}{2}\sum_j \left(d_{pj} - y_{pj}(w)\right)^2 \tag{3}$$

The mean square error (MSE) is applied as the error function for the back-propagation neural network. The MSE is given as;

$$E(w) = \frac{1}{2}\sum_p \sum_j \left(d_{pj} - y_{pj}(w)\right)^2 \tag{4}$$

where, d_{pj} and $y_{pj}(w)$ are the known/measured and predicted network outputs for the jth output neuron of pth example, respectively.

Figure 1: Schematic representation of FFBP



2.2. Generalised Regression Neural Network

The generalised regression neural network (GRNN), a variation of the radial basis neural networks, was proposed by Specht (1991). The GRNN shown in Figure 2 comprises four layers namely; input, pattern, summation and output layer. The input layer is responsible for transmitting a learning sample to the pattern layer. The second layer, so-called "pattern layer", is connected to the summation layer. The third layer 'summation' has two kinds of summation: S-summation (Summation units) and D-summation (a single division unit). The S-summation computes the sum of weighted outputs of the pattern layer, whereas the D-summation computes the unweighted outputs of pattern neurons (Jang et al., 1997). The last layer of the network "output layer" divides the output of each S-summation neuron by each D-summation neuron output. According to Specht (1991), $f(x,y)$ represents the known joint continuous probability density function of a vector random variable, x, and a scalar random variable, y. The conditional mean or regression of y on x is represented as;

$$E[y/x] = \frac{\int_{-\infty}^{\infty} yf(x,y)dy}{\int_{-\infty}^{\infty} f(x,y)dy} \tag{5}$$

In cases where the density $f(x,y)$ is not known, it should generally be estimated from a sample of observations of x and y. The probability estimator $\hat{f}(x,y)$ is based on sample values of the variables represented by x_i and y_i. Let n be the number of sample observations and p be the dimension of the vector variable x;

$$\hat{f}(x,y) = \frac{1}{(2\pi)^{(p+1)/2}\sigma^{(p+1)}} \times \frac{1}{n}\sum_{i=1}^{n} exp\left[-\frac{(x-x_i)^T(x-x_i)}{2\sigma^2}\right] \times \exp\left[-\frac{(y-y_i)^2}{2\sigma^2}\right] \tag{6}$$

A meaningful explanation of the probability estimate $\hat{f}(x, y)$ is that, it assigns sample probability of smoothing parameter (σ) for each sample x_i and y_i, and the probability estimate is the sum of those sample probabilities. Eq. (7) expresses the scalar function as;

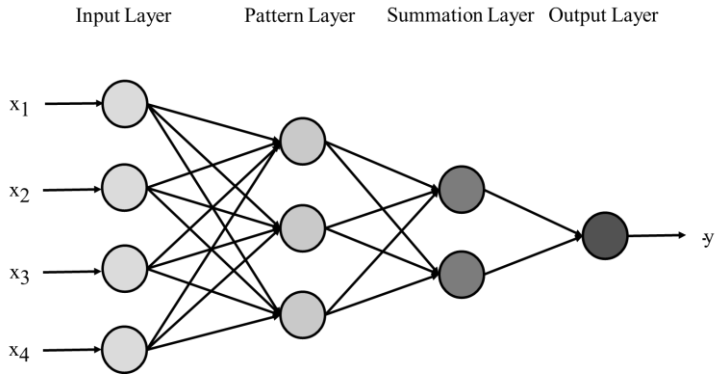
$$D_i^2 = (x - x_i)^T (x - x_i) \tag{7}$$

moreover, performing the indicated integrations yields Eq. (8) given as;

$$\hat{y}(x) = \frac{\sum_{i=1}^{n} y^i exp\left(-\frac{D_i^2}{2\sigma^2}\right)}{\sum_{i=1}^{n} exp\left(-\frac{D_i^2}{2\sigma^2}\right)} \tag{8}$$

The FFPB includes training parameters such as the learning rate, momentum and number of neurons in the hidden layer, whereas the GRNN includes only the smoothing factor (σ). This factor represents the widths of the radial basis function units. There is no prior method for selecting the optimum value for this parameter. Hence, the trial-and-error process was applied to find the optimum value for this parameter.

Figure 2: Schematic representation of the GRNN



3. APPLICATION and RESULTS

This study was conducted in the city of Trabzon, which is located on the northeast coast of Turkey. The location of the study area can be seen in Figure 3. In this study, the FFBP and GRNN methods were applied for 2D coordinate transformation between ED50 and ITRF96 coordinate systems. Ninety-four homogenously distributed points were chosen in both coordinate systems. It should be noted that the coordinates of all these points in both systems were known. Seventy-four of these points were chosen as a reference for training

procedure, and the remaining 20 were chosen as control points to assess the accuracy of the transformation (Figure 4).

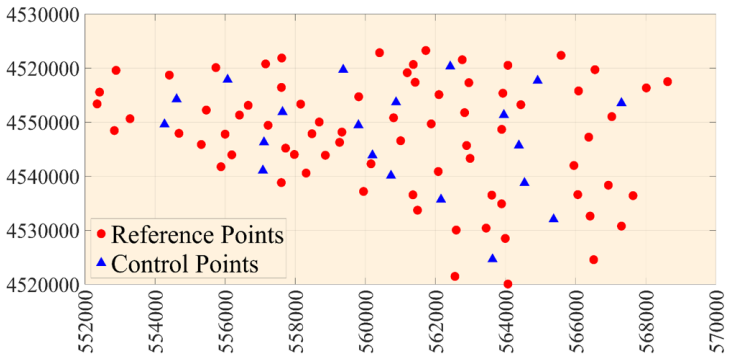
Figure 3: The study area

Finally, the root means square error (RMSE) was used to evaluate the performances of the transformation methods used. The RMSE is given as;

$$\text{RMSE} = \sqrt{1/n \sum_{i=1}^{n} (O_i - P_i)^2} \tag{9}$$

where n stands for the number of data points. O_i and P_i denote the measured and predicted coordinates, respectively.

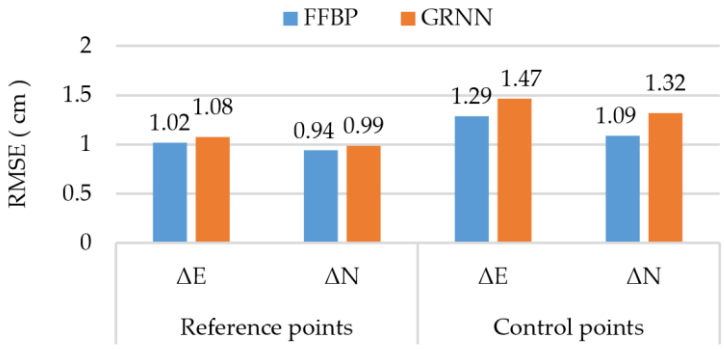
Figure 4: The distribution of reference and control points



A MATLAB script was written for the FFBP and GRNN models. While applying the FFBP, ED50 and ITRF96 coordinates in east and north directions were used as input and

output parameters, respectively. The ED50 and ITRF96 coordinates in east and north directions were used as an input parameter, whereas the difference between the ED50 and ITRF96 coordinates in east and north directions were used as an output parameter in the GRNN. After numerous trials, the optimum number of hidden neurons was selected as 26 in the FFBP structure, and σ was selected as 0.083 in the GRNN structure. Figure 5 shows the root mean square errors for each ANN method.

Figure 5: The root mean square errors of the reference and control points calculated by using the FFBP and GRNN methods in east and north directions



4. CONCLUSION

The performance of the generalised regression neural network (GRNN) on coordinate transformation was investigated in this study. The results obtained by the GRNN were compared against those obtained from the feed-forward back-propagation (FFBP). It can be concluded that the GRNN and FFBP models can transform the coordinates from the ED50 to the ITRF96 when the model is optimum such that the σ in GRNN and the transform accuracy reach the centimetre level in terms of the RMSE of the coordinate differences. Both transformation methods gave the same results. For the east direction, the FFBP method achieved the root mean square errors of 1.02 cm and 1.29 cm for the training and testing data, respectively. For north direction, the FFBP method achieved the root mean square errors of 0.94 cm and 1.09 cm for the training and testing data, respectively. On the other hand, the GRNN method yielded the root mean square errors of 1.08 cm and 1.47 cm in the east direction for the training and testing data, respectively. For north direction, the GRNN method resulted in the root mean square errors of 0.99 cm and 1.32 cm for the training and testing data, respectively.

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Data Mining on Global Terrorism Attacks between the Years of 1970 and 2016

Assoc. Prof. Pınar Kırcı[1], Murat Doğan[2], Enes Ateş[3]

Abstract

Globalising, marketing and research methods reveal the importance of information when compared to data. With the development of technology, the amount of data increases and makes it more difficult to reach the correct information. In this case, data mining emerges as a vital solution.

Data mining refers to a group of methods used to provide large data stack contents usable for the owner of these data stacks. With data mining, all of the data gathered is examined. After the investigation of the collected data, the valuable and useful bits are chosen to be used for different purposes. Contemporarily, data mining is one of the most popular research topics because it is based on mathematics. Data mining is utilised in space, marketing, computing and many different areas.

Keywords: Data mining, Dataset, R language; Linear regression, Terrorism rates.

1. INTRODUCTION

The importance of information emerges with great improvements in marketing and research methods. The effect of the huge developments in technology and the increasing amount of data makes it more difficult to reach the correct information. In this case, data mining emerges as a vital solution.

Data mining is a collection of improved methods for making large data stack contents usable for the owner of these data stacks. All of the data is examined, and valuable, useful and worthwhile bits are chosen to be utilised for different purposes. Mostly, these huge amounts of gathered data are scrutinised to determine any unexpected/unknown relationships among them to provide understandable data. Today, data mining is one of the most popular research topics because it is based on mathematics. Data mining is utilised in space, marketing, computing and many different areas.

In this project, data analysis was implemented on the dataset of Global Terrorism DataBase (GTD) for data mining (GTD, 2018). R language (TRP, 2018; Malviya et al., 2016) was used for providing data mining and to find rational and convenient data among

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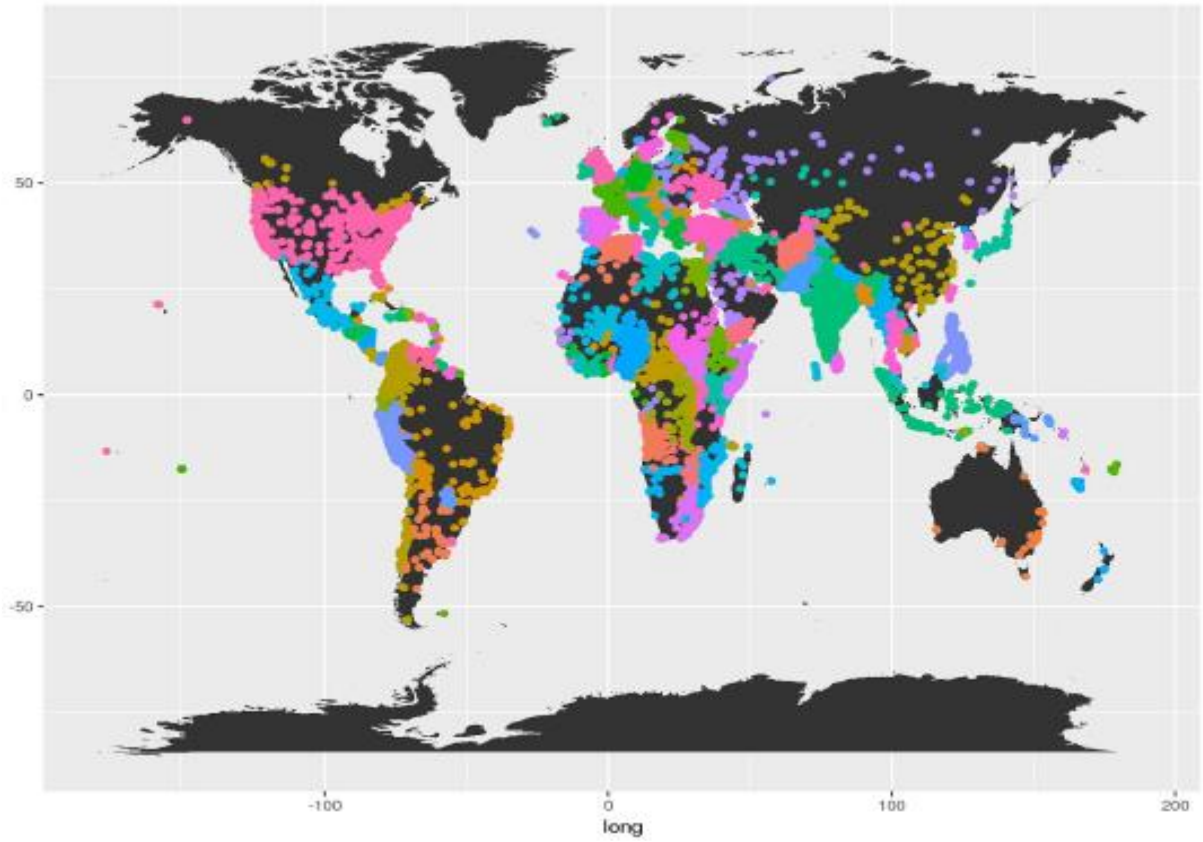
enormous data stacks. With R language, the gathered data can be easily analysed as statistically.

2. TERRORISM ATTACK RATES' ANALYSIS

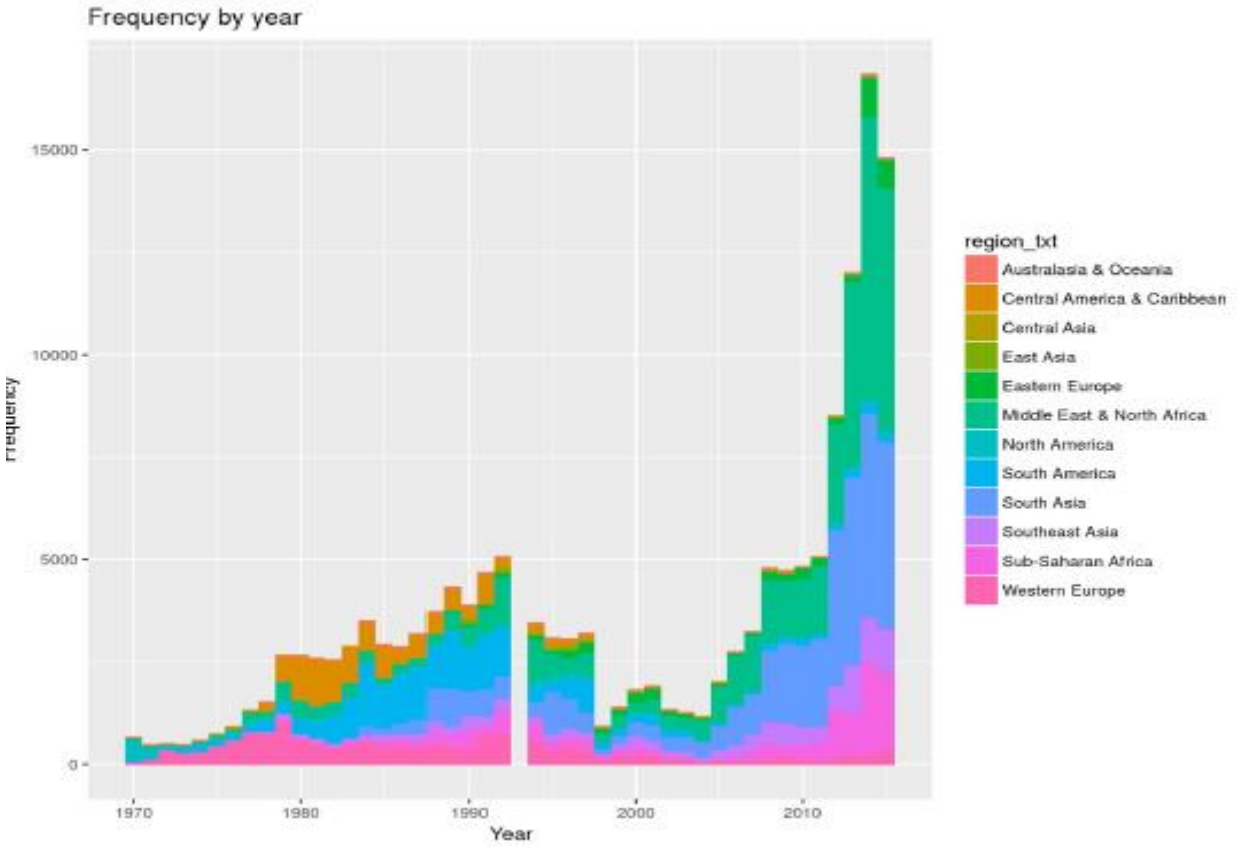
In the project, the rate and distribution of terrorism incidences were determined by countries. Then, frequencies and types of terrorism incidences were determined by years. Utilising linear regression, the relationship between the weapon type and the number of deaths was examined. With the help of the decision tree learning, according to the accomplished/ unaccomplished attacks and the number of death and wounded, a frequency table was presented for each year. Data analysis was implemented on the dataset of Global Terrorism DataBase (GTD) for data mining. R language was used to provide data mining and was also utilised to find rational and convenient data among enormous data stacks. The distributions of terrorism incidences by countries is given in Figure 1.

Figure 1. Terrorism rates' Distributions According to Countries



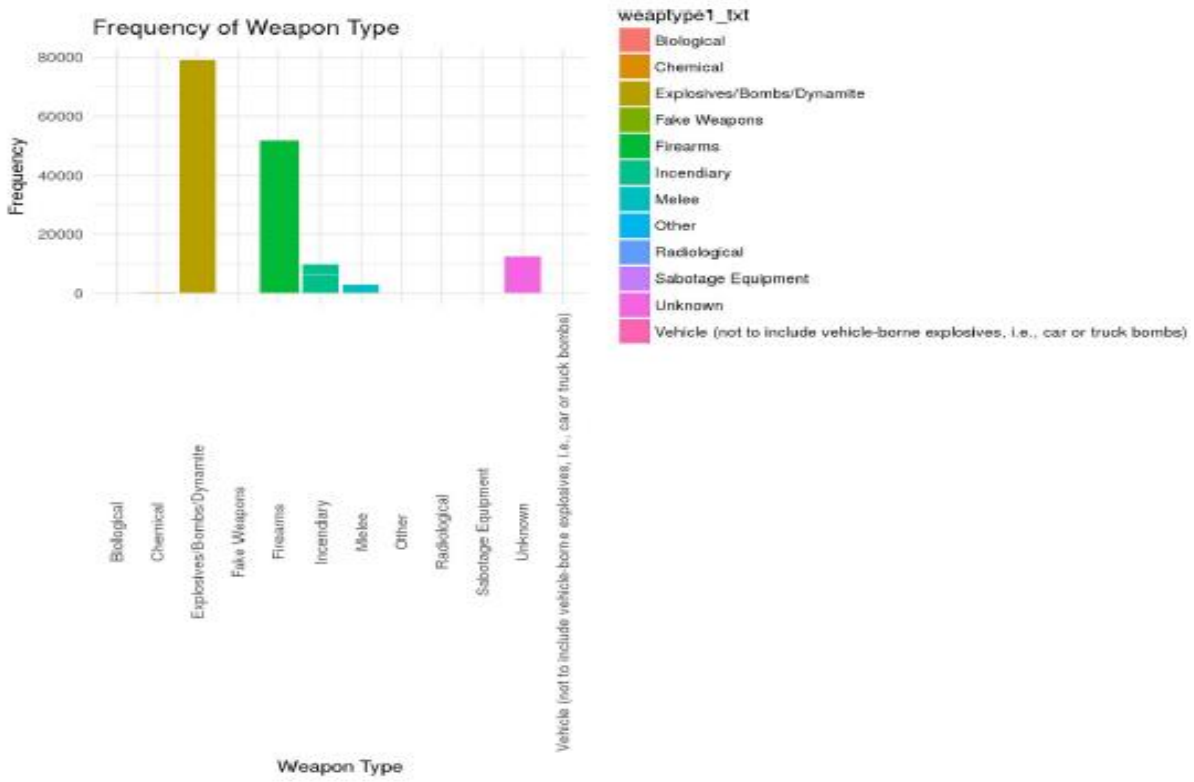
The distribution domains of terrorist attack by years are given in figure 2. Terrorism attacks were examined between the years of 1970 and 2010.

Figure 2. Terrorism Attack Rates' Distribution of Domains



The distribution of terrorist attack by weapon types is given in figure 3. Terrorism attacks were given between the years of 1970 and 2010.

Figure 3. Terrorism Attack Types' Distribution



3. CONCLUSION

With the help of improving technology and developing data analysing solutions, we can easily utilise and investigate databases. By presenting solutions, providing studies and combining the gained results with the technology, improvements in big data are accelerated.

Global Terrorism attacks were examined in the project between the years of 1970 and 2016, by countries, weapon types, frequency of attacks, and years to be able to attract attention to the increasing rates of Global Terrorism in the world using the dataset of Global Terrorism DataBase (GTD). R language was used to perform data mining and to find rational and convenient data among enormous data stacks.

ACKNOWLEDGEMENTS

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Proactive and Sustainable Data Management in Supply Chains – A Descriptive Study

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Abstract

Purpose:

This paper examines how data management is implemented within German-speaking companies. The idea behind industry 4.0 is complete transparency along the value chain. Main requirement for achieving this is a holistic and sustainable data management process in and between companies of interlinked value chains. The main focus at this moment should be the proactive data management between supply chain partners.

Design/methodology/approach

The paper addresses this topic by a large-scale empirical study focusing on potentials, advantages and the operative and strategic status quo of data management within and between single companies. In total, 228 German-speaking companies are integrated into the empirical sample. To ensure statistical significance, the single sample t-test is used for quasi-interval scaled indicators and the binomial test for dichotomous indicators. Finally, general recommendations for companies are derived based on the empirical data.

Findings

Companies can gain an added value from cross-company data management. There is a variety of deployment options in all sectors, depending on the availability of data and the willingness to restructure the flow of information. The possibilities are manifold; the decisive factor is the creativity in dealing with the data. A high-quality information supply chain forms the basis for reliable added value. Afterwards, companies have to start with a proactive and sustainable approach to data management and instead of working with the existing data; companies should look for new data sets within and especially outside of their organization.

Research limitations/implications

A limitation of the empirical approach is the fact that different industries are examined to get a general understanding of the topic. Therefore, further research should focus on single industries to obtain deeper insights. Another shortcoming is the limitation on

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German-speaking companies. It should be analysed whether there are national differences in a global context.

Practical implications/social implications

The empirical study provides benchmark data and derives recommendations for companies.

Originality/value

This is one of the latest studies which assesses the current status of data management. The paper follows a holistic understanding and combines company and cross-company data sources while most other papers concentrate only on one side of both.

Keywords

Data management, information supply chain, business analytics, cross-company, supply chain management

1. INTRODUCTION

Terms as big data, data mining or predictive analytics describe the high relevance of electronically available data for companies and their opportunity to reach competitive advantages. Due to this fact, the amount of available data is increasing exponentially every year. The internet of things generates unlimited demand using for example sensors penetrating every single part of customer interaction or value-adding processes in companies and especially cross-company supply chains. In most companies, a very high amount of data volume exists, but the question is, does every measurement also contain information and is this information really important and therefore worth saving for the companies?

Following the rules of lean management, the storage of data without any clear target can be described as waste regarding overproduction. Most companies hoard a large volume of data without knowing what to do with it. This is often referred to as a data cemetery. Thus, only a targeted proactive and sustainable data management can achieve the highest benefit of big data approaches without losing efficiency effects.

The aim of the paper is, to develop a conceptual model for an information supply chain as a basis for proactive cross-company data management. Also, the evidence and status quo of data management within German companies is assessed by a large-volume empirical study. The results are summarised in a phase model for the development process of proactive data management. The idea behind industry 4.0 is complete transparency along the value chain. Main requirement for achieving this is a holistic and sustainable data management process in and between companies of interlinked value chains. Therefore, the main focus is on proactive data management between supply chain partners.

2. INFORMATION SUPPLY CHAIN

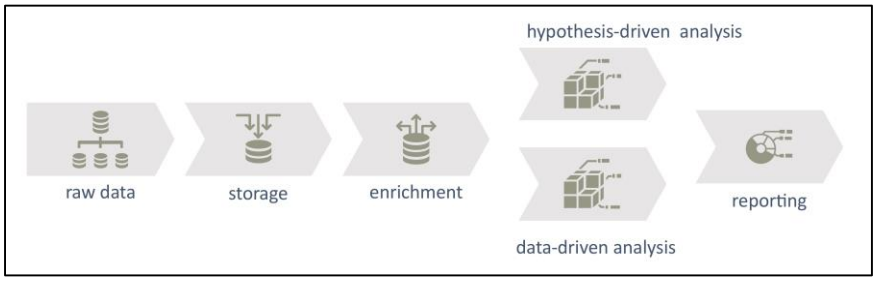
Only the purpose decides about the meaningfulness of stored data and its transformation into information. In most cases, information is far smaller than the corresponding data volume. The highest impact on this difference has data management, which is not connected to business tasks or business targets (Burgin, 2010).

However, how is it possible to find valuable nuggets in a bunch of river sand? The answer is not at all. Likewise, Michelangelo could have been accused of having to knock out everything of the block of marble that did not look like the statue of David. Therefore, information gathering, in economic terms, is not a primary sector, but a manufacturing industry. The benefit lies in the systematic collection of data, the transformation into information and the delivery to internal or external end-users. From this perspective, the term "data mining", commonly used for gathering information, is the wrong term and one should speak better of "information production". Gaining information from existing data is a creative process that creates something new from existing resources (Han et al., 2012; Naisbitt, 1982; Wellbrock and Hein, 2018).

The information supply chain model illustrates the corresponding process. Analogous to the logistics supply chain, the information supply chain enables a holistic view of information processes. For this purpose, the internal and external flow of information between different departments or even different companies must be identified and later systematically controlled. Every business unit needs to collect, analyse and enrich their own and external data along with business process chains with additional information. Also, the task of companies is to ensure that the data can be stored safely and sustainably and can be made available to other processes or users with the required quality and at the right time (Edmunds and Morris, 2000). Important is at this moment, not to focus on the method but always to maximise the benefits for the recipients of information: an objective that information supply chain shares with the traditional supply chain in logistics.

The focus of the model is on a holistic view, which ranges from data creation to decision-making (see figure 1). Decision-making is made based on the information obtained and includes tasks from different business areas. Within the information, supply chain data is seen as a product, which needs to be continuously refined.

Figure 1. Information Supply Chain



The beginning of the information supply chain is raw data, collected for example by transactional systems or sensors. This data is mostly large in volume and low in structure. Therefore, an analysis is not advised (Roggen et al., 2010).

In a first step, the raw data has to be stored appropriately to secure the future use of the data sets. Persistence of the data and access to the data by all relevant persons, organisations or processes have to be ensured (Strong et al., 1997). The importance of continuously maintaining the quality of stored data increased over the time in accordance with the growing use of automated analytical methods (e.g. machine learning or predictive analytics). Furthermore, a loss of data can lead to biased results in automated systems (Batista et al., 2003).

After the storage of data, the enrichment process starts. Data sets are cleaned, transformed and if necessary consolidated to reduce the amount of data and speed up the following analysis process. Standardised metadata can be added to provide further possibilities to analyse the data (Conn, 2005). Those first three steps lay the groundwork for effective and efficient data analysis.

The final analysis can be done in two ways: data-driven and hypothesis-driven. Data-driven analytics provide insights utilising methods like data mining or predictive analytics. It is based on automated unsupervised analyses and demands a high quality of the data sets with a minimal margin for errors. A hypothesis-driven analysis requires a manual definition of the data structure with the risk of ignoring specific areas of the data set. Afterwards, there is a testing of the hypotheses with methods like visual or pivotal analytics. Due to the user-based approach, errors within the data sets can be corrected through manual interpretation (Doan et al., 2012; Kell, 2003; Smalheiser, 2002 & Zhu et al., 2007).

The final step of the information supply chain is the reporting of findings gained in both analytical ways. This is the crucial step to provide the decision-makers with all necessary information (Beattie et al., 2003).

Following the model, the production of information begins already at the beginning of the information supply chain with the specification of a structure for data collection. Similar to a bill of material, it describes how data has to be made up for later use (Chaudhuri et al., 1997). The definition of the structure is based on a hypothesis about the desired results. In most cases, these are comparisons, time series, budget deviations and contribution margins. For example, all modern OLAP systems for multidimensional databases work this way (Sarawagi et al., 1998).

After the conceptual basis of the information supply chain, a large-scale empirical study is now analysing the status quo and design of data management in German companies with a special focus on cross-company data management in supply chains. Data management is the basic requirement to get information out of data and achieve potential competitive advantages.

3. METHODOLOGY OF THE EMPIRICAL STUDY DATA COLLECTION

To choose a sample that suits our research purpose companies from different industries and different size was considered. In all cases, the questionnaire was sent to experts and executives in digitalisation, business intelligence or information technology on a corporate level. The direct contact was either determined by internet research or requested by phone calls. The survey itself was carried out in three steps. At first, the questionnaire was created, validated in pre-tests with selected companies and further adjusted. The final questionnaire was sent to the companies with the request to participate online via a survey platform. After exclusion of incomplete answers, 228 companies could be integrated into the sample.

Table 1 shows the distribution of participants. Companies from 13 different industries are involved with a majority in information technology and consulting. More than 50% of all companies have less than 500 employees, whereas almost 30% have more than 5,000 employees. Overall, the analysed companies represent a meaningful sample for the selected industries.

Table 1. Sample Characteristics

Characteristics of the sample (n=228; relative frequency)						
Business sectors of participating companies						
Transport & logistics	Metal production and processing	Telecomm., technology & electronics	Food & consumer goods	Health care, chemistry & pharma	Public sector & education	Plant & mechanical engineering
2.2%	2.2%	2.6%	4.9%	5.3%	6.2%	6.6%
Finance	Other services	Automotive	Trade	Consulting	Information technology	Others
6.6%	6.6%	7.1%	8.8%	12.8%	19.8%	8.4%
Company size (employees)						
< 201	201-500	501-1,000	1,001-5,000	5,001-10,000	>10,000	
38.6%	11.8%	8.3%	11.8%	8.3%	21.1%	

4. METHOD

The questionnaire combines (quasi)-interval scaled (Gregoire and Driver, 1987; Jaccard and Wan, 1996) and dichotomous indicators (Sheskin, 2011). To determine significant results for quasi-interval scaled indicators the single sample t-test is selected with whom significant mean differences from a given value of the underlying rating scale can be determined. The rating scale for all (quasi)-interval scaled indicators are aligned from one (very low) to five (very high), wherein the values three (moderate) and four (high) are used as relevant test values for the determination of significance. The focus is on directed hypotheses, which lead in response to the sample means to the following null and alternative hypothesis (Cooper and Schindler, 2011; Sekaran and Bougie, 2013):

- Analysis regarding scale value $\mu_0 = 3$ (moderate): H_0: $\mu_i \geq 3$ and H_1: $\mu_i < 3$ (for $\mu_i < 3$) or H_0: $\mu_i \leq 3$ and H_1: $\mu_i > 3$ (for $\mu_i > 3$); i = quasi-interval scaled indicators.
- Analysis regarding scale value $\mu_0 = 4$ (high): H_0: $\mu_i \geq 4$ and H_1: $\mu_i < 4$ (for $\mu_i < 4$) or H_0: $\mu_i \leq 4$ and H_1: $\mu_i > 4$ (for $\mu_i > 4$); i = quasi-interval scaled indicators.

For significance testing of dichotomous indicators, the binomial test is selected. This test examines if a certain frequency p_0 of a characteristic is present in the population. The question, if a characteristic in the population has at least or at most a specific frequency p_0 can be converted in the following statistical test problem (Sheskin, 2011):

- H_0: $p_j \geq p_0$ and H_1: $p_j < p_0$ (for $p_j < p_0$) or H_0: $p_j \leq p_0$ and H_1: $p_j > p_0$ (for $p_j > p_0$); j = dichotomous indicators.

Therefore, directed hypothesis are considered in which the frequencies 0.25, 0.50 and 0.75 are used as relevant test values p_0. Regarding the significance level, the stages *(α = 10%), **(α = 5%) and ***(α = 1%) are taken into account (Cooper and Schindler, 2011; Sekaran and Bougie, 2013). All statistical tests were carried out by using the software SPSS (Field, 2013). To ensure the data quality of the sample, possible distortions are to be avoided. Statistical tests for distortions caused by non-response-bias did not lead to any significant results.

5. RESULTS OF THE EMPIRICAL STUDY

5.1 Importance and Objectives of Data Management

According to the empirical results the observed companies estimate especially the future (operative and strategic) importance of data management very high. The average values are 4.40 (operative) and 4.47 points (strategic) on a scale from one (very low) to five (very high). Therefore, high importance is significantly proved. The present importance of data management is quite lower with 3.74 points but also exceeds significantly a moderate level of three points (see table 2). There is no significant difference between the strategic and operative importance of data management.

Table 2. Importance of data management

Importance of data management *(n=228; scale: 1 (very low) to 5 (very high))*	Descriptive statistics		Significance	
	Average	σ	Test value 3	Test value 4
Present operative importance	3.74	1.02	>***	<***
Present strategic importance	3.74	1.04	>***	<***
Future operative importance	4.40	0.77	>***	>***
Future strategic importance	4.47	0.71	>***	>***

Looking at the objectives connected to data management, a general increase of the future importance can be recognised for all objectives. While for the present values a high importance is strong significantly exceeded, in the future the objectives „processual support of operational departments (4.07)“, “increased responsiveness to customer requirements (4.03)“ and „realization of competitive advantages (4.01)“ reach values above four points, even if there are no significant results regarding test value four. Therefore, companies use data management to support daily operative processes, but also as a strategic tool to reach competitive advantages and secure a higher market share in the future. The objectives „optimisation of value-added flow (3,98)“ and „optimisation of cross-company interfaces (3,89)“highlights the importance of cross-company approaches especially for future competitive advantages. Especially for the last objective, an increase from 3.33 points (present value) to 3.89 points (future value) is recorded (see Table 3).

Table 3. Objectives connected to data management

Importance of objectives connected to data management *(n=228; scale: 1 (very low) to 5 (very high))*	**Present importance**				**Future Importance**			
	Descriptive statistics		Significance		Descriptive statistics		Significance	
	Aver-age	σ	Test value 3	Test value 4	Aver-age	σ	Test value 3	Test value 4
Processual support of operational departments	3.51	1.08	>***	<***	4.07	0.92	>***	n.s.
Realization of competitive advantages	3.43	1.19	>***	<***	4.01	0.98	>***	n.s.
Increased responsiveness to customer requirements	3.48	1.17	>***	<***	4.03	1.02	>***	n.s.
Cost reductions	3.41	1.11	>***	<***	3.97	0.95	>***	n.s.
Observation of compliance requirements	3.15	1.18	>**	<***	3.49	1.14	>***	<***
Optimization of value added flow	3.50	1.04	>***	<***	3.98	1.00	>***	n.s.
Development of new business areas	3.29	1.25	>***	<***	3.85	1.12	>***	<**
Data as a separate product	2.73	1.35	<***	<***	3.33	1.36	>***	<***
Increased innovative ability	3.31	1.23	>***	<***	3.90	1.07	>***	<*
Optimization of cross-company interfaces	3.33	1.19	>***	<***	3.89	1.06	>***	<*

5.2 Definition of Data Management and Data-Driven Decision-Making

The definition of data management varies between companies and gives a first insight into the internal status of this topic. Almost 50% of all companies summarise providing an infrastructure, structuring and classification as well as analysis and evaluation of data under data management. Therefore, it already includes the active task of finding information by data analysis and evaluation. 28% of all companies also include the proactive development of new internal and external data sources, which is one of the main points to achieve efficient and sustainable data management. Eight % focus only on providing an infrastructure for unstructured data collection, without any active part. 15% summarise at least the structuring and classification of data as additional tasks (see table 4).

Table 4. Definition of data management

Definition of data management *(n=228)*	Descriptive statistics		Significance		
	Absolute frequency	Relative frequency	$p_0 = 0.25$	$p_0 = 0.50$	$p_0 = 0.75$
Providing an infrastructure for unstructured data collection	18	0.08	<***	<***	<***
Providing an infrastructure as well as structuring and classification of data	35	0.15	<***	<***	<***
Already mentioned points supplemented by the analysis and evaluation of data	111	0.49	>***	n.s.	<***
Already mentioned points supplemented by the proactive development of new internal and external data sources	63	0.28	>*	<***	<***

Following table 5, most of the companies have an understanding of the importance of structured data-based decision-making on operational and strategic level. 55% of all companies use data for structured decision-making on a strategic level. On the operational level, the percentage is quite lower with 29%. The main focus of data is to support strategic decisions. The next step in the direction of industry 4.0 – the use of data for automated decision-making on an operational and strategic level – is instead implemented very low with only five % of all companies. Therefore, especially in this topic, a high improvement is necessary to achieve all the advancements of big data. For twelve % of all companies' data-based decision-making takes place only unstructured and without a holistic plan. Four % even state that decisions are generally not made by data.

Table 5. Status quo of data-driven decision-making

Data-driven decision-making *(n=228)*	Descriptive statistics		Significance		
	Absolute frequency	Relative frequency	$p_0 = 0.25$	$p_0 = 0.50$	$p_0 = 0.75$
Decisions are generally not made on the basis of data	8	0.04	<***	<***	<***
Data-based decision-making takes place only unstructured	28	0.12	<***	<***	<***
Data is used for structured decision-making on operational level	66	0.29	>*	<***	<***
Data is used for structured decision-making on strategic level	126	0.55	>***	>*	<***
Data is used for automated decision-making on operational level	12	0.05	<***	<***	<***
Data is used for automated decision-making on strategic level	11	0.05	<***	<***	<***

5.3 Strategy and Implementation of Data Management

This chapter analyses to what extent the need for data management is reflected in the strategy and organisational implementation in the companies. The implementation level of a clear strategy for analysis of the company`s internal data achieves the highest value with 3.28 points on a scale from one (very low) to five (very high). A moderate level of three points is strongly significant exceeded as well as for the implementation level of a clear strategy for internal data collection and storage within a company. The integration of external supplier or partner data achieves lower values with 2.85 (strategy for data analysis) and 2.89 points (strategy for data collection and storage). For both values, a moderate level of three points can be rejected at least weakly significant (see table 6). This is the first implication that the level of cross-company data management is quite lower compared to internal data management and especially the integration of external supply chain data poses bigger problems.

Table 6. Implementation level of a data management strategy

Data management strategy *(n=228; scale: 1 (very low) to 5 (very high))*	Descriptive statistics		Significance	
	Average	σ	Test value 3	Test value 4
We have a clear strategy for internal data collection and storage within our company	3.22	1.152	>***	<***
We have a clear strategy for analysis of the company's internal data	3.28	1.133	>***	<***
We have a clear strategy for data collection and storage of internal as well as supplier and partner data	2.89	1.155	<*	<***
We have a clear strategy for analysis of internal as well as supplier and partner data	2.85	1.193	<**	<***

A similar situation to the overall weak values for the implementation of a clear data management strategy is visible for the organisational structure of data management. Only in 20% of all companies, a specialised department is responsible for data management within the organisation. For each 31%, data management is connected to the central IT department or handled decentralised within single business departments without any holistic approach. 14% even say that data management is done only informal and uncoordinated (see table 7).

Table 7. The organizational structure of a data management

Organizational structure of data management *(n=228)*	Descriptive statistics		Significance		
	Absolute frequency	Relative frequency	$p_0 = 0.25$	$p_0 = 0.50$	$p_0 = 0.75$
Informal and uncoordinated	31	0.14	<***	<***	<***
Decentralized within single business departments	71	0.31	>**	<***	<***
Central by the IT department	70	0.31	>**	<***	<***
Central by a specialized rod department	45	0.20	<**	<***	<***

The results show that some of the companies use data for strategic decisions, but the organisational structure is not implemented to achieve meaningful results. Most of them are still a long way from becoming a real "data-driven company". To make matters worse, they also have to deal with additional objectives in the future like increasing demand for innovation or the tapping of new business areas. Not to mention the promises of artificial intelligence with the methods of machine learning and deep learning.

5.4 CHALLENGES CONNECTED TO DATA MANAGEMENT

What are the main challenges leading to a sometimes insufficient level of data management? Table 8 shows that finding employees with sufficient specialist knowledge (3.87) or sufficient IT knowledge (3.78) is one of the main challenges. For both aspects, a moderate value of three points is strongly significant exceeded, whereas a high value of four points is rejected at least significantly. Another important challenge is the development and implementation of a clear strategy for data management with an average value of 3.84 on a scale from one (very low) to five (very high). For all other mentioned challenges – increasing the willingness of employees and management to change, management of the increasing amount of data and overcoming organisational resistance – a moderate level is also exceeded strongly significant.

Table 8. Challenges connected to data management

Challenges connected to data management *(n=228; scale: 1 (very low) to 5 (very high))*	Descriptive statistics		Significance	
	Average	σ	Test value 3	Test value 4
Finding employees with sufficient IT knowledge	3.78	1.046	>***	<***
Finding employees with sufficient specialist knowledge	3.87	.893	>***	<**
Development and implementation of a clear strategy for data management	3.84	.934	>***	<***
Management of the increasing amount of data	3.57	1.064	>***	<***
Increasing the willingness of employees to change	3.68	1.143	>***	<***
Increasing the willingness of management to change	3.69	1.152	>***	<***
Overcoming organizational resistance	3.68	1.158	>***	<***

5.3 Increasing Importance of Supplier Data Within the Supply Chain

Holistic data management in the sense of an information supply chain increases fundamentally the importance of supplier data. An outsourcing rate of up to 80% means that an isolated view of a company is no longer expedient. Interfaces with the value-adding partners (upstream and downstream) are becoming one of the most important competitive factors.

The vision of a digitised end-to-end supply chain is characterised by full real-time visibility along the entire value chain. The central collection and location-independent availability of all supply chain relevant information is an elementary prerequisite for this. The goals are to identify the potential for optimisation by big data applications and to reduce control complexity through decentralised, autonomous decisions (Hazen et al., 2014; Wagner and Kontny, 2017; Waller and Fawcett, 2013; Xue et al., 2014). The adaptation to production, quantity and layout changes due to flexible, scalable and lean material flow structures are mentioned as additional potentials (Bierwith and Schocke, 2017; Gallay et al., 2017; Hazen et al., 2014; Rai et al., 2006; Schauer et al., 2017; Waller and Fawcett, 2013). The fundamental basis for this vision is a cross-company, strategic oriented data management, which does not stop at the artificial border of a single company.

Although the need for a cross-company perspective is well known in practice, the empirical data of the underlying study show that almost half of the surveyed companies (45%) still focus only on their data. While 51% of the participants integrate at least customer data into their decision-making process, the value is significantly lower for supplier data with 27% (see table 9). Looking at the data management strategy from the chapter before,

the integration level for external data is also significantly lower than for internal data (see table 6).

Table 9. The range of data management

Range of data management *(n=228)*	Descriptive statistics		Significance		
	Absolute frequency	Relative frequency	$p_0 = 0.25$	$p_0 = 0.50$	$p_0 = 0.75$
Data management includes only company-internal data	103	0.45	>***	n.s.	<***
Vertical integration of customer data	116	0.51	>***	n.s.	<***
Vertical integration of supplier data	62	0.27	n.s.	<***	<***
Horizontal integration of competitor data (same industry)	54	0.24	n.s.	<***	<***
Horizontal integration of competitor data (different industry)	12	0.05	<***	<***	<***

Another interesting aspect is the low percentage of horizontal integration of competitor data. 24% of all companies integrate competitor data from the same industry, whereas only five % include competitor data from other sectors into their decision-making (see table 9).

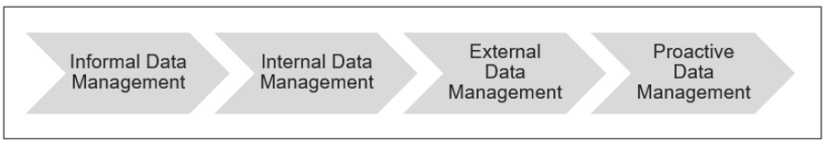
Especially for providing industry-wide data, suppliers become an important role. The example of self-driving cars shows that original equipment manufacturers can only collect data from their products, while suppliers can perform cross-brand analyses. In the case of the navigation system "Here", suppliers shall control the storage, processing and real-time provision of sensor data in order to provide all original equipment manufacturers with an adequate cross-brand information base. The provided data from the cars are used to keep the maps of "Here" current, so that, for example, information on construction sites or accidents are immediately available to other motorists (Taub, 2018; Wellbrock and Hein, 2018).

Overall, the results show that the potential of an intensive IT-related link with suppliers has not yet been sufficiently exploited, which represents a clear obstacle on the way to a holistic information supply chain.

6. MULTI-LEVEL PHASE MODEL FOR PROACTIVE AND SUSTAINABLE DATA MANAGEMENT

A phase model for the development of a proactive and sustainable data management process can be divided into four different stages (see figure 2). The first stage "informal data management" describes a company without any formal data management process. Data management occurs unstructured und separated within every single department (Price et al., 2008; Venkatasubramanian, 2009). The second stage "internal data management" describes the status that the importance of an interdisciplinary data management process is evident in a single company. Formal steps are implemented to ensure a structured data flow within the company (Otto et al., 2012; Shankaranarayanan and Cai, 2006). Stage three "external data management" extends the internal perspective to an external level. Not only internal data sources are used. Especially supplier and customer data is included in the data management process. The entire process is still reactive and not proactive. Data is used based on availability (Nakatani et al., 2006; Wang and Strong, 1996; Zhao, 2007; Madnick, 1995). On the final stage "proactive data management", no differentiation between internal and external data exist. The unified data management process includes all types of data. However, compared to stage three, data is not only included based on availability, but new data sources are proactively created, structured and explored as a basis for efficient and sustainable information creation (Chu et al., 2013).

Figure 2. The development model for proactive cross-company data management



The empirical data shows that only 28% of all companies include a proactive development of new internal and external data sources in their data management definition (see table 4). This is a key activity for stage four of the developed phase model. 45% of all companies include only internal data in their data management process and therefore, are limited to stage two "internal data management". 14% of all companies have only an uncoordinated and informal data management process, and for 31% data management is separated in every single department without any holistic view on data topics. These expressions describe stage one of the phase model for the development of a proactive and sustainable data management process.

Overall, less than 30% of all companies have implemented proactive tasks in their data management and therefore, can be assigned to the final stage "proactive data management". All other companies spread in the first three stages, which shows future improvement potentials.

7. CONCLUSION

Companies can gain added value from a cross-company information supply chain. There is a variety of deployment options in all sectors, depending on the availability of data and the willingness to restructure the flow of information. The possibilities are manifold; the decisive factor is the creativity in dealing with the data. A high-quality information supply chain forms the basis for reliable added value. Afterwards companies have to start with a proactive approach to data management, and instead of working with the existing data, companies should look for new datasets within and especially outside of their organization. Regarding increasing global competition an isolated view on each company is no longer sufficient, a structured cross-company data management along the supply chain will be one of the key factors for success in the future (Waller and Fawcett, 2013). Looking at the empirical data, most of the companies are still focusing mainly on their data, and especially the integration of external supply chain data and a proactive approach is missing in most cases.

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Buy & Sell E-Commerce Web Application

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Abstract

The project aims to build a structure in which users can sell or buy new or used products in different categories. In addition to this, the project provides location-based shopping, communication between users, adding product comments and scores for each product. The users should log in to use the application. Then, they can manage their products, observe their order status, receive messages immediately about the products offered for sale and shop in the application. Also, users will be graded according to their purchase and sales rates. These rates will provide reliability for the users.

Keywords: Online shopping, e-commerce, Web application, Java

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1. INTRODUCTION

Due to advancements registered in the field of technology, online shopping (Soo & Cehol, 2019; Okomoto, 2010) and e-commerce (Huang, 2019; Cuizhi, & Yunkang, 2011) have emerged and become very popular. The main aim of this project is to present a web application for e-commerce to make life easier for people of all ages with its easy to use and user-friendly interface. The project provides a communication platform for people to sell various types of used/unused products.

MySQL was used as a database, and Java programming language was utilised together with Angular2, HTML5, CSS, and Bootstrap technologies. MVC architecture was based on Frontend and Backend frameworks. Web service structure was used together with Angular2 instead of java web frameworks. Also, instead of JavaScript, we used TypeScript in frontend with an object-oriented approach.

There are similar applications in the world. The main difference of our application is its interface which is easy to use. The user-friendly interface can be used easily by older people. Also, we utilised web service structure for developing the application. Instead of using Java Web Frameworks, Angular2 was preferred for the application.

2. PROPOSED APPLICATION

The application has user-friendly and simple interfaces. Every type of customer; from every age and occupation can easily utilise the application.

Figure 1. Login Page of the Presented Application

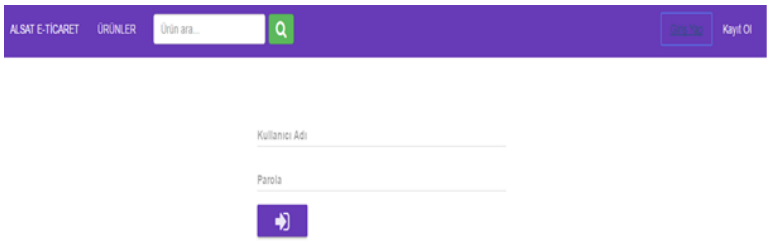


Figure 2. Registration Page of the Presented Application

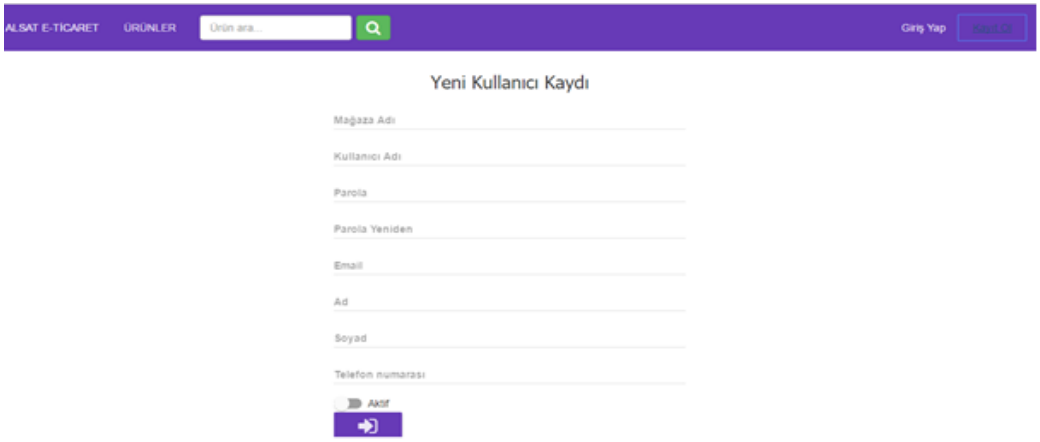
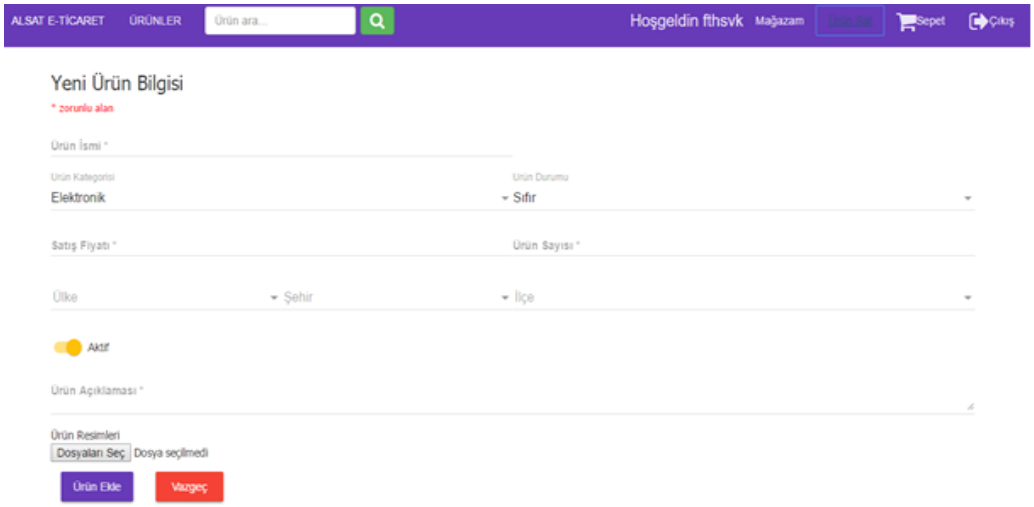
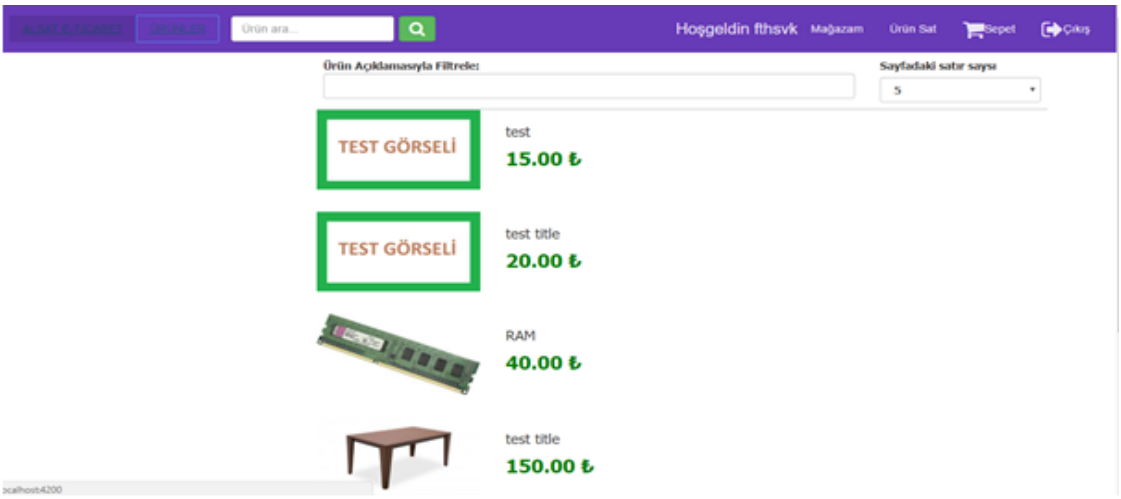


Figure 3. Product Selling Page of the Presented Application



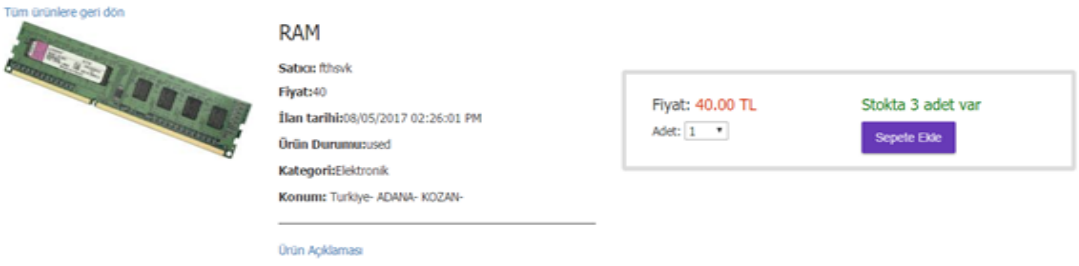
Users add their new product to the product selling page together with the product's most important properties.

Figure 4. Products Page



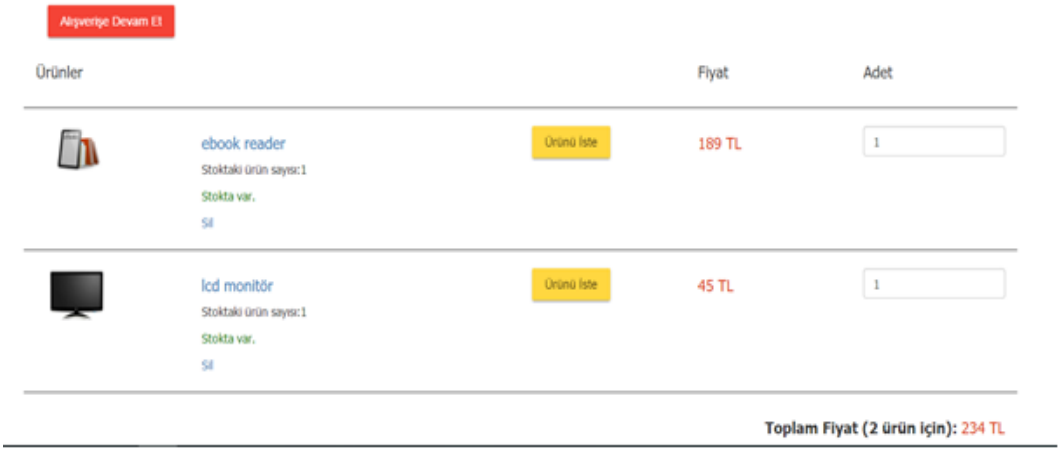
All of the products can be listed on the products page of the presented application.

Figure 5. Product's Details Page



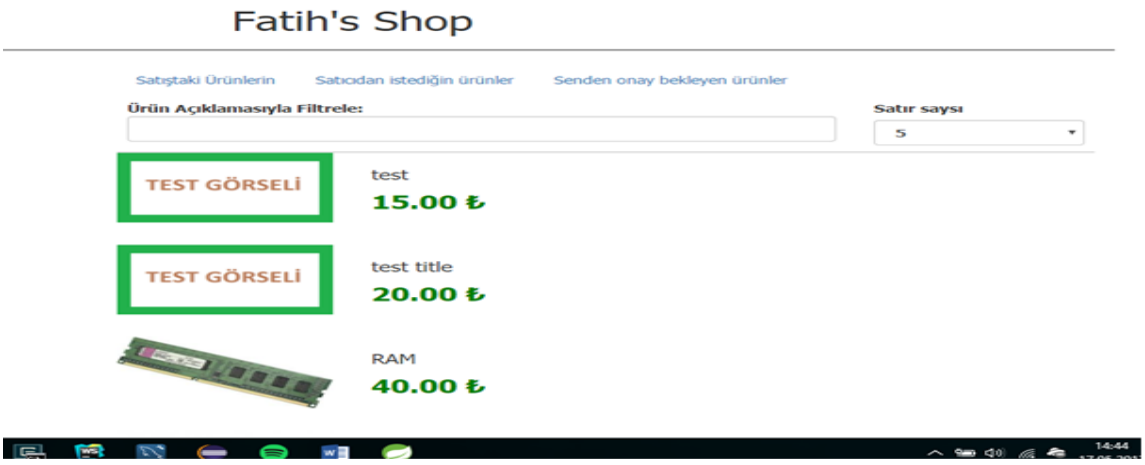
The properties of every product can be seen on the product's details page.

Figure 6. Shopping Cart Page of the Application



User's shopping bag is given in Shopping cart page. All of the chosen products are listed on the page with their prices and total price.

Figure 7. Main Page of the User



Each one of users has their main page. The page includes their products that will be sold, the products that are requested from the seller and the products that wait for approval from the seller.

3. CONCLUSION

Our project mainly aims to build a structure in which users can sell or buy new or used products in different categories. In addition to this structure, it is expected to have some more features. These include location-based shopping, communication between users, product comments and scores. Users who are members of the application can manage their products, observe their order status, have information about the products offered for sale in the immediate vicinity and can shop. Users will be graded according to purchase and sales quantities.

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A Comprehensive Look on BIM-GIS Integration

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Abstract

Efficient integration ability between Building Information Modeling (BIM) and Geographic Information System (GIS) has been a promising research subject in recent years. While BIM is a frequently used technology by both architects and engineers during project and construction management, GIS has a multi-disciplinary user portfolio, with its database management, visualisation, mapping, data integration, and interoperability features. Interoperability and integration possibilities between BIM and GIS are revealed in previous studies on project and construction management. In this paper, a comprehensive literature review on interoperability and integration of BIM and GIS is introduced. Studies on integration are categorised into three main groups which are data, process and application level. Interoperability features of BIM and GIS technologies, effective software of both technology and application development possibilities in these environments are also discussed within the scope of the study. Research findings indicate that the CityGML data structure of GIS and IFC data model of BIM are two the featured models on integration between these two distinctive technologies.

Keywords: Building Information Modelling (BIM), Geographic Information System (GIS), integration, Interoperability, Project, and construction management.

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1. INTRODUCTION

The concept of 3D object-based building systems, known as Building Information Modelling (BIM), has been in our lives for over 40 years. The concept, which was limited to programming at the beginning, gained a structure that accommodates the reality of the environment we live in. BIM has started to be used frequently by researchers who are studying on GIS. Thanks to BIM-GIS integration, successful studies are carried out in many fields of construction management. While BIM and GIS are two distinctive technologies with different working areas and different standards, the integration of these technologies helps to implement many applications that cannot be carried out in GIS and BIM separately (Karimi & Akinci, 2009). This integration is not easy because of the difference in standards. These differences can be listed as spatial scale, level of detail, geometry description methods, storage and access methods as well as semantic mismatches (Isikdag & Zlatanova, 2009; El-Mekawy & Östman, 2011).

Interoperability between BIM and GIS is demonstrated in many research works on project and construction management. The integration of these two technologies enables the creation of advanced construction management models. In order to ensure the interoperability and integration of BIM and GIS, it is necessary to conduct research on both technologies and to recognise their various tools. Also, previous studies on BIM and GIS interoperability and integration pointed out that CityGML is the most important model of GIS with open standards while Industry Foundation Class (IFC) is the most suitable interoperability data model of BIM.

There are several studies focusing on BIM and GIS integration and can be examined in three levels; application, process and data levels. In the application level, integration methods use reconstruction. An existing BIM or GIS tool is redesigned with software patches/add-ins to suit the purpose of the operation or to cover the functions of other technology (Karimi & Akinci, 2009). This method is usually expensive and inflexible. The process level integration methods of BIM and GIS utilise the Service Oriented Architecture (SOA) to allow participation in BIM and GIS systems in cases that require the capabilities of both technologies (OWS-4, 2007). Although this method offers more flexibility than application-level integration methods, integration challenges can be solved at the basic data level to provide interoperability. There are several methods that improve BIM-GIS integration at the data level. Combination methods such as ESRI ArcSDE allow data transfer between BIM and GIS with an API. Tools such as FME Workbench and Translation / Conversion methods developed by Nagel et al. (2009) are developed with the aim of directing the conversion between BIM and GIS formats. This method often provides data conversion between IFC and CityGML. Semantic losses, limitations in geometry transformation, and the fact that they are only focused on major structural elements constitute the main concerns about this method.

In this paper, we present a literature review on BIM-GIS integration. Since CityGML and IFC are the most suitable interoperability data models for integration, a brief comparison on them is discussed. Main studies on literature have been referred to considering the page limitation. Research is concluded by addressing the profound possibilities of BIM-GIS integration and suggestions for new ideas.

2. IFC AND CITYGML

IFC is an interoperable data model which is developed by buildingSMART as an open standard. IFC is designed and developed to define objects within the frame of geometric and semantic knowledge (buildingSMART, 2009). It enables users to integrate BIM model with another technology (e.g. GIS as addressed in this study). IFC represents both physical components (walls, doors, beams, etc.) and abstract concepts (schedules, activities, construction costs, etc.) of the buildings.

On the other hand, CityGML is a data model from Open Geospatial Consortium (OGC) which provides a specification for the representation of the 3D urban objects. CityGML defines different standard levels of detail (LODs) for the 3D objects, which allows us to represent objects for different applications and purposes. CityGML concerns with the outdoor environment while IFC focuses on the indoor environment. CityGML is lack of high level of details, while IFC provides a higher level of details. IFC tends to focus on buildings and their attributes. CityGML has a wider span and deals with the entire city and urban areas.

3. LITERATURE ON BIM-GIS INTEGRATION

New techniques are needed on architecture, engineering, and construction (AEC) industry in order to reduce project cost, increase productivity and quality, and reduce project delivery time. BIM has the potential to achieve these goals (Azhar et al., 2008). The virtual model of a structure can be created digitally with BIM tools. BIM comprises the correct geometry of the building and the data required for the design, material supply, application and management of the construction activities. A building information model can be used to illustrate the entire life cycle of the structure, including geometry, spatial relations, geographic information, quantities and properties of building materials, cost estimation, material stocks and project schedule (Bazjanac, 2006). In the last decade, the integration of BIM and GIS has been a hot topic and researched on many use cases.

Isikdag et al. (2008) proposed a method to integrate BIM into GIS on the purpose of land selection or fire management. The proposed method enables the conversion of IFC data into ESRI shape file. The Shortest route analysis of ESRI ArcGIS software is utilized in fire management cases. Isikdag and Zlatanova (2009) found that data conversions between two technologies needed a two-way transformation of both geometric and semantic data sets.

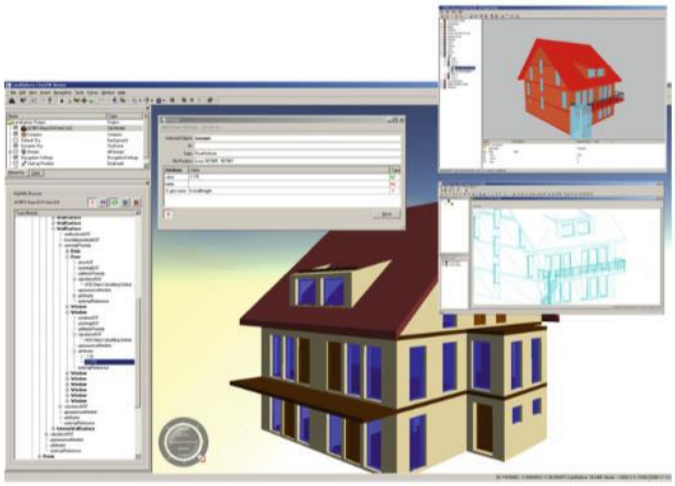
The research focused on the one-way transformation from IFC to CityGML, and this transformation is performed using the FME Workbench tool.

Hijazi et al. (2009) proposed a mapping methodology to extract utility information by using CityGML/Utility Network application domain extensions. The methodology provides a geometric and semantic transformation of information about utilities (e.g. water, gas, electric, plumbing etc.) between IFC and CityGML.

Van Berlo & de Laat (2011) have developed a plug-in with its high accuracy and a semantic structure called GeoBIM, which is capable of transmitting the building information model in the IFC data model to the CityGML environment. First of all, the known CityGML object types (building, room, door, window, etc.) are defined as IFC properties (such as window and door lengths and widths); then the IFC data is transferred into the CityGML environment. Thanks to the parameters created and the IFC classes, IFC-CityGML data integration can be achieved without data loss. Figure 1 illustrates a simple building model which is transferred from IFC to CityGML. GeoBIM is regarded as one of the most breakthrough researches on the integration of BIM into GIS within the frame of open standards.

El Mekawy et al. (2012) proposed the Unified Data Model, which can prevent data conversion difficulties and data loss between IFC and CityGML data models. Unified Modeling Language (UML) is utilised to identify the relationship between internal and external objects of the building and the conceptual relations between them.

Figure 1: A building model which is transferred from IFC to CityGML by GeoBIM extension**.**

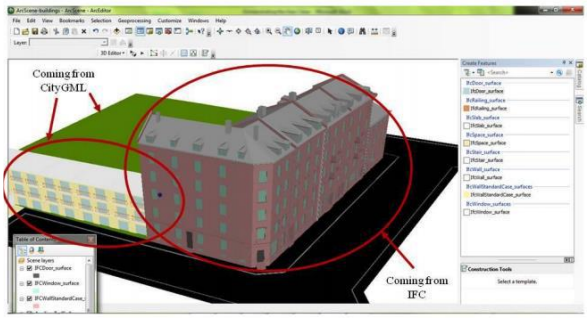


Source*:* Van Berlo and de Laat (2011)

Use cases of the study are developed for two main purposes of a hospital building, including the emergency evacuation of patients and the allocation of a new patient ward (Figure 2). Spatial analysis is performed in ArcGIS environment in light of traffic density, noise criteria, and traffic data. UBM is a unique approach that enables users to combine BIM and GIS features and capabilities into one single model. The proposed model is regarded as significant with its ability to fully integrate IFC and CityGML.

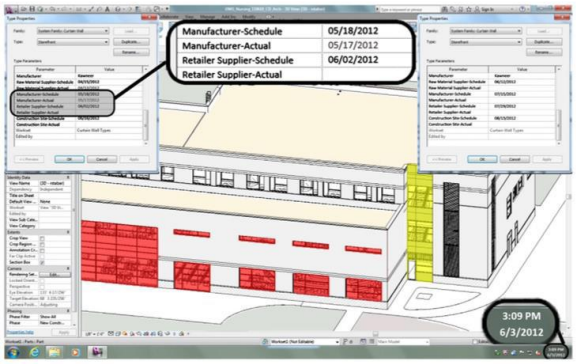
Irizarry et al. (2013) contributed to the literature on CSCM by integrating BIM and GIS into a unique system. The proposed system enables tracking of the vehicle and colour codes (blue, green, yellow, and red) on 3D-BIM model with the integration of the construction schedule in order to ensure the delivery of materials. Figure 3 illustrates the colour code function which is developed as an add-in on Revit. This study is one of the rare researches in the literature regarding proposing the integration of BIM and GIS in Construction Supply Chain Management (CSCM).

Figure 2. IFC-CityGML Integration by UBM in ArcGIS environment



Source: El Mekawy et al. (2012)

Figure 3.IFC-CityGML Integration by UBM in ArcGIS environment



Source: El Mekawy et al. (2012)

4. CONCLUSION AND SUGGESTIONS

There is a need for technology integration and advanced technology engagement in order to fulfil management targets in the AEC industry. BIM and GIS are two distinctive technologies with profound integration possibilities. Studies on this integration revealed that both technologies have great potential to integrate. While BIM focuses on the indoor details of buildings; GIS is more related to the outdoor details and urban surrounding. Merging urban data with buildings enables rich data models as well as leading smart city applications and more accurate solutions. It is concluded that IFC and CityGML data models as open standards of BIM and GIS respectively, can facilitate openBIM-OpenGIS integration and better collaboration between technologies. This research also reveals that there is a need for transformation of IFC building models into semantically and geometrically valid representations for CityGML. Therefore, the authors suggest more research on semantic issues on IFC-CityGML integration and the development of a transformation algorithm between them in further studies. The establishment of more independent platforms for integration in order to provide better management in construction is also suggested.

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ECO-SUPPLY: GIS Supported Supply Chain Management Model on Construction

A. Emre Cengiz[1], Asst. Prof. Osman Aytekin[2], Prof. İlker Özdemir[3], Asst. Prof. Hakan Kusan[4], Prof. Alper Çabuk[5]

Abstract

In this paper, we introduce a Geographic Information System (GIS) supported the Construction Supply Chain Management (CSCM) model entitled ECO-SUPPLY. ECO-SUPPLY is a model as well as being web-based software suggesting economy and ecology optimisation on CSCM. It enables two main analyses which are a selection of building materials and suppliers under multiple criteria. Cost as an economic criterion and global warming potential (GWP) category as an ecological criterion is taken into account. Due to the lack of findings on ecological impact values of building materials in Turkey, three wall materials are specified, and a simplified Life Cycle Assessment (LCA) technique is proposed in order to obtain ecological impact factor values on materials selection phase. Criteria for supplier selection are obtained by an expert panel, and a questionnaire survey is implemented to determine the weightings of each criterion. Analysis functions of the software are implemented in the sample building which is a 10-storey reinforced concrete building in the city of Eskisehir. Results revealed that ECO-SUPPLY can provide decision support to architects and designers in the design phase on materials selection and also to the project managers during construction phase on supplier selection. ECO-SUPPLY is regarded as a model which can bring construction projects the perspective of low carbon footprint, as well as the time, cost and quality objectives of the construction management.

Keywords: Construction supply chain management (CSCM), ECO-SUPPLY, Economy, ecology, Geographic Information System (GIS).

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1. INTRODUCTION

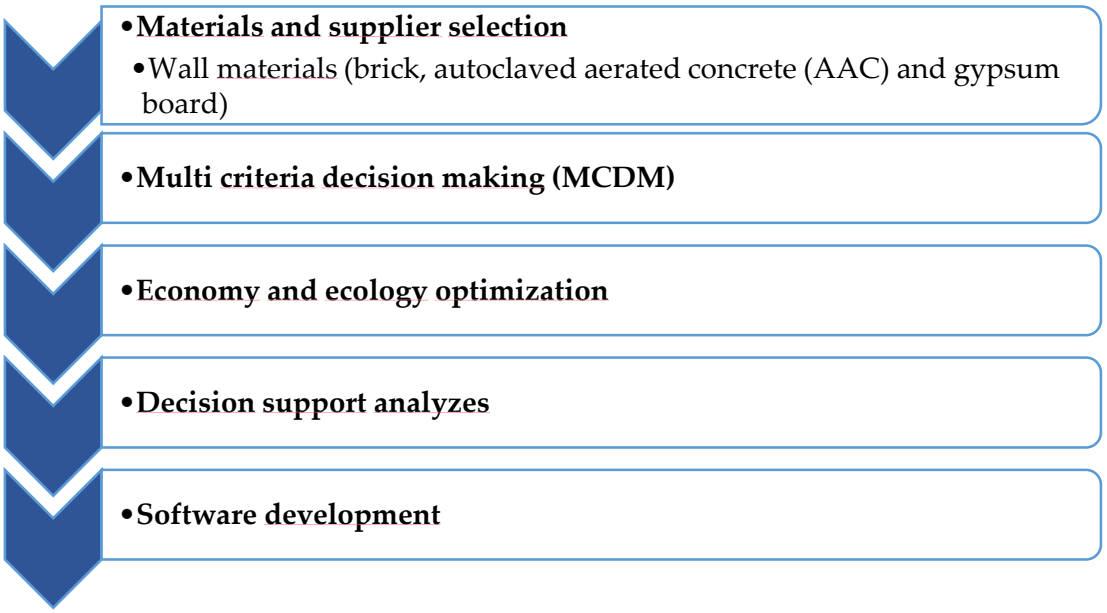
Supply Chain Management (SCM) is a sophisticated concept of material-related management which is not previously considered as a common research and application issue in architecture, engineering, and construction (AEC) industries. It is regarded as a bridge to establish a multi-disciplinary relationship between the construction sector and economics, business and industrial engineering. Conducting the material procurement process to construction sites within the framework of a management approach and philosophy has enabled frequent use of SCM in the construction sector. Many researchers have emphasised the benefits of SCM philosophy to the construction industry in order to improve the performance of construction and reduce large waste caused by inefficient materials management and control (Irizarry et al. 2013). Material-oriented activities (procurement, order, transportation, storage, application, etc.) are the main components of a building which is desired to be constructed within the frame of quality standards and a defined budget and time.

Geographic Information System (GIS) is recognised as one of the leading technologies that can be utilised in project and construction management. Even though the construction sector is less responsive to modern technology than any other academic and sectoral areas, it has the prominent potential of integration with GIS. During the life cycle of construction projects, there is an intensive data production, use, and sharing. GIS is an information technology that provides solutions to data-driven problems in construction projects thanks to its powerful database management functions. Besides, the spatial analysis functions of GIS provide decision support to the project participants during the stages of construction projects such as construction site and transportation planning, 3D visualisation, construction schedule tracking, real-time progress tracking and management of material-oriented activities. Researches in the international literature have indicated that GIS is one of the featured technologies in Construction Supply Chain Management (CSCM) process (Li et al., 2003; Li et al., 2005; Jadid and Idrees, 2013; Jadid, 2016). These studies focus on the quality, cost and time objectives of project management. On the other hand, the ecology parameter is yet to be researched more comprehensively.

In this study, a GIS-supported CSCM model that can provide decision support to decision-makers in construction projects within the frame of economy and ecology criteria is introduced. The model, entitled ECO-SUPPLY, utilises the functions of GIS technologies and multi-criteria decision making (MCDD) methods to carry out decision analyses and provide decision support for the selection of building materials and suppliers. Web-based interface of the software allows users to determine site and supplier locations by using the map-based location selection function and to calculate the distance between suppliers and the construction site using online map services. Figure 1 illustrates the ECO-SUPPLY software architecture. In order to test the functions and feasibility of the software, a mixed-

use construction project in Eskisehir Tepebaşı District was selected as a use case. The findings of the study revealed that a CSCM model which can select materials and suppliers within the frame of economy and ecology parameters could provide decision support to decision makers in both design and construction phases of projects.

Figure 1: ECO-SUPPLY model architecture



2. METHODOLOGY

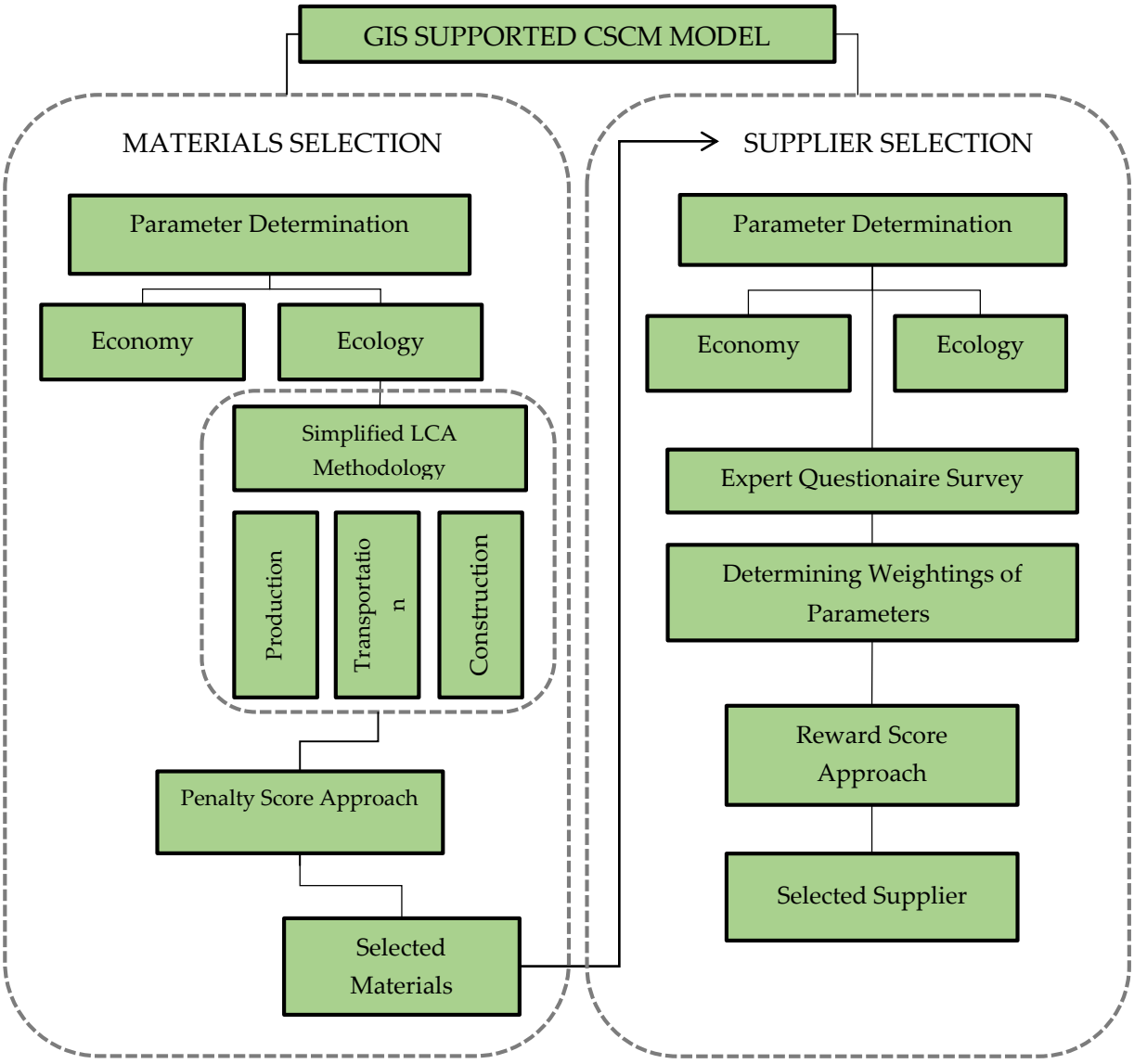
ECO-SUPPLY model has a semantic framework that can achieve the selection of materials in design and construction phases of the construction materials within the frame of the economy and ecology parameters and the selection of the supplier for the proposed material based on multiple criteria. In order to establish this framework, there were a need for MCDM methods and various techniques in both material selection and supplier selection phases. These methods are shown in Figure 2.

A simplified LCA method is proposed for material selection decision support analysis of the model. This approach allows the environmental impact assessment in three stages of production, transportation, and application of building materials. Since low cost and low carbon emissions for building materials mean the best economic and ecological performance; both criteria are graded according to "lower is better" rule.

ECO-SUPPLY model provides supplier selection decision support by utilising the capabilities of GIS for the optimum building material which is determined as a result of material selection analysis. As the distance between the construction site and the supplier

can be expressed numerically and displayed on the map in supplier selection decision support analysis, the total carbon emission and total cost values of each supplier can be calculated.

Figure 2: Methodology schema of the ECO-SUPPLY model



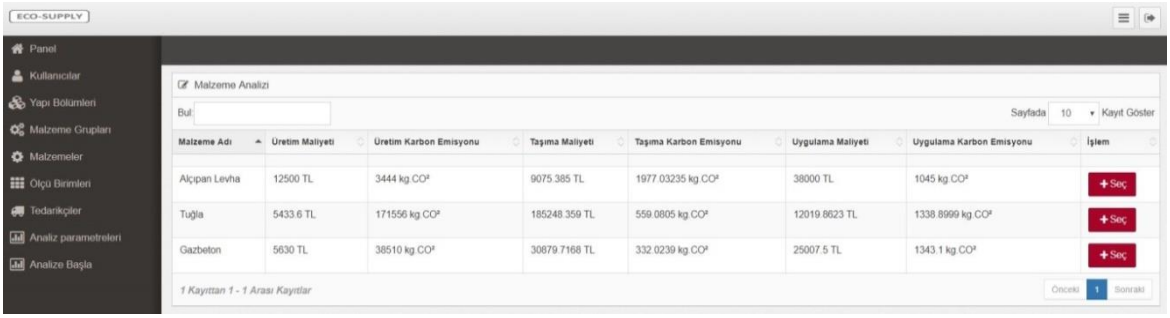
3. A BRIEF LOOK TO ECO-SUPPLY SOFTWARE

The ECO-SUPPLY software includes two basic analysis groups: material and supplier selection. When the user clicks on "Start Analysis", the map function is loaded, and the user is asked to mark the location of the site where the supply destination is. When the site location is selected by the user, and the Next button is clicked, the Material Selection Analysis interface, which is the first analysis of the ECO-SUPPLY software, is displayed. In this page, the user is expected to select the building section and material group to be analysed from the Compartment and Material Group Combo Box fields and determine the desired material quantity by entering a numerical value in the quantity field. When the data fields are filled, and the Material Analysis button is clicked, Material Analysis Results are displayed. All materials defined in the selected material group are included in the analysis, and the cost and carbon emission values of these materials during production, transportation, and application phases are automatically calculated and displayed. Figure 3 illustrates the result screen of the material selection analysis.

In the Supplier Selection Analysis interface of the ECO-SUPPLY software, the user is expected to choose the weighting method. Since all of the analysis parameters do not have numerical data and are not consistent with each other, hypothetical numerical data in the 0-10 range for analysis and parameter percentage weights determined as a result of statistical analysis are used.

When any weighting method is selected by the user, and the Supplier Analysis button is clicked, the Supplier Analysis Result Screen is displayed. Figure 4 illustrates the results of the supplier selection analysis performed by selecting the ECO-SUPPLY Weighting Method. For each supplier, total cost and total carbon emission values can be compared, and the reward points for each supplier are also displayed.

Figure 3: Material selection analysis results interface



By clicking the Select function in the Process section of the most appropriate supplier, the Supplier Route is displayed. The route information from the supplier to the site on the map interface is shown just as in the Google Maps application. Thus, the distance

from the optimum supplier to the site and the route information can be accessed by the user (Figure 5).

Figure 4: Supplier selection analysis results interface

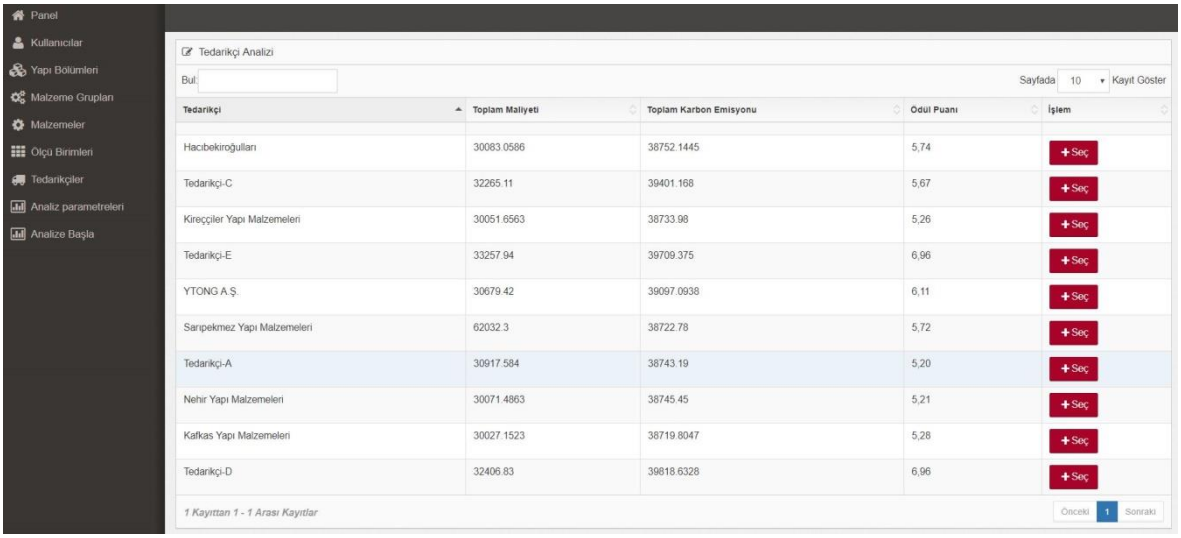
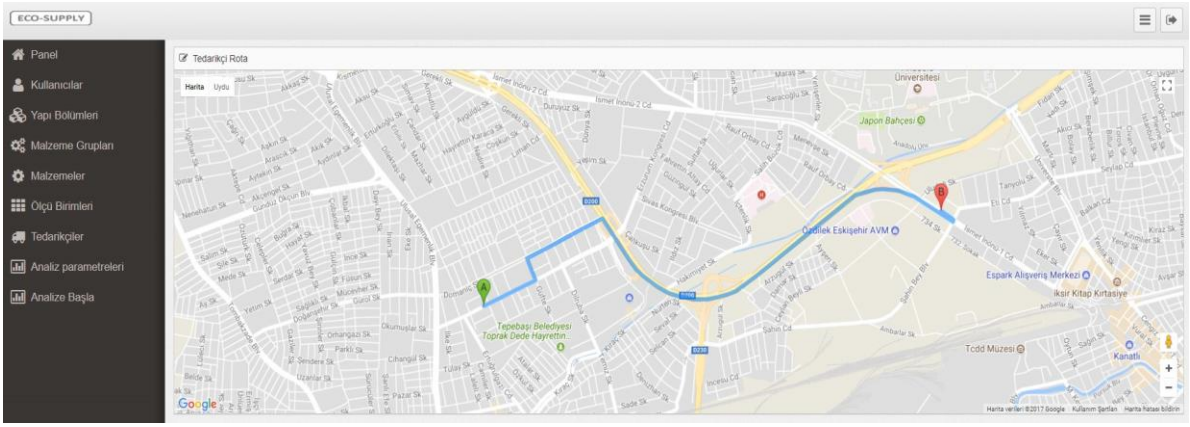


Figure 5: Route between the most appropriate supplier and construction site



4. CONCLUSION

The GIS-supported CSCM model enables material comparisons on the production, transportation and application phases of the building materials in light of the economic and ecological criteria. For the material selection decision support analysis of the model, the approach, which is named as simplified LCA is adapted from the cradle to the grave scope of LCA. Brick, AAC and gypsum board which are the most preferred wall materials in the

Turkish construction sector are researched. In the material selection decision support analysis of the model, the cost as an economic criterion and the global warming potential of carbon equivalent as the ecology criteria are taken into consideration. Unit price analyses of the Ministry of Environment and Urbanization are used for the ordering, and the labour unit costs of the materials and data derived from the construction sector are used as production and transportation unit costs. While EPD documents published by the manufacturing companies of building materials are used in order to calculate the global warming potential at the production phase, the transport functions given in IPCC2013 and the related resources in the literature are utilised for the transport phase. A new approach is proposed for the implementation stage carbon emission value by utilising TURKSTAT's annual greenhouse gas emission statistics and construction person-hour tables.

The software developed enables material and supplier selection functions in the CSCM process. Thus, it can provide decision support to architects and designers during the design phase of construction projects and to all sector participants who participate in the material procurement process, especially project and construction site managers during the construction phase. Besides, thanks to its economic and ecological optimisation features, ECO-SUPPLY is an emerging analysis tool that can add the ecology perspective to the cost, time and quality targets of construction management.

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Performance Observations on IP Traffic - Influence of Packet size on Efficiency

Marius Istel[1]

Abstract

This paper gives insight on how efficiency and workload are influenced by different packet sizes. It explains why conventional observations on arrival rate fail to recognise the real behaviour of modern applications and lists traffic attributes of such examined traffic patterns. By analysing Wireshark captures of different real-time applications via mirror-ports, evidence on packet size distribution, the composition of used protocols and corresponding arrival rate is gathered. As a result, various applications characteristics are known, which does not only open up the possibility to derive what software is in use by monitoring overlaid network traffic but also enables optimisation of network dimensioning.

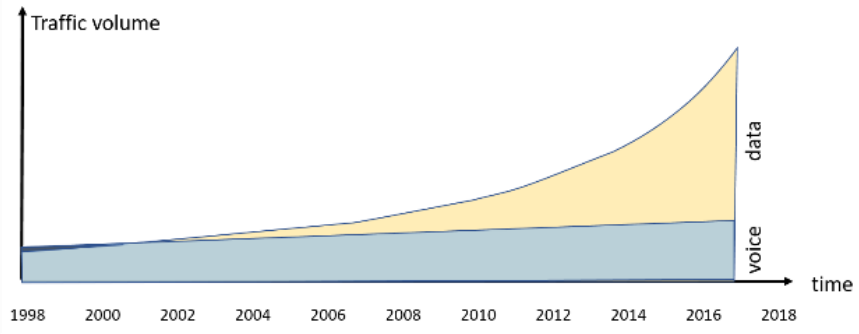
Keywords: IP traffic; Performance; Packet size; Arrival rate; Workload

1. INTRODUCTION

The volume of traffic transported via communications networks has changed dramatically in recent years. From 2015 to 2017, the global internet traffic grew 49.7%, reaching a value of 108.5 Exabyte (EB) per month. According to forecasts, the amount is expected to further increase to monthly 194.4 EB by 2020 (Chuvieco; Li, & Yang, 2010). However, not just the quantity of the data is shifting; its composition is subject to change as well.

While voice transmission used to be the main part of data communication networks, ever since the turn of the millennium data traffic prevails and is rising almost on a daily base as can be seen in Figure 1

Figure 1: Development of Voice and Data Traffic



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An increasing part of this data has requirements for transmission in real-time, for example, Voice-over-IP, Internet of Things (IoT) or online gaming applications. New applications with new requirements expand the existing environment of data communication and entail new higher requirements on IP data networks regarding reliability and Quality of Service (QoS). Though often those requirements are not fulfilled, this results in long delays or loss of information. Therefore, applications do not work as expected and in some cases, cannot be used any more under these circumstances.

Following, the reasons for this behaviour will be observed, trends in IP traffic will be presented, and insight on characteristics of new applications as well as their requirements specification will be provided. To do so, traffic measurements of Local Area Networks (LAN) were taken in business environments and examined using analysing tools.

To begin with, theoretic foundations of traffic theory, which are necessary for understanding, are explained, followed by trends in IP traffic. Chapter 4 is dedicated to a description of measurement techniques, the results of which are given in chapter 5. Concluding, chapter 6 provides a summary of the findings and gives an outlook on further research areas

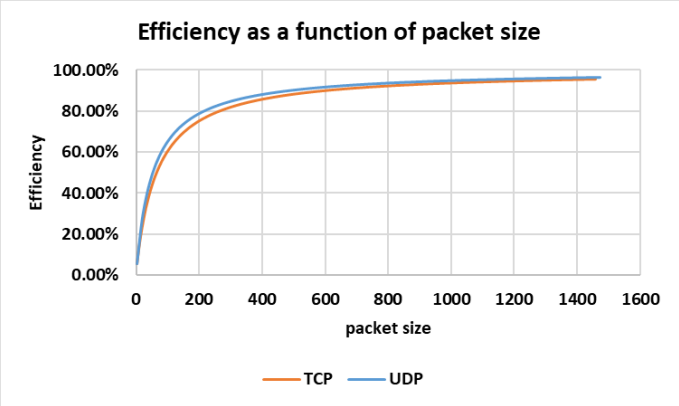
2. THEORETIC FOUNDATION

Packets form the basis for data transmission on the Internet; they are exchanged between the sending and receiving instance via the Internet protocol. The distinction between user data and header data is elementary for the understanding of performance considerations, see Figure 2.

Figure 2: Schematic Representation of a Data Packet

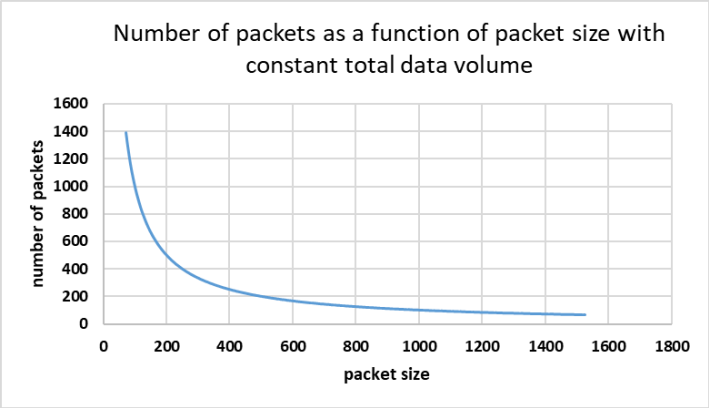
Each packet consists of a header fraction of fixed size, as well as a user data fraction of variable size. The header contains information about the data packet, such as the IP address of the sender or receiver, its volume varies depending on the type of protocol used. The user data fraction, on the other hand, contains the actual data. The ratio of these components is of significant importance regarding the efficiency of transmission. Figure 3 illustrates the efficiency of transmission as a function of different packet sizes, for the protocols Transmission Control Protocol (TCP) and User Datagram Protocol (UDP) in the Ethernet frame.

Figure 3: Efficiency as a Function of Packet Size



For small packets, an unfavourable ratio of user data to total data is obtained, only 5.6% of the packet consist of user data if the minimal packet size is used. This value rises as packets increase in size, reaching almost 100% (99.6%) for maximal allowed packet size in the Ethernet frame. As a consequence, given a constant total data volume, there are significant differences in the necessary number of packets to be transferred as a function of the packet size. An example of a transmission of 100 000 bytes is shown in Figure 4.

Figure 4: Number of Packets as a Function of Packet Size with Constant Total Data Volume



Thus, when using small data packets, due to the fixed header data contained in each packet, a considerably larger total data volume is incurred. This in turn directly affects the degree of capacity utilisation of a transmission, which is defined as the quotient of the mean arrival rate λ and the mean service rate μ.

$$utilization\ \rho = \frac{mean\ arrival\ rate\ \lambda}{mean\ service\ rate\ \mu}$$

Equation 1: Utilization ϱ [2]

The arrival rate provides information on how many objects per unit of time arrive in the waiting system. This refers to the number of packets received per time interval on the server (Siegmund, 2014). The second parameter of the equation, the service rate μ, provides information on how many packages can be processed by the system per unit of time. Equation 2 reveals how this value is composed of the quotient of the data transmission rate and the average packet size.

$$mean\ service\ rate\ \mu = \frac{data\ transmission\ rate}{average\ packet\ size}$$

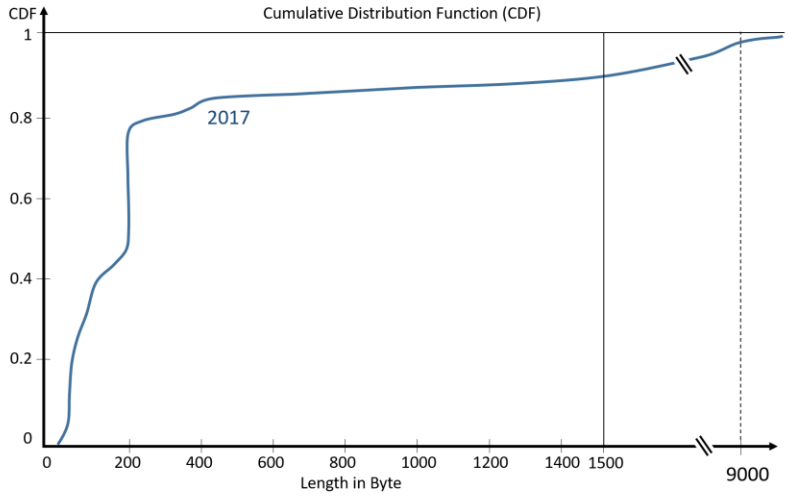
Equation 2: Mean Service Rate

The data transmission rate is determined by the capacity of the network elements or by network providers; the packet size corresponds to the total length of a packet including the header. Usually, both, arrival rate λ and operating rate μ are averaged. While the arrival rate is normally considered as an average value over one second, it is common to consider the packet size, and consequently the service rate, on average over the total duration of a measurement. However, this view often reflects the reality inadequately, and thus often leads to a failure to estimate the traffic load of a network as will be shown in the next chapter.

3. TRENDS IN IP TRAFFIC

To investigate why these approaches are critical, the cumulative distribution function of the packet sizes measured in Local Area Networks (LANs) should first be observed. See Figure 5.

Figure 5: Cumulative Distribution Function



Based on Studies made by Hurtig, John and Brunstrom in 2011 (Lu; Qu & Qiao) it is noticeable that between 1998 and 2006 the number of small packages has increased significantly. The number of packets of 40 bytes' length, the smallest one possible, rose in particular. Whereas 1998, packets of a length less than 200 bytes were responsible under 10% of the total traffic, in 2006 they accounted for almost half of it. This trend is confirmed by the measurements obtained in 2009.

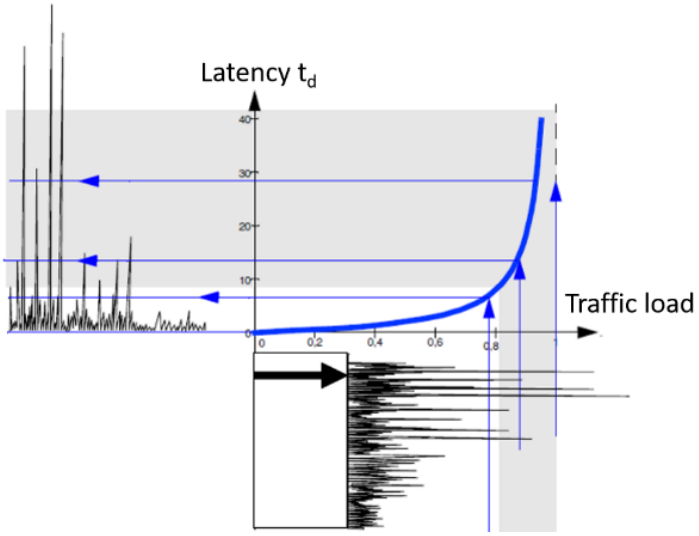
Moreover, this tendency is verified once more by the results of own measured data in 2017. The distribution function is shifted towards packets of minimal length.

Nonetheless, there is a second tendency recognisable, too. Packets of maximal size of the Ethernet frame gain on importance as well. Furthermore, packets that exceed this frame of 1518 byte, so-called jumbo packets, tend to be used more frequently. Due to their larger size of up to 65535 bytes, they are by far more efficient than smaller packets and therefore evoke a higher data throughput. This is the reason why they find use in professional LAN environments whenever large amounts of data are being transferred, as it is the case for Network Attached Storage (NAS) systems for instance.

It is precisely these two trends that are responsible for the fact that conventional approaches often fail. On the one hand, the averaging of the arrival rate leads to short-term bursts not being detected, though they do occur. Bursts are short time intervals, where the arrival rate exceeds the average arrival rate many times. Usually, such a burst last a few milliseconds and can reach values of 40 to 50 times the average rate. An increasing number of small packets and a rising traffic volume generate a higher packet arrival time. As the arrival time rises, utilisation capacity is elevated as well. This leads to the second crucial issue, observing packet size as a mean value. Usually, the packet size is computed by taking into account all of the packets traced during the measurement. While small packets lead to an increased service rate, which is positive concerning utilisation, jumbo packets cause the average packet size to be elevated. Hence, the mean service rate decreases and in return utilisation capacity is enhanced.

In conclusion, those two issues lead to the utilisation capacity frequently being undervalued. Shortly, during bursts, for example, its values can spike up and reach values far from the average. This, however, is critical, as utilisation values of 80% and greater imply exponentially longer delays as well as higher packet loss rates, as can be seen in Figure 6. In the case of long-range dependence and self-similarity in network traffic (Hurst parameter $0.7 < H\ 0.9$) several studies showing this can be already measured with utilization of about 40 % to 60%.

Figure 6: Latency as a Function of Utilisation – Based on [5]



The use of small packages, which are typical for applications with requirements on real-time transmission, results in a shift of the traffic load into a range of higher utilisation. Since the traffic peaks are additionally distorted at the utilisation curve (valid for M/M/1-Systems and short-range dependence), short-term bursts result in a significantly longer packet runtime. Whereas this behaviour was rarely observed before and could be neglected, current trends in IP traffic are causing this undesirable pattern to appear more frequently, ultimately provoking applications not to run as expected or not work at all.

Against this background, getting to know the real characteristics of internet traffic is of fundamental importance in order to be able to estimate a resulting network load and to dimension communication networks according to requirements.

For this purpose, a variety of measurements were carried out in a professional environment of various companies. The next chapter describes the measurement techniques and procedure in greater detail.

4. MEASUREMENT TECHNIQUES

Using Wireshark, a tool for network protocol analysis and graphical representation of data traffic (Romaguera. et al. 2010) many Internet-based applications were recorded via a LAN connection at a mirror port. Particular attention has been paid to recording applications as isolated as possible in order to minimise interference. Specific information of the traces, such as the type of protocol used, time of arrival the packets and packet length were extracted from these recordings and stored as comma-separated values via Linux-based bash scripts. The traces including confidential data were deleted afterwards according to data protection and data security laws.

Subsequently, these anonymous data built the foundation for statistic studies of the packet length distribution as well as the arrival rates as a function of time. The analyses were implemented using MATLAB, as well as Excel using Microsoft Visual.

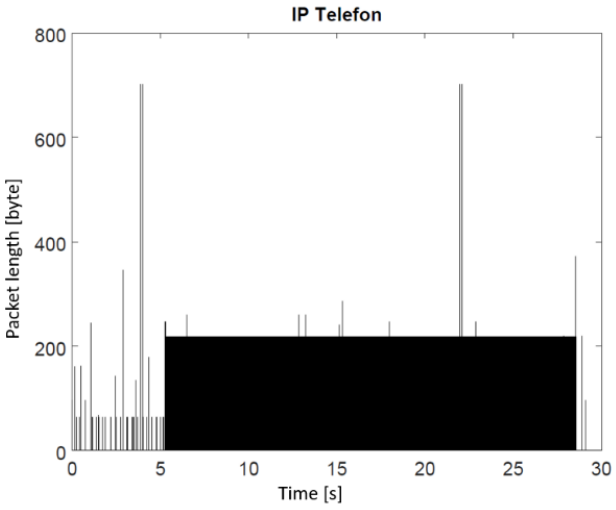
5. FINDINGS

By analysing the measured data, traffic patterns can be defined. Such a pattern or footprint consists of a characteristic combination of arrival rates and packet size distribution for different applications. Knowledge of those traffic pattern, in turn, allows statements about a resulting network utilisation to be made, by giving means to estimate the collective workload based on prior determined attributes.

Furthermore, conclusions about the applications used in a network can be drawn by comparing these characteristics to a measured superposition of different applications.

Every software application has a unique footprint, a characteristic combination of used protocol, arrival rate-behaviour regarding user interaction and packet size distribution. Following, an excerpt of the obtained footprints is given. The first presented application is Voice over IP. A VoIP call generates packets of 180 to 200 bytes, depending on the used hardware and transmits approximately 100 packets per second. Figure 7 shows the packet size distribution as a function of time for VoIP-phones. The End-to-End connection is established at 5s. The black bar lasting to 28s corresponds to the phone call being made. A clear distinction to the traffic captured before call setup and after termination can be seen.

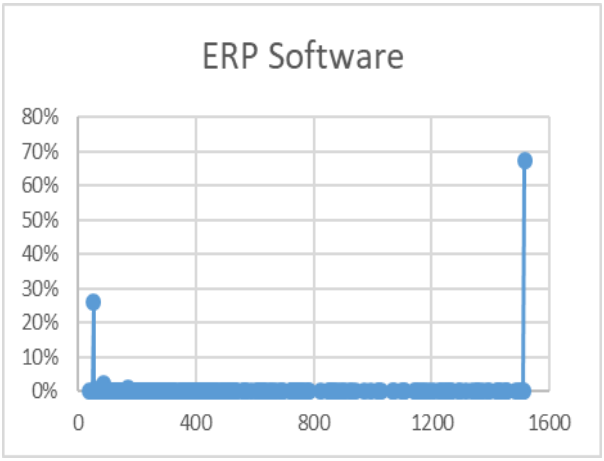
Figure 7: Packet Length Distribution as a Function of Time, VoIP-phones



Another analysed application is Enterprise Resource Planning Software. This ERP Software commonly used in medium-size companies to manage day-to-day business

activities, such as accounting, procurement, project management, and manufacturing. Figure 8 shows the relative packet size distribution for the start-up process of such an ERP Software.

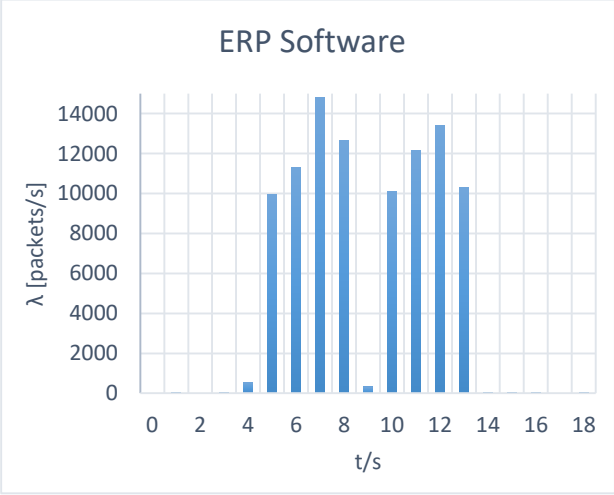
Figure 8: Relative Packet Size Distribution – ERP Software



Source: UNOOSA

Two major peaks are significant, the first one at 66 bytes' length (25%), the second one at the maximum Ethernet size of 1514 bytes' length (67%). Figure 9 shows the corresponding arrival rate. During the start-up process, 10k to 15k packets get transferred over the course of 8 to 10 seconds.

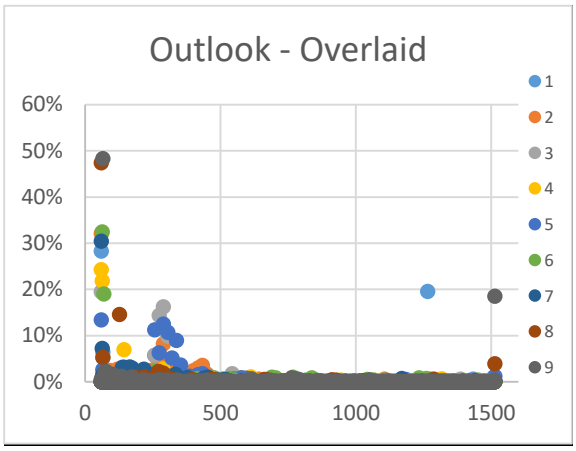
Figure 9: Arrival rate - ERP Software



Source: Intel, 2018

Another example of a characteristic application is Email Software. The application analysed, in particular, is Microsoft outlook. Again, the start-up process was monitored. Figure 10 shows the overlaid packet size distribution of 9 captures of the software start.

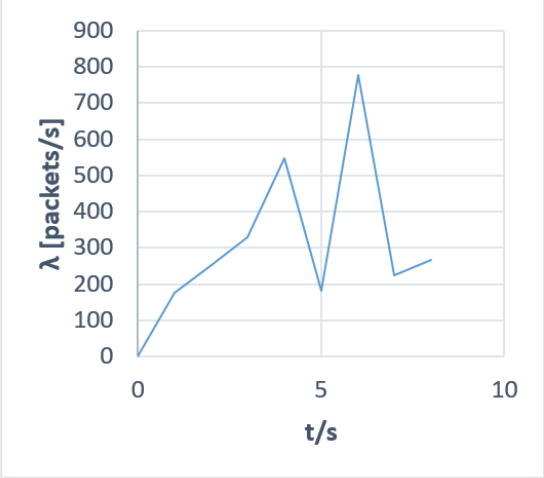
Figure 10: overlaid packet size distribution



Source: Intel, 2018

All nine captures obtained from 9 different companies show a similar distribution function. There's a peek at 60 to 66 bytes of about 40%, an accumulation in the range of 250 to 320 byte, that makes up about 20% and an otherwise equal distribution of the remaining packet lengths. The mean arrival rate of the captured samples is 302 packets per second; significant is that all samples peak at a value more than twice the average rate. Figure 11 shows an exemplary arrival rate function.

Figure 11: Arrival Rate – Microsoft Outlook



Source: Istel, 2018

As displayed examples suggest, each form of application consists of a unique combination of packet size, packet arrival time and used protocol. To mention all the captured and analysed traces would go beyond the scope of this paper, first results can be found in (Istel, 2017; Istel, 2018).

6. CONCLUSION AND OUTLOOK

The current work provides first insights into the real behaviour of Internet traffic; it explains why previous considerations often fail to make correct statements about the actual utilisation of a network connection. Building a catalogue of the characteristics of different applications is another essential aspect. Based on these significant traffic characteristics, statements about the resulting utilisation of a network can be made. This is of great importance about dimensioning communication networks most efficiently. On the one hand, the negative user experience can be avoided using networks that are designed to be too small and thus potentially overloaded. On the other hand, an over-dimensioning of the network elements, which would be disadvantageous from an economic point of view, can be prevented.

However, the work on the field of performance analysis in data traffic is far from being completed. As the data collection is still in progress, new applications are being catalogued, as well as already characterised applications get adapted based on larger comparative values, and therefore their characteristics get updated. Consequently, not all planned applications are analysed at the time of publication. Furthermore, it has not yet been practically verified whether conclusions can be drawn from superimposed traffic to the individual components.

Due to the big increase in jumbo frames, common approaches concerning traffic shaping cannot be applied no more, as only arrival rates are affected by this mechanism. The specific impact jumbos have on traffic shaping is subject to further research.

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An Android Application for Gamification with Education

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Abstract

Education period is an important part of our lives. Online education applications have become widespread. In addition to the education period, games occupy a great part in our daily life. Well-designed games and game-based applications entertain and motivate people. Utilising the dynamics of games in daily life has attracted the attention of researchers. There are many studies on utilising the dynamics of games in education. This project aims to provide a mobile education platform for primary school students. For this reason, an attractive application was designed on android using gamification principles.

Keywords: Education Technologies, Mobile Learning, Android, Gamification, Game

1. INTRODUCTION

Games and gamification principles are used in many Android and mobile applications. There are also many educational applications in the Android platform.

In our century, games have attracted great attention of the educators as a learning tool by providing more influence and meaningful learning experiences to students and learners. Gamification also provides a lifelong learning process. Games provide many meaningful, motivating challenges for the players, then presents problem-solving breaks where learning occurs. Thus it educates players while entertaining them (Yue &Ying,).

Serious gamification is a new method for education in the nursing discipline. There is not a definite boundary among serious gamification and other educational technologies like digital learning objects, virtual learning environments, and games for education (Tan; Lau, & Liaw).

In this paper, the gamification concept is presented with gamification elements, user types, theoretical background, design period and many other key concepts. The aim of the project is providing a useful and gripping mobile education application for primary school students. For this reason, an interesting application is designed using gamification elements on android. In the application, the topics of the primary school lessons will be included, and the topics will be easily accessible using a user-friendly application interface. Besides, gamification elements will be used to motivate students. Thus, the application presented will be a good example in e-education for primary school students.

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In the application presented, Android SDK was utilised with Eclipse ADT on Java together with SQLite. The milestone of the project constructs a question and answer pool for users and to be able to present the collected data to the users. The motivation of the students regarding the lessons is expected to improve as a result of the application.

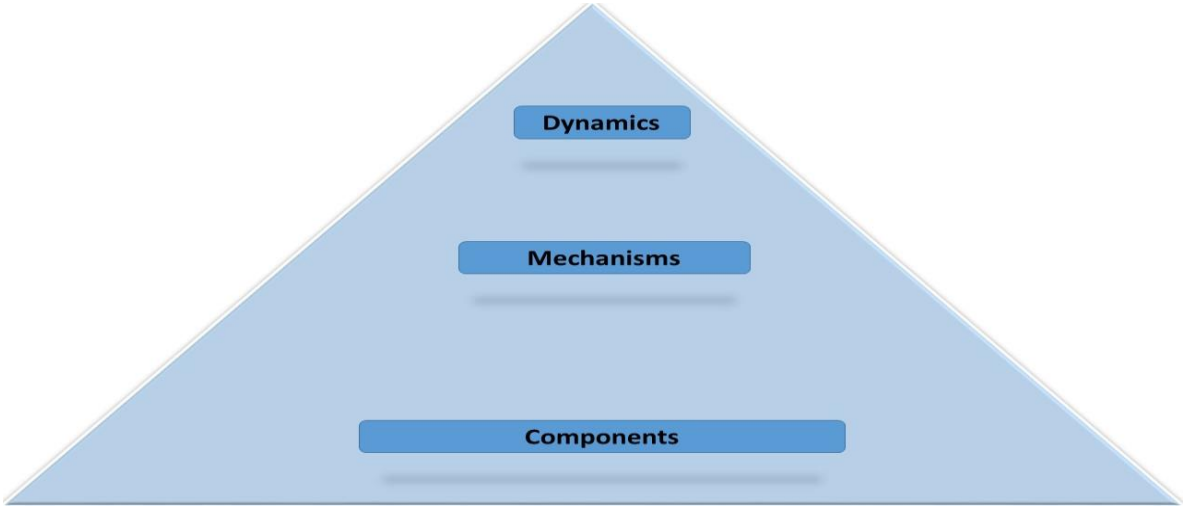
2. GAMIFICATION

To be able to explain the gamification structure, a gamification model with a three-layered structure was presented (Werbach & Hunter, 2012). The layers were composed of dynamics, mechanics, and components. These layers were represented as a pyramidal structure in figure 1.

Basically, with the help of gamification, creativity, and active minds can easily be stimulated. For example, in the process of learning programming, teaching using a passive learning method causes disengagement during class time for many students. Gamification aims to present a way to help many students who may have difficulty in engaging with programming (Shahdatunnaim; Noorminshah & Norasnita).

Lately, obesity and chronic diseases have spread between kids and the younger generation. The main reason for the chronic diseases and obesity is eating habits. It is obvious that these behaviours may be evolved by education. Also, in education, game playing as a learning method is mostly considered in schools as the best way for motivating kids. Thus, the effects of utilising games in Health e-Learning Network on teaching third graders in elementary schools about nutrition was examined in (Hung, 2009).

Figure 1: Gamification model and components

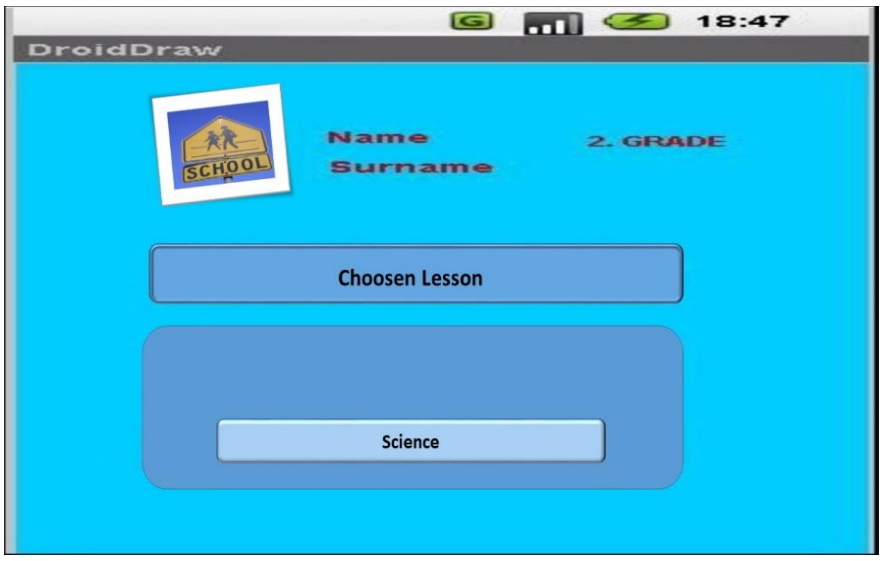


Source: Werbach, & Hunter, 2013

3. PROPOSED STRUCTURE

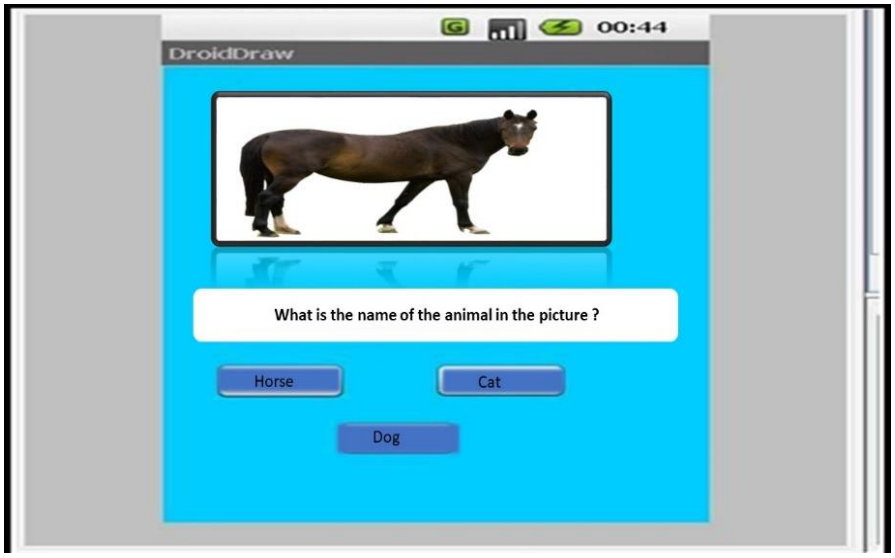
The presented application is designed with Android SDK, Eclipse ADT, java programming language and SQLite. The most important part of the application is composing some question/answer pool for each topic and presenting them to the students according to their levels in the application. With the help of the application, a motivating lesson platform is proposed for primary school students in online education.

Figure 2: The chosen lesson



A question and answer pool were formed and categorised according to the topics and difficulty levels for the project as shown in figure 2. The project has an easy to use interface and is controlled by buttons on the interface. Many gamification elements were used on the interface to provide a visual attraction for the target group as presented in figure 3.

Figure 3: The randomly chosen question about the lesson



In the project, the students logged into the application and chose their grade from the list of grades. Then they chose a lesson for their grade. The questions are presented to the student one by one starting from the easiest.

4. CONCLUSION

Gamification takes place in our lives daily, but we are mostly not aware of it. A well-designed system with gamification increases the motivation of users using the system and also provides more entertaining experiences for users.

As a result, the gamification approach increases the motivation and participation of learners in the learning process. In addition to this, gamification makes the learning process more effective, fruitful, interesting and entertaining because of its innovative approach.

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