THE REPUBLIC OF TURKEY
BAHCESEHIR UNIVERSITY

DIGITAL TRANSFORMATION OF TELECOMMUNICATIONS INDUSTRY

Master's Thesis

MEHMET ÖZKAYA

ISTANBUL, 2018

THE REPUBLIC OF TURKEY
BAHCESEHIR UNIVERSITY

SOCIAL SCIENCES

MASTER OF BUSINESS ADMINISTRATION

DIGITAL TRANSFORMATION OF TELECOMMUNICATIONS INDUSTRY

Master's Thesis

MEHMET ÖZKAYA

Supervisor: Phd. CEYDA SÜER

İSTANBUL, 2018

THE REPUBLIC OF TURKEY
BAHCESEHIR UNIVERSITY

SOCIAL SCIENCES
MASTER OF BUSINESS ADMINISTRATION

Name of the thesis: Digital Transformation of Telecommunication Industry
Name/Last Name of the Student: Mehmet Ozkaya
Date of the Defense of Thesis: 29 Mayıs 2018

The thesis has been approved by the Graduate School of Social Sciences

Title, Name and LAST NAME
Graduate School Director
Signature

I certify that this thesis meets all the requirements as a thesis for the degree of Master of Arts.

Title, Name and LAST NAME
Program Coordinator
Signature

This is to certify that we have read this thesis and we find it fully adequate in scope, quality and content, as a thesis for the degree of Master of Arts.

Examining Comittee Members   Signature____

Thesis Supervisor   -----------------------------------
Title, Name and SURNAME

Thesis Co-supervisor   ----------------------------------
Title Name and SURNAME

Member   ----------------------------------
Title Name and SURNAME

Member   ----------------------------------
Title Name and SURNAME

ABSTRACT

DIGITAL TRANSFORMATION OF TELECOMMUNICATION INDUSTRY

Mehmet ÖZKAYA

Business Administration Master's Program

Thesis Supervisor: Dr. Ceyda SÜER

May 2018, 113

In globalized world, organizations should be adapt dynamic challenges and changes with innovations. Companies need to think strategically and be strategically competitive by simply developing good corporate strategies. Sustainable competitive advantage could be arise when evolving strategy by innovation that creates a value for customers. Today most of strategy evolves by digital transformations.

In the last decade, telecom industry changed information technology and business support systems, focusing on convergence, operational efficiency and cost reduction. Global communication services industry fixed, including mobile, broadband, cable and satellite service companies are a wave of digital transformation of their core systems.

The reason is in telecommunication markets where traditional voice and also mobile revenues decline due to fierce competition, operators turn to new and innovative services in order to improve their competitiveness. Rapid service deployment and efficient service life-cycle management then become important means of competition.

Short time-to-market is the most important factor that will ensure a positive bottomline for the new service. The novelty factor will put that operator ahead of competition and could be used to capture market share. Speed is also vital in the discontinuation of a service: time is money when cutting back a service that has not attracted sufficient customer interest.

In the first part of the thesis, the structure and development of the telecommunication sector and global trends in the sector are reported. The history of the telecommunication

industry and the process of advent of these days, and to describe the new technological possibilities reported.

In the second part of the thesis, examined telecom campanies acording to digital systems and how to perform digital transformations on existing system landscape. Focusing on digital transformation reasons and modules of transformation systems and functions described.

In the third part, as a result of Digital Transformation, the results of employee surveys about the examination of telecom employees' business processes were analyzed by statistical research methods.

Keywords: Telecommunication, Digital Transformation, Global Trends in Telecommuncation Industry

ÖZET

TELEKOMÜNİKASYON SEKTÖRÜNDE DİJİTAL DÖNÜŞÜM

Mehmet ÖZKAYA

İşletme Yüksek Lisans

Tez Danışmanı: Dr. Ceyda SÜER

Mayıs 2018, 113

Küreselleşen dünyada, kuruluşlar dinamik zorluklara ve yeniliklerle değişimlere uyum sağlamalıdır. Şirketlerin stratejik olarak düşünmesi ve iyi kurumsal stratejiler geliştirmesiyle stratejik olarak rekabetçi olması gerekir. Sürdürülebilir rekabet avantajı, müşteriler için bir değer yaratan inovasyon tarafından strateji geliştirilirken ortaya çıkabilir. Bugün stratejinin çoğu dijital dönüşümlerle gelişiyor.

Son on yılda, telekom sektörü bilgi teknolojilerini ve iş destek sistemlerini değiştirerek, yakınsama, operasyonel verimlilik ve maliyet azaltmaya odaklandı. Mobil, geniş bant, kablo ve uydu servis şirketleri de dahil olmak üzere, global iletişim hizmetleri sektörü, kendi çekirdek sistemlerinin dijital dönüşüm dalgası içerisindedir.

Bunun nedeni, rekabetin artması için geleneksel sesin ve aynı zamanda mobil gelirlerin azaldığı telekomünikasyon pazarlarında, operatörlerin rekabet güçlerini geliştirmek için yeni ve yenilikçi hizmetlere yönelmeleridir. Hızlı hizmet dağıtımı ve verimli hizmet yaşam döngüsü yönetimi daha sonra önemli bir rekabet aracı haline gelir.

Hızlı olarak pazara giriş, yeni hizmet için olumlu bir alt çizgi sağlayacak en önemli faktördür. Yenilik faktörü, operatörü rekabette öne çıkaracak ve pazar payını yakalamak için kullanılabilir. Bir hizmetin kesilmesinde hız da hayati önem taşır: yeteri kadar müşteri ilgisini çekmeyen bir hizmeti keserken oluşan zaman gelir kaybı olarak karşınıza çıkmaktadır.

Tezin ilk bölümünde, telekomünikasyon sektörünün yapısı ve gelişimi ile sektördeki küresel eğilimler rapor edilmiştir. Telekomünikasyon endüstrisinin tarihi ve bu günlerin ortaya çıkış süreci ve yeni teknolojik olanaklar açıklanmıştır.

Tezin ikinci bölümünde telekom kampanyasının dijital sistemlere göre incelenmesi ve mevcut sistem manzaralarında dijital dönüşümlerin nasıl yapılacağı incelenmiştir. Dijital dönüşüm nedenlerine ve dönüşüm sistemlerinin ve fonksiyonlarının modüllerine odaklanılmıştır.

Üçüncü bölümde, Dijital Dönüşümün bir sonucu olarak, telecom çalışanlarının iş süreçlerinin incelenmesiyle ilgili çalışan anketlerinin sonuçları istatistiksel araştırma yöntemleri ile analiz edilmiştir.

Anahtar Kelimeler: Telekomünikasyon, Dijital Dönüşüm, Telekomünikasyon Sektöründeki Global Yönelimler

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ABBREVIATIONS

3PP	:	Third Party Product
aaS	:	as a Service
API	:	Application Programming Interface
B2B	:	Business to Business
B2C	:	Business to Consumers
BSS	:	Business Support Systems
CFS	:	Customer Facing Service Specification
CIL	:	Common Information Layer
CM	:	Catalog Manager
CPM	:	Customer and Partner Management
CRM	:	Customer Relationship Management
EDM	:	Event Data Management
GSM	:	Global System for Mobile Communications
HTTP	:	Hypertext Transfer Protocol
IP	:	secInternet Protocol Security
IT	:	Information Technology
IVR	:	Interactive Voice Response
KPI	:	Key Performance Indicators
LTE	:	Long Term Evolution
M2M	:	Machine to Machine
MSISDN	:	Mobile Subscriber ISDN
OM	:	Order Management
OSS	:	Operations Support Systems
OTT	:	Over The Top
TMF	:	Telecom Management Forum
TTM	:	Time to Market

1. INTRODUCTION

Telecom markets are driven by customer demand for an increasingly better user experience, value-added digital services and competitive pricing. In this rapidly changing landscape, business agility and flexibility are fundamental.

For operators, a digital telecommunications approach represents a new business and business model for building digital services and responding to consumer demand. This model provides the agility needed to manage the entire digital ecosystem.

These business model adaptations also call for a digital transformation which includes all business support systems and operational business. Operator core business mostly intented to growing and lower-cost services. It is time to create revenue and profitability rather than act as a revenue eviction.

In telecommunication markets where traditional voice revenues decline due to fierce competition, operators turn to new and innovative services in order to improve their competitiveness. (Wang, 2009). Rapid service deployment and efficient service life-cycle management then become important means of competition.

Short time-to-market is the most important factor that will ensure a positive bottom-line for the new service. The novelty factor will put that operator ahead of competition and could be used to capture market share. Speed is also vital in the discontinuation of a service: time is money when cutting back a service that has not attracted sufficient customer interest.

Reusing service components that are already active in the network not only makes new service deployment faster and more efficient, it also reduces the required investment and operating costs.

Taking the operator organization's business processes into account is as important to the successful implementation of digital transformations with using technical framework

itself. The approval and provisioning of a new service from an external service provider

can be achieved in as little as two weeks with efficient routines. Operational cost savings up to 25% can be achieved when the services are supported on a horizontal transformation. (Chalmeta, 2008) This also includes the necessary configuration of the subscriber's device.

1.1 MOTIVATION OF THE THESIS

Telecom industry changed information technology and business support systems, focusing on convergence, operational efficiency and cost reduction. Global communication services industry fixed, including mobile, broadband, cable and satellite service companies are a wave of digital transformation of their core systems.

The reason is in telecommunication markets where traditional voice and also mobile revenues decline due to fierce competition, operators turn to new and innovative services in order to improve their competitiveness.

In this case digital transformation is crucial step for telecom operators in order to survive and continue to revenue of business models. In this thesis focus on telecom companies are how to transform business with digital transformation and examine benefits of transformation with analysing operational cost save and increase of revenue.

1.2 OUTLINE OF THESIS

In the first part of the thesis, the structure and development of the telecommunication sector and global trends in the sector are reported. The history of the telecommunication industry and the process of advent of these days, and to describe the new technological possibilities reported.

In the second part of the thesis, examined telecom campanies acording to digital systems and how to perform digital transformations on existing system landscape. Focusing on digital transformation reasons and modules of transformation systems and functions described.

In the third part, as a result of Digital Transformation, the results of employee surveys about the examination of telecom employees' business processes were analyzed by statistical research methods.

2. GENERAL INFORMATION ABOUT THE TELECOMMUNICATION SECTOR

Communication is emerging as one of the basic needs of people in every age. However, thanks to the developing technology, telecommunication has become an element that shapes the age and has an effective and wide place in our lives. The most important developments of our era were experienced in the field of telecommunication; telecommunication has become a concept that has decisive effects on our lives and the economy.

The telecommunication sector has a dynamic structure that is shaped by the effects of all these developments. It is open to innovations and progress as a rapidly growing sector, with scope and prominence.

2.1 HISTORICAL DEVELOPMENT OF TELECOMMUNICATION

Communication refers to the transfer of feelings and thoughts among living things. Communication is essentially occured by spontaneous. Through mutual, face-to-face talk, people express emotions and thoughts to each other. "Talk" has formed the beginning of the communication. The first people are to be protected from various hazards, find food and a place to sleep, and so on. they tried to communicate by bringing together some voices as they felt the need to convey feelings and thoughts to each other for reasons. They understand that it is always necessary to use the same voices to describe certain topics over time. Thus, over time, a spontaneously communication scheme called "language" has emerged.

Postal services were the starting point of modern communication. After the invention of the writing and the paper, people started to communicate by writing articles and communicating these written texts to each other called "postman". Later, in the early 19th century, American Samuel Morse communicated that he had not invented the telegraph, and from then on, it was possible to transmit sound to remote areas by making use of electricity. Then in 1876, Alexander Graham Bell began a new era in communicating with the phone. After this first meeting, there have been new

developments in communicating with the phone. Instead of magnetized phones, automatic phones have emerged. (Aktan,1993:1) Thus, direct communication was possible without switching on the switchboards, and phone calls between cities and countries started to be made over time.

The progress achieved in the field of communication today has been a major contributor to the development of the tools that are the products of the advances in communication techniques. Among these tools, it is possible to count twisted - pair cabling, fiber - optics, satellite channels and radio waves used in telephones and telegraphs.

The telephone network, which is based on automatic dialing, has been developed for the initial transmission of voices. But when it came to the 1950s, the idea that this network could be used for other purposes was born, which in turn promoted the development of telex.

Following these developments, which allowed the transmission of text messages along with voice, in the 1960s, techniques were developed that integrate computer and communication systems and provide remote access to computers. With this structure, a large number of end computers (terminals) have been able to transfer information and perform various operations by reaching from a distance with the lines they hire a main computer.

However, incompatibilities arising during these transfers to computers with different characteristics have been addressed by the development of local network (LAN) and packet switching techniques. Local area networks (LANs); business centers, universities and hospitals, or in organizations operating in a single building. Thus, data and information can share the possibilities offered by large-scale storage units with high data processing power. (Dağdelen, 2002; 17)

One of the most important developments presented by communication technologies today is internet. The costs of using the internet are decreasing day by day and the world becomes a small space where all users can reach each other thanks to internet.

Today, new services can be offered to telecommunication day by day thanks to electronic and computer technology. Moreover, it is possible to communicate more

easily, faster and cheaper by means of satellites. (Aktan, 1993: 2.)

The steps in the field of Information and Communication Technologies that do not reach today's conditions can be summarized in three main categories: the discovery of writing, the development of arithmetic operations and the discovery of the printing house. (Halton, 1986) With the discovery of the article; information has been recorded and it has been possible to move it in time and space as a message. Arithmetic operations on the numerical data on a variety of transactions, the numerical data can be passed through the desired number of transactions were caught. The discovery of the printing press has made it possible to reach very large quantities with a large number of duplications of similar copies of written texts. On the other hand, the discovery of steam locomotives, technological developments in land and air transport; telegraph, telephone, radio and radio waves working in the development of communications systems has laid the groundwork for today's technology. (Dağdelen, 2002: 9)

2.2 DEFINITION OF TELECOMMUNICATION

In the context of information technologies, information is found in text, picture, sound, moving picture and so on. Information technologies cover information communication, processing and storage technologies and their infrastructures are formed by today's electronic, communication and computer technologies.

Telecommunication technologies traditionally involve the transfer of sound, picture and moving picture between users economically and effectively. As a result of the developments in technology, the fields covered by information and telecommunication technologies have started to overlap with each other, more precisely these technologies have entered into each other. This overlap of telecommunication and information technology is also called "convergence".

In telecommunication; transmission, transmission and reception of any kind of data that can be converted into any kind of signal, symbol, sound and visual and electrical signals through cable, radio, optical, electric, magnetic, electro magnetic, electro chemical, electro mechanic and other transmission systems.

2.3 STRUCTURE OF TELECOMMUNICATION

The telecommunications sector is a sector that provides communication services from one point to another. The industry can be divided into two main groups, mainly telecommunication services and devices.

Telecommunication services are applications that combine services such as mail, telephone and telegraph to help transfer voice, data and information over a transmission line and computer applications that process basic telecommunication services from various angles.

It consists of information-intensive services (value-added services) that enable differentiation and reshaping of information transferred between two different points of contact or mutualizing relations between subscriptions (İçöz, 2003: 21-23).

Value-added services can be provided via wired or wireless networks, such as in basic telecommunications services. Value-added services including e-mail, data services, banking ATM services, video conferencing, interactive television-data services (home banking, home shopping, etc.), mobile phones, pagers, internet telephony services, digital TV are intensive information and technology It has.

Telecommunication services are provided with the help of distribution and transmission networks that provide connections between one or more points for communication purposes. Conveying services are high-capacity (high-bandwidth) trunk lines that connect large producers and consumers in telecommunications traffic. Distribution services are services that are carried out with networks of low capacity and high geographical density. In order for subscribers to communicate with each other, it is first necessary to connect to a central station or mobile base station located in its own area. The smallest communication networks among the subscription-based power stations, termed the "local loop", may be wired (copper, coaxial or fiber optic) or wireless (satellite, cellular radio, microwave etc.).

Fixed costs are high because distribution networks require subscriber connections to the local switchboard or mobile base stations in areas close to the user, which is why it has a natural monopoly.

Communication services can also be offered as wired (fiber optic) and wireless (radio or

infrared). Transmission networks with fiber-optic cabling with high installation costs constitute significant scale economies due to their high capacity.

On the other hand, low-cost wireless telecommunication networks have low cost economies of scale because of the high cost of increasing capacity. Competition in distribution services varies according to the technology, student and geographical conditions used for the end-user connectivity. (Aktan, 2006: 86)

The telecommunications market is a market for goods and services that replace or complement other industry-provided goods. The main features of telecommunication markets are listed following paragraphs. (De Bijl and Peitz, 2003: 26-31):

The costs of running out of the market (sunk costs) are high. A company that enters the telecommunications market can not compensate for the costs it has to bear when it first enters the market when it has to abandon the market (renewing existing networks with networks based on new technologies, license fees etc.).

There is a difference in products and services. Due to differences in preferences and opinions of consumers, there may be intense demands for differentiation in products and services. Consumers can be ambivalent about which product or competitor is better (horizontal product differentiation) or can change their preferences according to quality difference (vertical product differentiation). In this case, incomplete competitive market conditions arise. (İçöz, 2003: 21-23).

Non-linear pricing spread. The price of the product or services depends on the quantity requested. For example, in the telecommunications market the price is usually set in two parts, such as the cost per minute spoken and the subscription fee. Products are packaged. Multiple products or services are offered at a single tariff or price.

Vertical relationship is the issue. The final product offered to the customer is obtained through the collaboration of multiple companies. While some firms provide input, the firm that provides the final product-service using these inputs determines the retail price. Unless firms with vertical relations can negotiate the price, the final price of the product will increase as firms will maximize profits at every stage.

Network effect occurs. Demand in the telecommunications market often depends on the number of people using the same or similar product or service, or on the volume of the network. For example, consumers want to use the most popular messaging program, which is why more and more products run on computer operating systems. Since the network effect is so productive, over-demanding firms can dominate the market and competition regulation can be compulsory. (Aktan, 2006: 88)

2.4 OLIGOPOLY IN TELECOMMUNICATION INDUSTRY

In most of country, the telecommunication industry has an oligopoly structure in terms of its market structure. An oligopoly is a form of market where a market or industry is dominated by a small number of big sellers (oligopolists). Oligopolies can stem from a variety of hidden forms of negotiation, which reduce competition and lead to higher prices for consumers. Oligopoly has its own market structure.

A small number of sellers, every oligopolist will be aware of the actions of others. According to game theory, a firm's decisions are influenced and influenced by the decisions of other firms. The strategic planning of the oligopolists should take into account the possible answers of the other market. Significant investment is required, as can be said from the fact that the current brand has strong consumer loyalty and scale economy for the current brand. (Perloff, 2008)

Oligopoly is a common market in which several main firms are in competition. As a quantitative recipe of oligopoly, four company concentration ratios are frequently used. This measure represents the market share of the top four companies in a given sector as a percentage. For example, as of the fourth quarter of 2008, Verizon Wireless combines AT & T, Sprint and T-Mobile's total market share to see that these companies control 97% of the US mobile phone market. (Perloff, 2008)

This situation arises in a similar way in Turkey. Turk Telekom, Turkcell and Vodafone, we can say that the telecom sector is in the hands of 3 main companies. These companies use the dynamics of game theory from time to time in the process of competing with a briskness. Especially in the sense of advertising strategy, companies compete according to game theorem theories among themselves. However, this

competition is advocated by regulators that it is necessary to move into the field of technology and innovation. (Kimmelman, 2017)

Digital communication platforms offered by a cable company, a telecommunications company or an internet service provider offer the most important text and video content that empower our economies, educate our citizens and nurture our democracy. The difficulty in telecommunication and networking industries, which was recognized in the first quarter of the century, is also relevant today. These industries benefit from enormous economies of scale and scope, leading to large size and market power of tehdine. Today we call them platforms. It affects a wide range of economic and social activities that are directed towards these platforms, and public policy should not destroy economic benefits while preventing misuse of the existing market power. The more dynamic the sectors of the communications industry, the more accurate and important it is to find the right mix. (Kimmelman, 2017)

An important lesson in the communication sector is that strong regulation and insecurity can create conditions for market success. But balance is the key. Technological innovation and convergence are not guarantees against misuse of the market power, but efforts to control market power abuse must not prevent innovation.

These markets will not be put on the market again, but they will become a more intense oligopoly on the stronger steroids, and two or three vertically integrated giants charge huge inflated prices and have extreme grief in the market of ideas. (Kimmelman, 2017)

2.5 DEVELOPMENTS IN THE TELECOMMUNICATIONS SECTOR

In the last two decades, developments in information technology have been experienced. Especially in hardware products, the price / performance ratio has decreased in favor of users and commercialization in the form of explosion of Internet has been mentioned since 1993. These developments have resulted in the effective and indispensable use of information technology in every aspect of everyday life.

Internet and mobile technologies have revolutionized the history of human civilization. Labor and social life; shape, content, method, communication, speed, density and service shopping. (İçöz, 2003).

Especially with the first years of the 21st century, significant developments in internet and mobile phone technologies have been experienced. The title of the last book of the New York Times writer Thomas Friedman describes this period strikingly. In an environment of tremendous momentum of communication and mobility, Friedman now shows with striking examples that the ground is increasingly equal in the relations between countries, societies, institutions, companies and people. (Çağlayan, 2006:35)

According to the author, the world is becoming increasingly flat, and as a result, the international competitive climate is relatively equalized. The obstacles are diminishing and the conditions are becoming equal. Services, commodities, news, ideas, images, data, capital and people travel more easily between the developing and developing world, especially India, China, South East Asia and Latin America. Production units, supply chains, service channels and information networks are increasingly developing on an equal footing in the world.

To summarize the technological innovations in the telecommunication sector are listed following paragraphs. (Wellenius, at All., 1989, Ambrose, at. All., 1990).

Analog technology has gone through digital technology. In the past, analog techniques have been used in power plants and transmission systems. In analog transmission, the waveform of an analog signal tends to distort and distort the sound over a long distance and give bad sound quality. Numerical (digital) transmission techniques have been developed by integrating electrons into system design in telecommunication. A digital signal can reach its destination smoothly and without distortion. At the same time in digital transmission, digital signals can be multiplexed in a single transmission line without any interference, allowing for greater system capacity.

Switch from circuit technology to packet key technology. Packet-exchange techniques divide data streams into small "information" packets that can be routed in a shorter period of time, independent of the network. Switching has been one of the important innovations of the telecommunication revolution. (Aktan, 2006:65) Switching from electromechanical switching to digital switching and making networks 'intelligent' significantly improves the efficiency and efficiency of data processing, routing and storage. Digital technology allows operators to create different networks, allow

consumers to choose between these networks and receive telecommunication services and operators to bill these services. Advances in switching technology help different operators create and manage their own networks and increase decentralization in the sector. (Hulsink, 1998: 73 and Scherer, 1994: 61)

There was a switch to the optic cable instead of a copper cable in the transmission. Fiber optic cables provide great convenience in telecommunication services.

Developments in computer technology are reflected in telecommunications. Computer and communication together make it possible for a real telecommunication revolution. Innovations have emerged in the tools and equipment necessary for the transmission of telecommunication services. New devices such as private automatic branch exchange (PABX), telefax, teleprinter, telex have been developed (Aktan, 2006: 95)

Significant developments have been made in mobile and cellular telephone services. The provision of communications in mobile (mobile) vehicles (ships, aircraft, road vehicles, etc.) has become easier thanks to cellular technology. Cellular mobile technology represents a wireless extension of the public network. Cellular service has increased the possibilities of the public network by providing communication between fixed and mobile (mobile) subscribers. In the past, mobile radio technology was able to access a limited number of radio channels in a large area. Cellular technology has provided uninterrupted negotiation as it moves from one cell to another by dividing the service area into small cells. Using the same number of radio channels, the number of possible mobile service users exceeds ten times. (İçöz, 2003)

In cellular mobile technology, a message is sent from an active vehicle to an antenna, which is connected to a private cellular office. Systems are delivered directly to another system subscriber or public network; where the message is sent to the calling party's telephone. The connection between the cellular network or the cellular network and the public network can be provided by leasing capacity from the existing outline network or by establishing a separate transmission facility such as a microwave.

The establishment of digital coating networks has made telecommunication considerably easier. In many developing countries, public networks are inadequate

against increasing data and voice communications in the business environment. One solution is to establish a digital coating network to meet the specific needs of users around the business. The idea behind the digital coating network is to establish a modern digital outline network for the customer to reach the business world. Instead of all intercity and local switchboards, digital switches are placed at strategic points close to where the customers of the firm are concentrated. These users are connected directly to digital stations by bypassing the congested local network. Digital stations are connected to each other nationwide through dedicated and high-speed outline facilities. (Freeman, 2004)

The Paging system is also part of the telecommunications revolution. The call system is a one-way message system. In this way, the interviewers can send messages to specific paging receivers set to a specific frequency.

Private satellite business networks have also created a new era in telecommunications. Private satellite business networks offer flexible, point-to-point, national and international services to third parties using a common satellite network. A typical private satellite business network mainly consists of three elements: satellite, remote earth stations and main earth station, ie center. The center controls and manages connections between remote stations. Remote stations typically use Very Small Aperature Terminals (VSAT). (Freeman, 2004)

Teleports are also a new service in the telecommunication industry. They mainly act as international gateways for voice and data communication traffic.

The expansion of terminals into multi-media equipment and the widespread use of intelligent and conditional access technologies (smart cards, coders etc.) allows the provision of value added network services (VANs) such as telex, telefax, videotext, telepating. (Freeman, 2004)

Value-added services allow small service providers to compete on the market by offering differentiated services and increase the level of competition in the telecommunications equipment market. (Hulsink, 1998: 73 and Scherer, 1994: 64)

In telecommunications, new technologies have significantly reduced costs. New data

communication technologies have significantly reduced the costs of telecommunication production, connection, transmission and operation of power plant equipment. (Aktan, 2006: 84,85)

2.6 GLOBAL TRENDS IN THE TELECOMMUNICATIONS SECTOR IN RECENT YEARS

The telecommunication sector has become an important part of the macro economy in the developing world. Developments in globalization and information-communication technologies make information an important factor of production. The increasing demand for information in the production process is rapidly increasing the demand for telecommunication services.

Technological developments and an increasing tendency to globalization have pushed the telecommunications industry out of the classical molds, leading to a radical transition process. In this process, the sector's monopolistic structure has left its place to privatization, liberalization and consolidation movements.

The privatization movement, which started with the advancing technology and increasing competition conditions pushing the national telecommunication operators out of the sector dynamics, is now largely completed in the world. In this process, the sector has witnessed large enterprises, under the name of globalization, go beyond their own borders to pursue a wider spreading policy, as well as smaller niche players to enter the market by concentrating on certain services. (Erol, 2003: 69)

Fixed line revenues are falling all over the world while mobile market revenues are rising. Telecom / Media and Fixed / Mobile integration both increase the product range in the market and create new opportunities for the sector. (Turk Telekom Annual Report, 2006: 31)

The dynamic developments in the telecommunications sector have made themselves felt on the technological scene, and the operators have begun to produce new services to keep up with the evolving needs of the age.

Technological advancement leads to major innovations and changes in the field of

telecommunications as well as in other fields.

Innovations and developments in telecommunications services have led to a number of factors that enable market-based regulations in the telecommunications sector. New data communication technologies have significantly reduced the operating costs of production, connection, transmission and switchgear equipment in the telecommunications sector. (Dodd, 2012)

Along with the decline in costs, new technologies such as digitalization and wireless connectivity provide a multifaceted business opportunity in the telecommunication sector (Aktan, 2006: 98)

In digital technology, which is one of the most important reasons of transformation and development in the telecommunication sector, many information formats such as text, audio and video can be processed and transmitted through binary codes used by computers. With this technology, more traffic can be transmitted faster in telecommunication networks. In this respect, telecommunication, computer and media sectors are integrated with each other. (Erol, 2003: 47)

The Networked Society is expanding rapidly - broadband connectivity is provided by mobility and cloud computing everywhere and is driven by a demand for enriching people's lives, creating industrial productivity and contributing to the wellbeing of the community. We see that everything in the neighborhood has changed.

By 2021, it is estimated that 90% of the world's population will be met by mobile broadband and 6.7 billion smart devices will be accessible to people everywhere internally - each person will have 4.3 connections. All this means that a tenfold increase in mobile history will increase with 70% of the video content. (Ericsson Mobility Report, 2016)

One can estimate the number of digital services that demand increasing personalization in every area of digital lifestyles, or which companies will provide this service. It is estimated that more than 75% of Standard & Poor's S & P 500 will not be heard even a few years ago, and that most of these companies will have a large digital component or it can be built entirely on a digital model. (Foster, 2015)

Health, media, education, transport, retail, public banking services and the government will be transformed by the Networked Society and we will consume our products and services on this. This is already happening today when motor vehicles are connected for insurance, remote monitoring and entertainment purposes; We are no longer getting recordings, but we are serving as music; Remote monitoring of garbage cans in some cities to optimize disposal operations; and probably the number of m-commerce transactions will exceed one billion by 2020. (Ericsson Mobility Report, 2016)

In addition, consumer behaviors will mobilize the ecosystem of digital service providers in every aspect of our lifestyle, with demands for personalization, control and convenience in the way they access and manage consumer services. Take energy as an example. Today, we have smart measurement. By 2020, consumers can monitor consumption and control their expenditures remotely in real time, compare their figures to season and consumer averages, and buy based on real-time market information. In addition, NPS (Net Promoter Score) has a huge area to add value to consumers' experience for operators who are still lagging 11% of their peers in the consumer sector. (Ericsson Mobility Report, 2016)

This transformation brings new requirements to the connection, and the next generation of wireless access (around 2020) is setting the scene for 5G systems that are suitable for commercial use. Usage scenarios for 2020 time slots will require new connectivity services that can be scaled and programmed high in terms of speed, capacity, security, reliability, availability, latency and impact on battery life.

Telecom operators are undoubtedly some of the largest stakeholders in the Networked Society and have the most potential to lose, but at the same time they will lose most. It has the highest potential to add value by providing consumers with the level of personalization they will demand based on their customer relationships, their infrastructure and, in particular, their operational and business support systems (OSS / BSS).

Conversely, operators are at risk from an ever-growing ecosystem of over-the-top (OTT) digital service providers and other new niche players, which offer services that are consumed over operator networks but often have no direct relationship with the

operator themselves. It is estimated that by 2020, the OTT industry will be worth some $500 billion a growth of some 280% compared to an overall growth of 20% estimated for telecoms operators. (Ericsson Mobility Report, 2016)

Operators are in a strong position to collaborate with third-party actors and to be at the center of the Networked Society ecosystem and to add value to digital services, thanks to their ability to customize the way they buy, deliver, control, manage and pay for services and consumer experience.

2.7 TRANSFORMATION IN THE TELECOMMUNICATIONS SECTOR

Telecoms is at a crucial turning point. The last decade has dealt a series of punishing blows to an industry that had previously enjoyed enviable growth for more than 20 years. Services that once returned high margins are being reduced to commodities in the digital world, and our insatiable appetite for data demands continuous investment in infrastructure. On the other hand, communications service providers (CSPs) and their partners are in an excellent position to guide and capitalize on the next wave of digital revolution. The growth opportunities attached to new 5G ecosystems are estimated to be worth over $580 billion in the next decade. (Ericsson Research, 2017)

Servicing these opportunities requires transformation of the entire industry. Early digital transformation efforts focused on improving customer experience and embracing new technologies such as virtualization, with promises of wide-scale automation and greater agility. It has become clear that these 'projects' alone are not enough. CSPs' business and operating models, choice of technology partners, mindset, decision-making and time to market must also change. (Willetts, 2015)

True digital business transformation is not an easy or quick path, but it is essential to surviving and thriving in the future digital market. Companies that can master the business, operational and technical challenges have a huge opportunity to play a pivotal role in the next wave of digitalization of commerce and society.

Trust and influence with national governments will open partnership opportunities in transport infrastructure, health, city management and much more. Reaching this deeply embedded digital partner status creates an opportunity for CSPs to play to their

strengths, using open technology standards and application program interfaces (APIs) to drive interoperability. This will enable multiple stakeholders to engage in open ecosystems that avoid the pitfalls of proprietary or locked-in offerings.

While advances in virtualization, cloud computing, machine learning and artificial intelligence (AI) promise to radically improve operational agility and efficiency, realizing these benefits requires fundamental changes to service providers' IT organizations, systems and corresponding business processes. Yet, as an industry, we are still approaching IT as we did in the 1990s. (Keathley, 2014)

Delivering IT that can meet the needs of the digital age demands a new vision with clear ambition, matched by strong technology leadership and governance and delivered through industry alignment and collaboration. (Reilly, 2014)

The business-to-consumer (B2C) world has been transformed by social media and commerce platforms, enabled by CSPs' multi billion-dollar investments in global communication networks. However, as mobile data has enjoyed a compound annual growth rate of 66 percent for the last five years, research by Accenture for the World Economic Forum shows that the share of profits going to the owners and operators of these networks has declined from 60 percent a decade ago to 45 percent today. Ubiquitous connectivity has driven down prices, eroded profit margins and lengthened the time it takes for new infrastructure to pay back, which is slowing the innovation cycle. (Willetts, 2015)

In the last decade, telecom companies have focused on convergence, operational efficiency and cost reduction by transforming the landscape of information technology and business support systems. They followed different paths - green space transformation, evolutionary transition, inclusive approaches - but with similar difficulties. (Guzman and Pierron, 2014)

These include the management of multi-year transformation programs, long business transitions with customer influences, complex data transitions and the inability of older systems to be out of service, and sometimes an ambiguous business case.

To switch from a telecom or cable operator to a digital service provider, there should be

a much higher level of customer service at a much lower cost. After this phase, it is no longer a sustainable option to simply sell at retail stores, use call centers, and communicate with customers. Monthly billing is no longer a sustainable option. To accelerate the transformation of the digital work model, telecom companies is considering a new way to transition to BSS. (Guzman and Pierron, 2014)

It has become imperative to implement a digital transformation strategy that is now differentiated in today's approaches. In the past, systems such as customer experience management, omni-channel, order entry and product catalog, CRM, Billing, Collection have been designed to be separate, with the distribution of systems that have been successfully applied in the banking sector. (Guzman and Pierron, 2014)

The following steps should be considered in the next generation transformation approach;

a. Investments must be made to create a new and differentiated customer digital experience. For example, lean, agile, time-to-market, high value potential products should be designed.

b. A common central structure with an integration layer must be established to integrate the distribution layer into the production layer.

c. Simplify existing business processes by designing the product catalog in a simple and simple manner.

d. To implement future capacities in stages, a ROI-focused digital roadmap should be created.

Transfer or move resources to a standalone cloud replacement solution. This includes roaming agreement, co-management, fraud analysis, downtime analysis, labor management, commissioning and troubled ticketing.

New generation applications should be developed using SaaS technologies. In this way, to meet new generation expectations, agile and fast cloud-based BSS applications should be migrated to support new business models.

Investment should be provided through virtualized software-based operational applications. So that it will work in a single real-time IT infrastructure, and IT and networking organizations and systems will be built as infrastructures. (Guzman and Pierron, 2014)

Operators should be adopted a completely new transformation organization. The deepest change for industries, such as telecommunications, is to understand change as a continuous process from a series of different projects. Adoption stems from extensive cultural changes, such as the integration of "design thinking" into product development and focusing on customer feedback. To embrace the rapidly changing digital environment, companies move away from their engineering roots and prefer a strong customer-focused service-oriented culture. (Shepard, 2014)

The telecommunications industry is one of the pioneers of this transformation as an industry witnessing a major shift in the marketplace as well as an important driving force for worldwide digitalization. While the telecommunications industry's investment in technology and interoperability has supported a major shift in information and capital flows in the global economy, it has provided a pioneering approach to the emergence of entirely new business models. In addition, access to a network of world boundaries has enabled millions of people worldwide to access real-time information, markets, and social programs that will have long time impact on quality of life. (McKinsey, 2014)

A transformational change will occur with digitization. Often, the gains from digitization were unfair and the benefits did not reach the people most in need. Inter-sectoral enterprises are struggling with challenges, including constantly changing customer expectations, worldwide cultural transformation, fashionable past arrangements and skill shortages, among others. (Little, 2015)

Innovation has the potential to combine innovative technologies such as mobile, social, data analytics, artificial intelligence and unmanned people with innovative ways to replicate their talents. The "combinatorial effect" is much larger than the effect of distributing these technologies separately. It is expected that these technologies will come together and change our usability, our development, our living, working and interacting form - the Fourth Industrial Revolution - all the more, than ever. (Little,

2015)

When these new technologies are activated with telecommunication technology, the information flow and growth flow in the global economy is seen as an important goal. The telecom market, which is 26 trillion dollars in 2012, is expected to rise to 80 trillion dollars by 2025. To understand this, the total value of these trends increased only 1.5 times over the 20 years between 1990 and 2012. Broadband speeds increase by 20% per year, the role of the telecom industry is to integrate cloud, mobile and digital services to drive business models and telecom industry companies, thereby greatly increasing the importance of the core network. growing. (World Economic Forum, 2016)

There was a connection and explosive explosion in connectivity. 400 million factors that have grown in total mobile data traffic over the last 15 years. 44 zettabytes Estimated annual data flow is 2020 (equivalent to 44 trillion gigabytes) 40% of all data stored or processed in the cloud until 2020. (World Economic Forum, 2016)

The intersection of telecommunication goes beyond OTT services, which change CSP proposals to the intersection of the entire relationship between the client and the operator. Web-based competitors like Google, Microsoft, Facebook are going faster than telecom companies in most cases. These software companies have begun to fill the basic gaps in the main telecom services and connection in the sense of OTT very quickly and with high quality. While Google continues to pursue both active IP and end-user connections (Google Fiber, Project Loan, and Project Fi), Amazon and Apple are working on which network providers their customers will choose, and even the technologies they will not need to know. Facebook has now announced its own "white box" optical network switch, a plan for network equipment vendors to launch a stand-off plan to cut through existing revenue streams. Fitted with greater focus and the ability to meet customer demands, these digital software companies are moving to become serious competitors to the established customer capacity of telecom companies. (World Economic Forum, 2016)

Figure 1.1: Platform Companies
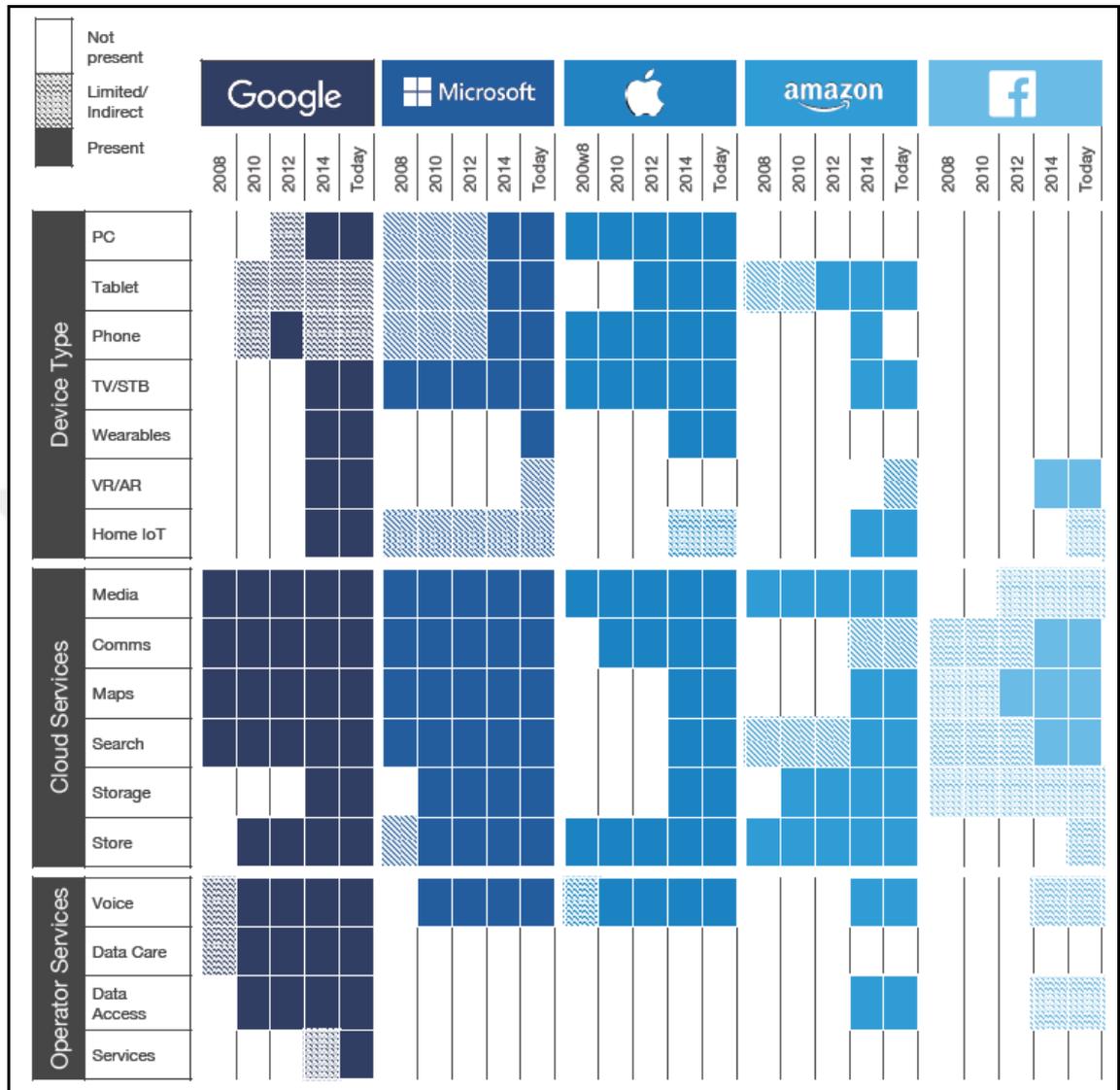
2.7.1 Platform Technologies For Telecom Companies

Amazon Web Services (AWS) is one of the best-known platform providers, and the story that shows how Amazon is getting stellar is interesting. At the beginning of the 2000s, Amazon was just an online bookstore, but the company's CEO, Jeff Bezos, said that all the technology teams inside the company are showing each other through the data and communicating through the application program interfaces (APIs). He did not allow any other interprocess communication and insisted that these interfaces be open to the outside world. (Parker, Alstyne, Choudary, 2016)

Communications service providers are uniquely placed to turn their networks and operational and business support systems inside out the way Amazon did, and many are already starting to do it. These architectural changes enable them to shift to a platform business model and offer customers access to all kinds of services that may or may not be hosted on their network. This is similar to how the Apple App Store or Google Play offers access to third-party applications. (Willetts, 2015)

A customer can order services on demand through a self-service portal, and the operator, in turn, can provision and manage them end to end, potentially in conjunction with partners, so that the services consistently meet pre-determined levels of quality. Eventually these services will be 'zerotouch', meaning everything happens automatically, without any human intervention, using orchestration, analytics and policy management. (Keathley, 2014)

Platforms such as Airbnb, Amazon, Facebook, Google, Netflix and Uber provided billion-dollar valuations by providing an interface between customers and sellers. They do not have anything other than infrastructure - and even in some cases it is not even that. End-users or curators are setting up their businesses by curating ecosystems that link users to goods and / or service producers. (Parker, Alstyne, Choudary, 2016)

Platform-based companies include an increasing number of 'unicorns' – startups valued at more than $1 billion. Collectively, according to a recent study from the Center for Global Enterprise, unicorns account for $4.3 trillion in market capitalization across fewer than 120 companies – and the most valuable of all are platform-based.

Platform business models are underpinned by – a technology platform. The most important characteristic is that this platform exposes common services that are quick and easy to integrate using a set of supporting capabilities, such as onboarding. These capabilities are made accessible through open APIs. (Willetts, 2015)

Communications service providers have not been able to match their digital native counterparts when it comes to delivering what customers want, when and where they want it, but thanks to a number of interrelated disruptive trends that are happening in parallel, there is a real opportunity to close the gap. (Keathley, 2014)

Service providers are already transforming infrastructure, business processes and back-office operations through network functions virtualization (NFV), software-defined networking (SDN) and cloud technologies. The next step is turning those capabilities inside out to make internal platforms available to partners and customers in a dynamic, ondemand way that can support almost instant, mashed-up services.

To adopt a platform approach, communications service providers have to give up the role of gatekeeper and move to a model that unbundles ownership of the infrastructure (for example, network access or cloud infrastructure) from the offering of value-added services to consumers. 5G is going to play a critical role in this. (Parker, Alstyne, Choudary, 2016)

The platform model promotes the disaggregation of network functions like switching, routing and security, which enables new value-added composite services. This disaggregation, which is often part of a transformation process, can be realized in many ways, like by leveraging wholesale connectivity or cloud infrastructure from a partner.

Operators can also use platformbased business models to efficiently leverage their core assets and differentiate themselves from competitors. For example, a provider could pull together a virtual customer premises equipment service that aggregates network connectivity, managed IT/cloud services (such as a network firewall or parental control), and over-the-top services (like video on demand) to offer an attractive package to residential subscribers. (Keathley, 2014)

Communications service providers are already in the middle of many service chains, so they are naturally well placed to become the curator between producers and consumers of services. They also have a wealth of knowledge about their customers that they can use in new, innovative ways. (Shepard, 2014)

Companies like BT, Orange and Vodafone are adopting platform architectures, in part to ready their infrastructure for platform business models. They see orchestration, analytics and policy management as key components: Through open APIs, multiple orchestrators in multiple software platforms can communicate with each other, and with other network and operational and business support system (OSS/BSS) components, to

deliver services end to end. By using analytics, policy and intent-based management, all the configuration changes necessary to fulfill customers' requests can happen automatically. (Parker, Alstyne, Choudary, 2016)

Operators are proposing multiple technical platforms within the network, each abstracting some of the complexity. Operators can then use them as part of a platform-business model, now or in the future.

As it turns out, with a platform architecture, it's not really important what features individual systems, such as orchestration systems, have or even whether they meet particular standards. All that matters is that they can communicate through open APIs with other orchestrators and OSS/BSS, using intent-based management and layered service abstractions of virtual and physical network components. (Keathley, 2014)

Possible services of platform infrastructures listed as below;

2.7.1.1 Paas

The network operator enables the consumer (usually a developer) to deploy applications onto cloud infrastructure. The consumer doesn't manage or control the underlying infrastructure but has control over the applications.

2.7.1.2 Naas

This is a flavor of SaaS where the network operator provides network functionality as a service. This could include hosting virtual firewalls or routers, content delivery, or bandwidth on demand. In some cases, operators host entire networks, as in the case of mobile virtual network operators (MVNOs).

2.7.1.3 Saas

The network operator provides applications running on cloud infrastructure to the consumer. The consumer doesn't manage or control the underlying infrastructure or the application.

2.7.1.4 Iaas

The network operator enables the consumer (usually a business) to deploy applications onto cloud infrastructure, and the consumer manages and controls both. Amazon Web Services (AWS) and Microsoft Azure are well-known examples of IaaS, and many communications service providers also offer IaaS.

2.7.1.5 Marketplaces

Network operators leverage their status as trusted intermediaries and settlement brokers to host platforms for ecosystems such as a smart city or group of healthcare partners. To monetize the services, the operator may offer usagebased transactions to its partners. (Willetts, 2015)

2.7.2 New Digital Services For Telecom Companies

For communications service providers, the era of digital services represents unprecedented opportunity combined with a nearly incomprehensible competitive operating environment. Today any business can conceivably deliver digital services on top of any network infrastructure, yet service providers that operate networks are hamstrung by network construction and operating expense. (Bradbury, 2014)

Electronic communications has evolved from convenience to necessity and from productivity enhancement to critical infrastructure. For customers, it's no longer fixed or wireless, voice, data or video – only devices and applications. However, as providers of critical infrastructure, network operators will become more, not less, regulated in the future. (Hurley, 2014)

Customers are being driven to buy based on device and application choice rather than network or service provider loyalty, and driven away by inadequate offerings, inflexible product and pricing plans, inaccurate activation, poor performance, and incompetent support.

Ensuring a positive customer experience entails more than collecting metrics: Managing the customer experience in the era of digital services needs service providers to implement high quality, customer-focused business processes and Business and Operational Support Systems (BSS/OSS). (Bradbury, 2014)

Service providers worldwide know they must significantly alter their businesses to deliver digital services and compete with over-thetop (OTT) providers. Recognizing the need for business-wide optimization and automation of operational processes, end-to-end customer visibility, data-driven information technology (IT) architectures and seamless BSS/OSS integration will establish the role of BSS/OSS (and IT) as an agent of change in a very powerful way. (Hurley, 2014)

There are hundreds and, in some service providers' operations, thousands of IT and BSS/OSS solutions and data collection points in use. While service providers do have access to every transaction that traverses the network, the volume is staggering and growing daily. Quarterly data consumption is currently measured in petabytes and continues to increase exponentially. (Reilly, 2015)

Examining trillions of packets from thousands of devices creates a bottleneck. Correlating and distributing that data to hundreds of applications creates another one. Multiple parallel interfaces from digital services delivery environments, BSS/OSS and customer applications requires tremendous processing power, and each application must have the ability to evaluate and correlate the incoming data stream.

Equipping a network with the probes required for continuous data collection and examination is expensive. The BSS/OSS solutions and other applications requiring access to that data must implement and maintain expensive discovery and correlation engines in addition to the substantial library of adaptors required to interface with all the necessary network elements, probes and management systems. Monitoring and distributing customer transaction data as well as service providers' existing operational requirements multiplies costs. (Reilly, 2015)

Network and infrastructure probes, elements, and management systems use a variety of formatting approaches for status and monitoring data. BSS/OSS solutions that access data from any of those sources has to accommodate each type of interface. As elements and devices change, the interface adaptors must be updated and tested to ensure continued interoperability. As the number and type of connected devices and digital services grows, so too will the cost of maintaining interface adaptor libraries.

Connectivity is only a small part of digital services enablement. Service providers don't need to build the devices or the applications; they need to build the ecosystems, protect the users and broker the data. In short, service providers need to go over the top and deliver a well-integrated, secure ecosystem that is inclusive of any variety of partners and developers using simple, automated, open interfaces and data models. (Shepard, 2014)

Those products can then be offered to millions of customers, quickly delivered, supported and billed. Each link in the ecosystem supply chain gets paid, and the customer is being served by a trusted company with an established brand.

Service providers wholeheartedly agree that existing BSS/OSS solutions cannot be summarily replaced to accommodate digital services. Beyond that, existing BSS/OSS solutions generally accomplish the functions they were installed to execute and keep the business running around the clock. However, service providers also admit that despite numerous efforts to evolve BSS/OSS to fill the gaps, many existing billing, customer relationship management, fulfillment, assurance and inventory systems cannot be extended to fill the orchestration gaps that are preventing end-to-end automated execution of the complex processes needed to define, deliver and support digital services. (Mitchell, 2014)

The complexity created by new digital products and services can be managed, provided that existing BSS/OSS is augmented with solutions and overlays that reposition foundational data and core functionality to execute end-to-end streamlined processes that can ultimately be automated from the end user to the core of the network. (Reilly, 2015)

Service providers will benefit from evolving, retrofitting or replacing existing BSS/OSS with the ability to rapidly provision connected devices and just as quickly turn them off; implementing micro-billing that accommodates fractions of a cent and pays partners per transaction; monitoring virtual layers in parallel to quickly detect and correct errors; automatically boosting performance based on customer value; launching new products in days or hours rather weeks or months; and so much more. (Mitchell, 2014)

That's what customers want from a provider and that's what service providers need from BSS/ OSS to increase revenue, improve profitability and become retailers of connected products rather than wholesalers of network capacity. (Bradbury, 2014)

Infrastructure, hosting and data center services have been available for some time, but it is interesting to note that a high percentage of respondents are involved in mobile payments. Banks and payment processing companies are implementing network-enabled mobile payment technology for use by mobile applications rather than connecting via the Internet, to manage identity and help ensure security.
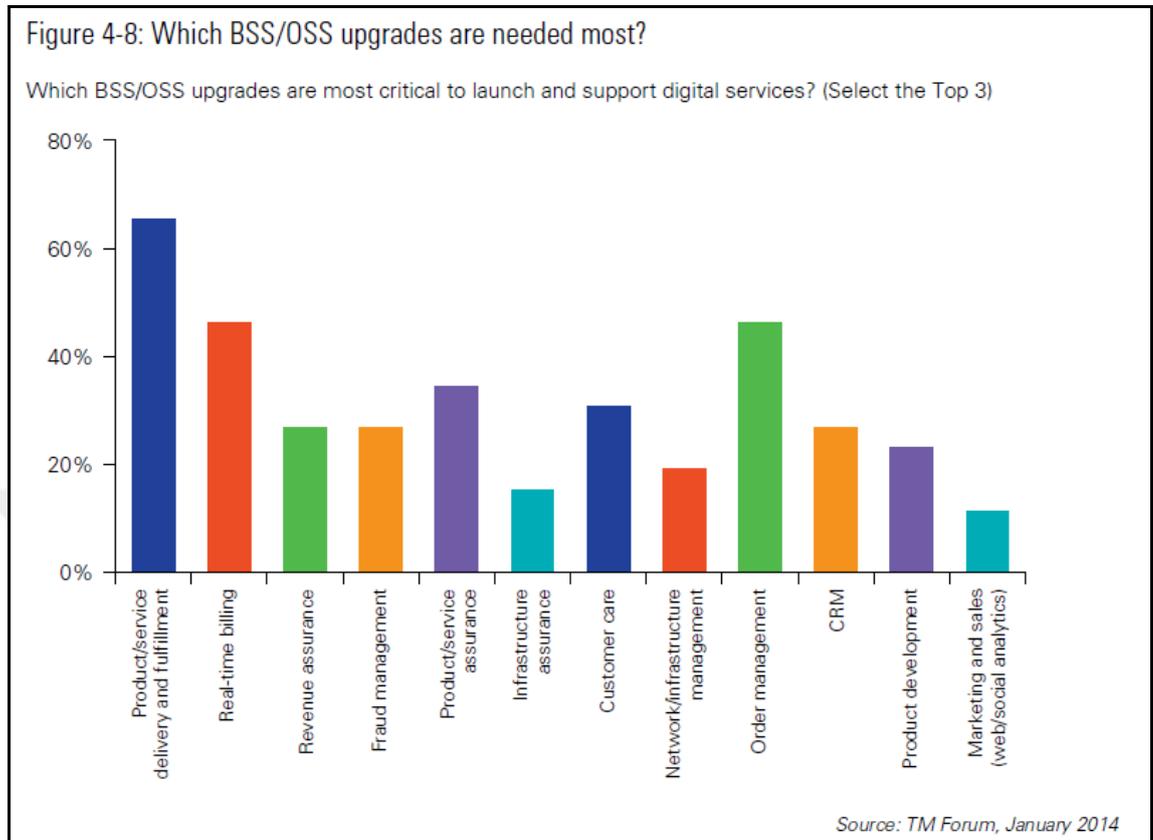
The most logical extension of existing service provider offerings is 'as-a-service' products. Service providers have begun offering a full complement of managed or stand-alone services that include hosting, software as a service (SaaS), platform as a service (PaaS), infrastructure as a service (IaaS) and all associated infrastructure and facilities. (Mitchell, 2014)

Service providers are also offering colocation facilities both in conjunction with data center services and as a stand-alone product. Most digital services offerings include some amount of software if only for email, messaging and identify management.

In rolling out digital services, service providers are developing strategies intended to create a simple, reliable, accurate and unique customer experience. They are upgrading CRM, billing, assurance and fulfillment capabilities but still report that the time-to-market for new products has not substantially improved. (Reilly, 2015)

TMForum surveyed surveyed 44 executives from service provider organizations worldwide including mobile, cable, fixed and converged operators.

Figure 2.1: Which BSS/OSS upgrades are needed most

Figure 4-8: Which BSS/OSS upgrades are needed most?

Which BSS/OSS upgrades are most critical to launch and support digital services? (Select the Top 3)

Source: TM Forum, January 2014

Source: TM Forum, January 2014

Acording to TMForum survey point to the fulfillment process as the weak link in the digital services delivery chain as shown in Figure 2.1. Seamless end-to-end order management that includes orchestration and automation from product definition, offer development, order capture and delivery through billing notification and customer care is critical to profitable delivery of digital services. (Mitchell, 2014)

Service providers are implementing centralized product, service and resource catalogs; sophisticated workflow management to eliminate order fallout; sophisticated policy management and enforcement solutions; and analytics that correlate fault and performance data with customers and products. (Reilly, 2015)

Service providers are also insisting that BSS/OSS solutions be pre-integrated such that data and application interfaces are seamless and easily updated and tested. Large BSS/OSS vendors offer service layer platforms designed to accommodate any

combination of functional products, while smaller BSS/OSS vendors are implementing open interfaces and ensuring that new products work in concert with BSS/OSS solutions and platforms. (Willetts, 2015)

Another point that has been made repeatedly is that there is a growing need to address the quality of the software delivered by BSS/OSS solutions. Development of software to fill an app store is entirely different than the software design and development discipline required to build the complex transaction-driven applications required to manage digital services customers, products and infrastructure in real time. Good software developers are difficult to find and quality software architects and structured programmers are nearly extinct. The BSS/OSS solutions used to manage software-defined, virtual networks and data centers must be every bit as reliable as the hardware infrastructure.

Software quality will become a discriminating factor when choosing BSS/OSS solutions and defining service level agreements for managed services and cloud offerings. The development of BSS/OSS solutions for digital services must focus on software scalability, reliability, availability, performance and security consistent with the requirements placed on hardware. (Willetts, 2015)

At the heart of service providers' digital services strategies are new processes and BSS/OSS solutions that implement more streamlined, less complex end-to-end product design, delivery, billing and support functions built around a single view of the customer and its individual services. The volume and variety of products that customers demand point to an approach that aligns BSS/OSS solutions around a horizontal, product-driven digital services model that is network agnostic. (Hurley, 2014)

Service providers understand that BSS/OSS solutions that execute agile and optimized business processes will make or break their digital services business. Customers are becoming less and less tolerant of errors and delays, and enterprises are using digital services for business critical functions that simply cannot fail.

As digital services strategies and process optimizations become tactical and are translated into programs, schedules, requirements, BSS/OSS solutions and success criteria, service providers are proceeding as budget, staffing and demand allow.

Service providers would seem to be prioritizing investments in the infrastructure and BSS/OSS solutions necessary to deliver digital services. For some, BSS/OSS upgrades will suffice, while for others nothing short of complete replacement will enable a full complement of digital services offerings. (Hurley, 2014)

Digital services need BSS/OSS solutions that improve quality, reduce redundancy, eliminate complexity, provide better visibility and deliver more products to customers faster. Those solutions will dramatically improve the customer experience and enable service providers to create differentiation. BSS/OSS will lead the way in enabling service providers to compete in a digital services marketplace and take advantage of existing brand recognition and customer loyalty. However, in order to make digital services a reality, both service providers and vendors must recognize the need to transform to the realities of this new market. (Reilly, 2015)

2.7.3 The New Digital Operator Model

Telecom companies need to rethink their processes and adopt strategic capabilities in the service market in order to be able to adapt to changing digital environments and offer different services to customers.

In the transformation process Operators' priorities should become a Integrated Digital Service Provider for their customers. Being an IDSP will allow an operator to offer a new solution group. A sampling of future scenarios may include: digital home integrator, home health integrator, customized cloud provider, M2M activator, one-stop shopping for IT, smart city providers and road crossing partner. (Guzman and Pierron, 2014)

To enable this model, operators must re-design their customer operations and internal systems. In this context, you should rethink to convert the following core systems: (Grant, Meadows, 2016)

a. Digital Omni Channels

b. Order Management and Negotiation

c. Customer Interaction

d. Campaign Management

e. Billing and Charging

f. Order Fulfillment

Operators should adopt strategic capabilities in service market:

a. Real Time Charging and Integrated Policy Management & Control

b. Social Sensitivity Analysis

c. Collaboration

d. Omni-channel Experience Management

e. Next Best Action Marketing

f. The only online product catalog that is common to all sales channels and single order entry function

g. Partner value activation (API access to core business functions, multi-tenancy) and roaming, wholesale, reseller, content, on top, partner value distribution between M2M business partners (Accenture, 2014)

After a typical transformation process that needs to be done according to changing customer needs, a digital operator needs to use the system architecture in real time and analytically comprehensive manner and contain the necessary digital capabilities and features. (Guzman and Pierron, 2014)

For example, the new generation digital system architecture view that Accenture has proposed is as seen on Figure 3.1.

Figure 3.1: The new digital operator model of Accenture
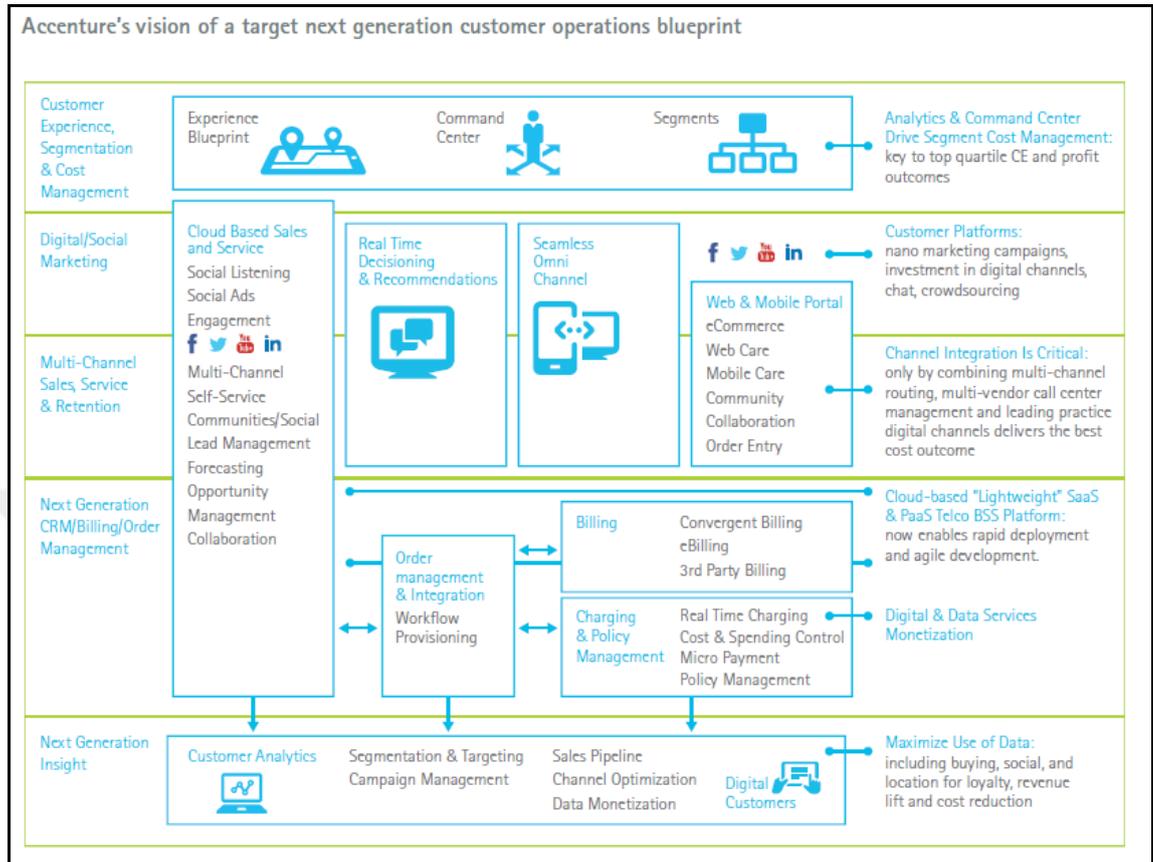
2.8 TELECOMMUNICATIONS SECTOR STANDARDS AND TMFORUM

TMForum (Tele Management Forum) is a worldwide collaboration aimed at making non-profit and telecommunication sector service providers more agile and innovative. In this cooperation, more than 900 companies, 85,000 industry experts and 195 countries are located. (Tele Management Forum, 2001)

World-wide internet service provider companies in the telecom sector use TMForum standards in their BSS applications.

Major institutions involved in TMForum cooperation worldwide:

a. Alcatel-Lucent
b. Accenture
c. Amdocs

d. BT

e. Cisco

f. Comarch

g. Deutsche Telekom

h. Ericsson

i. EMC

j. Huawei

k. IBM

l. Nokia

m. Oracle

n. Telecom Italia

o. Verizon

p. Vodafone

Some of the advantages of using TMForum standards are listed below;

a. By bringing together thought leaders in the telecommunications sector, it enables sharing of thinking approaches that address sectoral solutions.

b. It establishes a common platform for identifying and eliminating common problems in the sector.

c. Enables industry stakeholders to come together to remove barriers that are at work and in technology.

d. Helps optimize service providers' operations with best practices and tools available by bringing together qualified experts.

TM Forum 4 focuses on the main framework;

1. Integration Framework (Frameworkx) specifies how to use other frameworks for architectural design.

2. The Business Process Framework (eTOM) focuses on the functions that must be performed in a telecom company.

3. Application Framework (TAM) helps how and how to get and optimize applications.

4. The Information Framework (SID) provides the data infrastructure for modeling.

2.8.1 Integration Framework (Frameworkx)

Forum Frameworx is a general package of best practices and standards that are used together to create efficient and efficient operations. It ensures that operations and integrations are monitored and optimized using a service-based approach. Thanks to the practical tools used, it provides the development of end-to-end management of complex and multi-stakeholder-oriented services. (Rygielski,Wang,2002)

Thanks to this definition along with Frameworx:

  a. Integrated business architecture (OSS-BSS),

  b. Vendor and technology independent standards,

  c. It is aimed to create and use the frameworks of Process, Data, Application and Integration.

The Frameworkx development method is being developed through the business association program. Association programs listed below;

  a. Virtual research and development consortium consisting of TM Forum members in different roles in the sector

  b. Goals and goals set by Forum administrators

  c. Best practices resulting from the Business Association program and standards such as FrameWorx

  d. Projects made by all members of the Forum

Some of the advantages of using FrameworkX standards are listed below; (Chang,2009)

  a. Providing end-to-end service management increases pace product removal speed.

b. Provides the creation, delivery, and management of multi-partner value-chain services that the organization provides.

c. Ensures increased customer experience and loyalty by using defined maturity levels, metrics and processes.

d. Optimizes business processes to create automated and efficient processes.

e. Reduce the cost and risk of integration by using standard interfaces and a common knowledge model.

f. Reduces the risk of conversion by allowing agile and efficient business processes to be planned.

g. Allows independence and assurance of procurement processes.

h. Creates a common language in industry standard.

i. Specify the methods and structures necessary for the identification of the processes.

j. Identify business-critical assets and relationships between assets.

k. Facilitates the creation of structures that support the implementation of solutions.

2.8.2 Business Process Framework (Etom – Enhanced Telecom Operation Map)

The Business Process Framework (eTOM) is a reference architecture that consists of business process components that categorize and model service providers' workflows. Service providers are used as a method of developing a strategic business model plan for companies. It is a hierarchical display of key business processes that have been comprehensively and industry-aligned to enable the service provider to operate effectively, efficiently and agile. (Chang,2009)

The main objective is to categorize and present process steps and business activities as references. Internet service provider companies that implement the process follow these processes to create different compositions according to their customer profiles and

perform their business processes accordingly; For example, the processes of establishing procurement, invoicing, cargo and so on can be different in terms of how to implement the standards according to company strategies. (Rygielski,Wang,2002)

It aims to standardize the aims, names and definitions of the various process particles in the workplace instead of a job. Workflows are created using this standard in turn. So you can get rid of it, avoid incomprehensibility and create reusable jobs. In short, it can be called 'Telecommunications Process Standards'. (Chang,2009)

Some of the advantages of using eTOM standards are listed below;

a. Establishing a common language between departments, systems, business partners and suppliers

b. A standard structure, terminology and classification scheme for business processes

c. Improvement of business processes at a specific discipline and consistency throughout the organization

d. Manage, develop, design and understand IT applications based on business process requirements

e. Consistent and high-end end-to-end workflow creation

f. Identifying opportunities for cost and performance improvements

Figure 4.1: eTOM Level 0 Processes and Domains
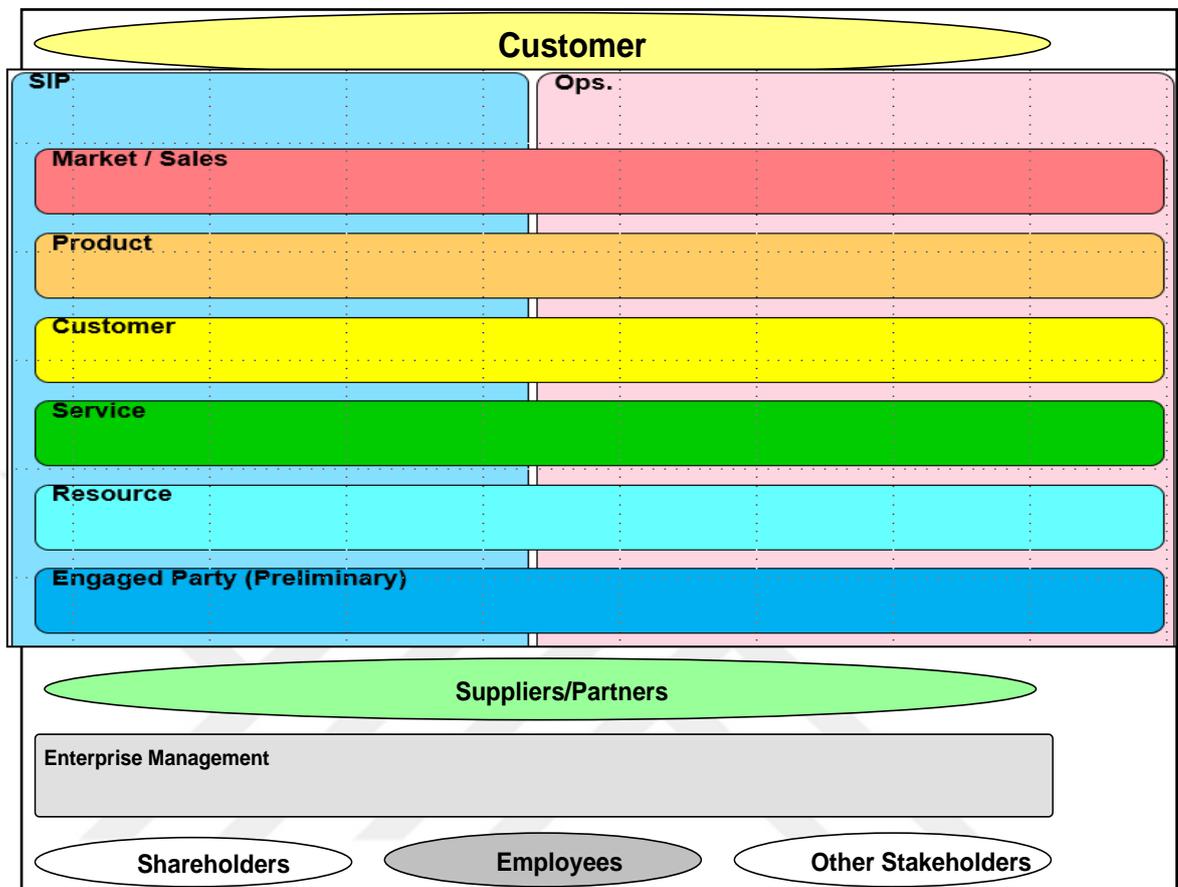
Figure 4.1 shows the conceptual view of eTOM in the most general way. According to this, at the top of the figure there are process areas which are divided into 2 vertically. These are the areas of strategy and life cycle processes and operational process areas. Process groups that horizontally cut these process areas are included. These are Marketing, Product, Customer, Service, Resource, Interpretation. The main process area at the bottom of Sheklin is the corporate governance process area. Beneath this area are stakeholders, employees who are the breakdown of their own head. (Chang,2009)

Figure 4.2: eTOM Process and Domain Groups
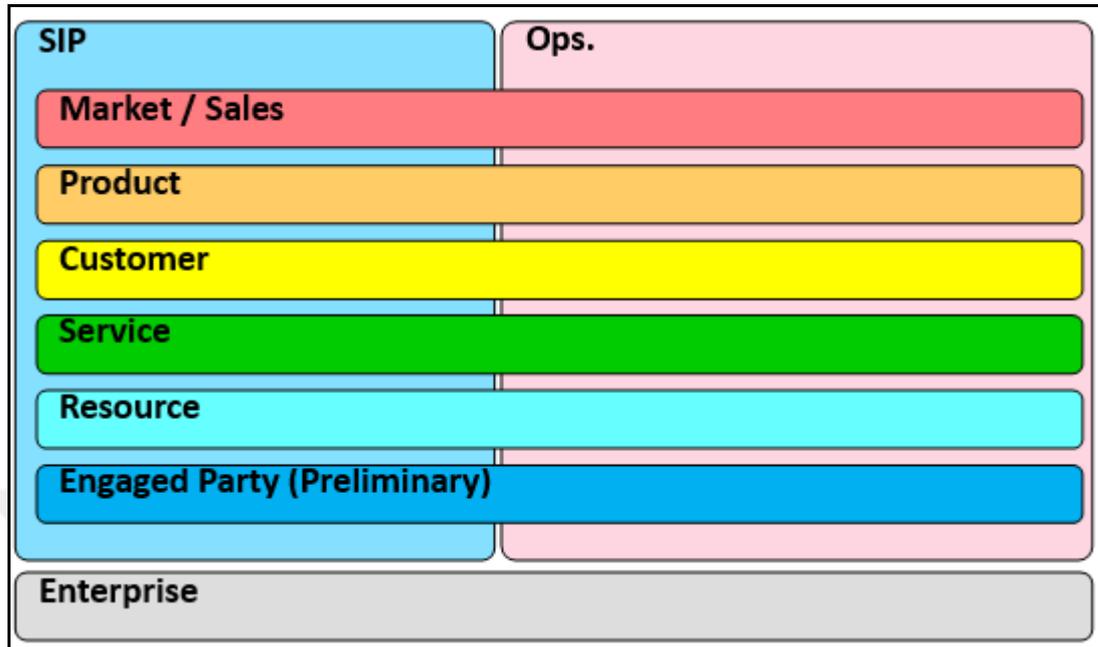
As can be seen in Figure 4.2, the main process areas and the headings of the groups of ETOM are shown. Within each of these process areas are the areas that form the standards. The graphs on the eTOM are indicated with levels and usually concentrate on the subject. (Rygielski,Wang,2002)

The main prospect of the operational process area is stated as the 3 items and it is stated that FAB (Fulfillment, Assurance and Billing) should be managed as one piece. Operations Support & Readiness (OSR) is considered to be a preliminary unit responsible for the management of products, services and resources.

2.8.3 Application Framework (Tam)

It is a framework used for demonstration of generic applications and capabilities used in the telecommunications sector. Technology is independent. It is based on functional standards far more than custom design standards. The functional standards refer to the minimum requirements that a system must fulfill. (Reilly,2015)

2.8.4 Information Framework (Sid – Shared Information Data)

Today, the need to share information among applications in the sector is inevitable. At this point it is important to define what information is shared among applications and what it contains. The main purpose of introducing the data standard is to have the same meaning for all of the information shared among applications. In short, it can also be called Telecommunications Process Standards. (Chang,2009)

eTOM creates a common dictionary for the model of all information needed to implement its processes. It provides a ready-made data model for service and system integration, enabling all stakeholders to quickly adapt.

SID identifies information sharing and data identification model in the telecommunication sector. These definitions include the designation of software designs by being poured into the tables and fields of business processes. These tables and fields contain the necessary information about the existing atomic business process and process and aimed to create information and data standard with process-oriented perspective. In addition, these table and field designs are put into UML diagrams as software design and software standards are determined. (Chang,2009)

**Figure 5.1: SID Domain and Business Process Framework**
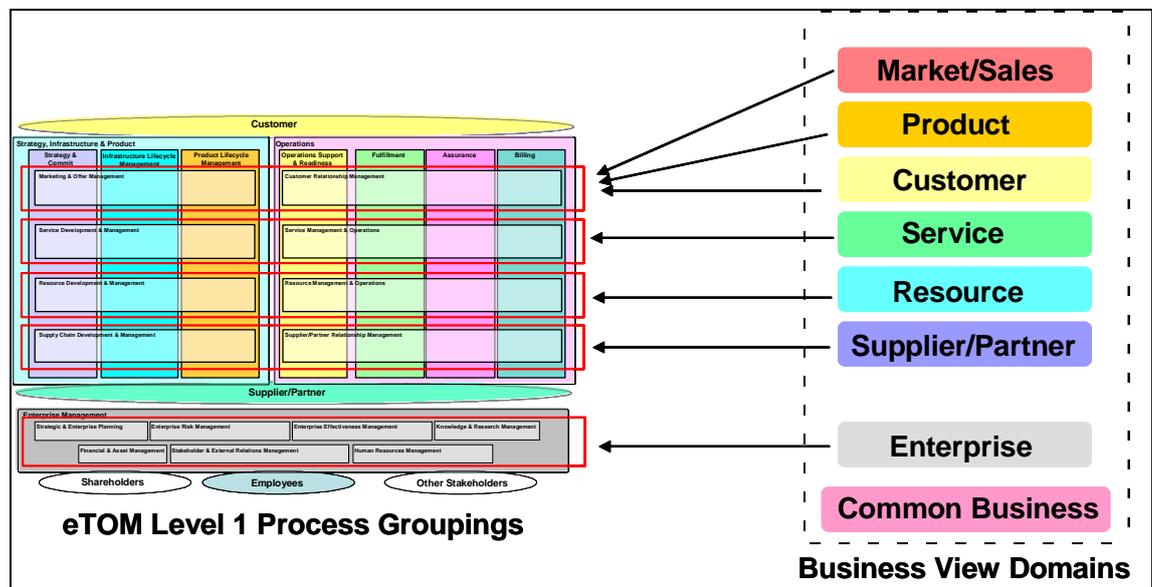
Source: TMForum, 2009

Figure 5.1 shows how the horizontal process groups specified in the eTOM process are

handled in the SID structure. According to this, business assets belonging to each process group in ETOM are addressed on SID and service and product integrations are addressed in such a way as to cover the relevant process group together with all fields. The probing, which occurs in any business process on this number, allows for counter-segmentation and allows only working on the related business entity. (Rygielski,Wang,2002)

Figure 5.2: SID Domain and Level 1 ABE structure
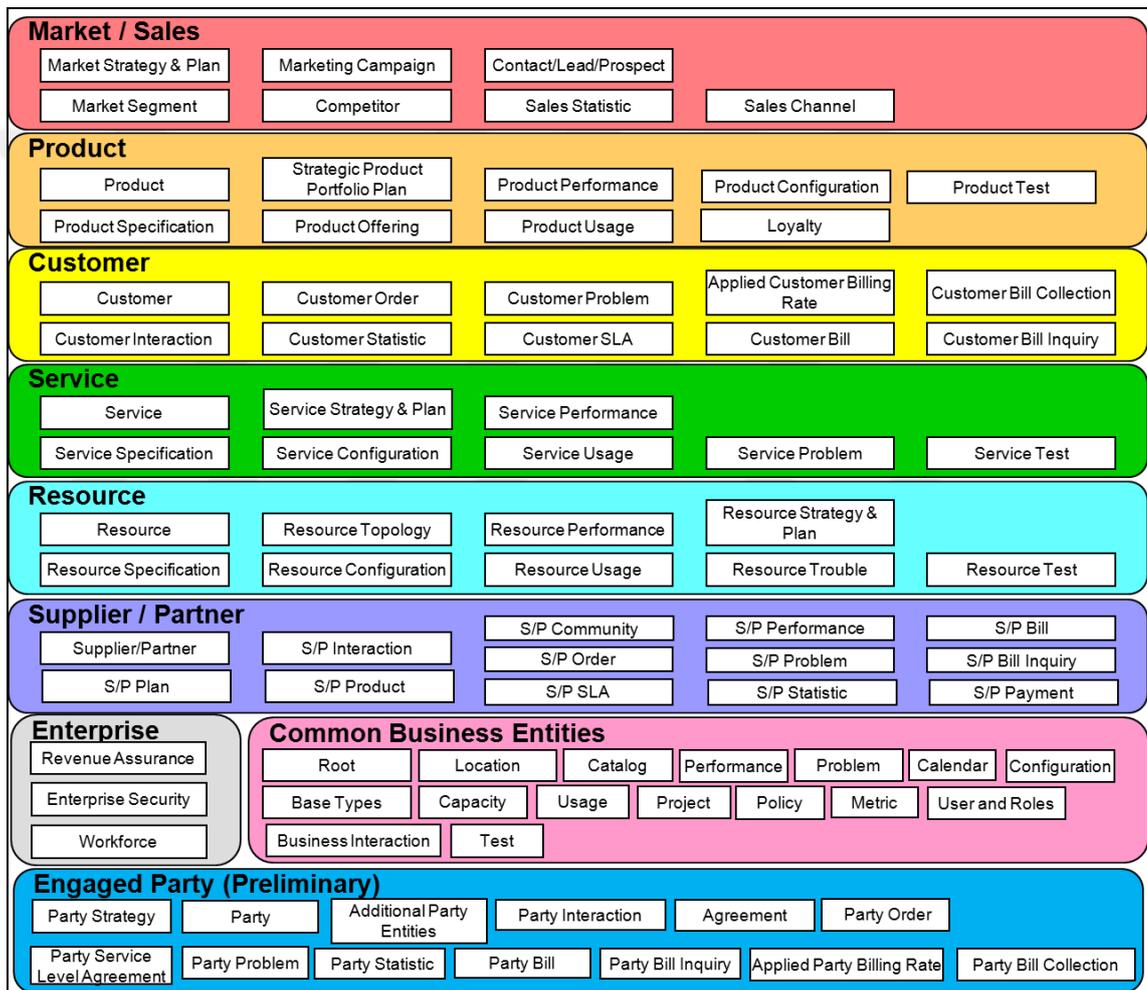
The fields and relationships within a business entity (Business Entity-BE) have the characteristic to include the characteristics of the relevant business process. Business assets, areas and relationships are specified in detail with UML diagrams, drawing a procedural path to development. Thanks to the UML diagram, it plays an important role

in ensuring the integrity of the product, allowing for an architectural design that focuses on business processes. (Chang,2009)

All these models and designs in SID are open source by TM Forum members. This design continues to evolve over time in line with the needs and analysis of the telecommunications industry. (Rygielski,Wang,2002)

SID Key Concepts are listed as follows;

a. BE (Business Entity) : They are atomic entities related to a job belonging to the business process. In short, it can be called "Business Asset". For example, Customer, Customer Order, and Customer Account. Business assets have qualities and interact with other business assets. Examples of business entities move along a well-defined life cycle.

b. Aggregate Business Entity (ABE) : It is the sum of the business assets that represent the same business process that are highly related to each other; business assets.

c. Relationship : The connection between the business assets that are related to each other.

d. Attribute : A domain that represents a specific feature of a business entity.

e. Domain : It is the sum of ABEs associated with a particular management area. Domains are consistent with eTOM key concepts. It can be evaluated as the main operations and enterprise information clusters that contain business assets. It helps to identify the data format and to separate responsibilities in a specific management area. (Rygielski,Wang,2002)

The main business entity clusters (ABE's) including SID standards and their associated information are presented in UML diagrams. In order to create a common language for companies developing in the telecommunication sector, these diagrams are used to make improvements in accordance with the exact requirements on the forum. (Chang,2009)

Some of the advantages of using SID standards are listed below;

a. Allows the cost of integration to be reduced using a ready-made model.

b. Allows you to get up to speed quickly with 1500 entities developed and approved by field experts.

c. Vendor earns time and money for selection by providing compatibility certifications in assessment and procurement decisions.

d. Reduce development time.

2.9 REVENUE MANAGEMENT IN TELECOMMUNACATION INDUSTRY

The subcontracts of communication service providers (CSPs) are under increasing pressure because of the inconveniences in basic services such as voice, messaging and data access. They need new ways to increase profitability. In particular, when using data transport and related services, they need to make better money without having to grow exponentially, and in order to do so, they need to transform their businesses completely.

CSPs are undertaking huge technical, operational, commercial and cultural changes that compete for all resources and priorities. Despite a common goal, most of these conversion projects come from silos. However, when these changes are only holistic, they will provide the benefits that CSPs want. This integration ensures a significant convergence of service and performance developments with the ability to charge accurately for them and ensures that money flows efficiently throughout the entire value chain. In short, making money from money money requires effective end-to-end revenue management. (Newman, Yee, 2017)

The whole CSP business is under pressure, and this emerges as change requests within organizations that can be categorized under three main themes:

Need for a step change in efficiency - this means reducing costs without running through automation and software-focused platforms that can support changes quickly and inexpensively. The marginal cost of services should be reduced across all network, operational and support functions. For example, creating and modifying settings in

pricing and policy functions to support new tariffs or services will not incur additional costs and will not cause significant delay in serving usage. Working on the Internet is a must.

Adoption of a new customer experience paradigm - the direction of the service flow has always been a customer from the CSP, but self-service provision is increasingly controlling the need to engage with customers through activation and tariff flexibility. It meets thousands of years of anticipation and offers a valuable tool that will allow CSPs to go beyond prices, reduce their market penetration and even gain market share from their competitors. (Newman, Yee, 2017)

Creation of new services - point-to-point voice, messaging and internet access will remain the main CSP services, but new services are crucial for future growth. However, many new services will not only be provided by CSP, they will work on different business and pricing models and will have a definite lifetime. This means that CSPs need to create ecosystems and create new value chains. (Chang,2009)

Core services are affected by each of the three alternate drives described above. CSPs want to increase the perceived value and profitability of their services to their customers. Millennia and low-cost access expectations have a major impact on the ability of CSPs to connect volume growth to revenue increases. (Newman, Yee, 2017)

Unlimited data plans have become a widespread solution for thousands of years of demand. Fifteen European and four US operators have launched an unlimited data package. It has increased data usage. For example, when the UK publishes three unlimited data plans, usage doubles over 12 months, with an increase of around 40 percent on the fixed side of business data. However, this increase does not provide the necessary long-term increase in income. There is usually a one-time short-term increase in average revenue per subscriber (ARPU), but this does not end with competition pushing package prices down. (Reilly,2015)

The new customer experience paradigm focuses on providing more control in the hands of customers. However, the same stringent tariff plans need to be more than just a self-service portal; Customers need to be able to develop their own packages.

New services require a more comprehensive approach that connects many customer requests to the products of many suppliers. The goal is to approach web design companies like Amazon and Google to business models that are so successful. (Newman, Yee, 2017)

Supporting multiple revenue streams does not have any difficulty. Most importantly, revenue should be distributed through the value chain according to the commercial agreements between the partners, which must be very good and different from each other. Settlement is not a new concept for CSOs, but is usually the carrier and circulation areas that hold expertise. Even more than their technical experience, competitors, customers and suppliers also understand how to work with potential partners. It is a cultural maturity required for new partnerships to work.

2.9.1 Need Of Integrated Revenue Management Systems

The components of end-to-end revenue management are not new to CSPs. All product catalogs, billing systems, charging mechanisms, policy control functions, rating engines, intermediary applications, and so on. There is. However, they can be limited, rigid and integrated. (Reilly,2015)

This is especially true in paid networks, where they do not use intelligent network (IN) and online charging systems. Programmability, flexibility and real-time operation are key features for these functions if CSPs convert to the digital age. Finally, income management functions should be integrated to provide end-to-end visibility and to remove dead ends or function silos. (Newman, Yee, 2017)

2.9.1.1 Product flexibility

Flexible product catalogs are at the center of long-term growth and revenue management. Products need to be easier to add, edit, and remove, but this means that the domain can easily be overloaded and become unmanageable. (Reilly,2015)

2.9.1.2 Real-time convergent charging

Core services have a relatively limited number of charge requirements. Metrics are voice and audio time for data and messaging. The related tariffs are also equally simple,

with volume-based discounts and bonuses. This limits the number of arms that the BSS must support, but it does not mean that the system itself is simple. The underlying data of these systems is derived from call detail records (CDRs).

2.9.1.3 Integration between functions

Implementation of Real-time convergent charging and integration with policy control is a start, but integration work has to spread beyond everything expected to work together. The most important part of the digital transformation concerns the transformation of BSS and OSS systems. Basically, the boundaries between the OSS and the BSS rise from the middle and the interchanges are made simple.

BSS integration is time consuming and expensive, but sometimes inevitable. The facts are that legacy systems are available and operations must continue. When implementing a new end-to-end revenue management system, the CSP can not close the BSS for several weeks. For this reason, cross-functional conversion planning has a vital proposition. This will minimize the need to run parallel functions and ensure that the effect of a transformation does not hit a brick wall when it reaches the traditional boundaries of another function. (Newman, Yee, 2017)

In all these cases a BSS owner must support an unpredictable future resulting from new business models, different radio technologies, and evolving consumer requirements. Revenue Manager supports the Communication Service Provider (CSP) in capturing Digital Services Opportunities with minimum effort and lead-time. (Ericsson Mobility Report, 2015)

These needs are considered in Revenue Manager since the inauguration of the design, using Enterprise architecture, TMF models, "Cattle principles", Common Information Layer, Product Centric approach and the 3GPP standards as a base. Revenue Manager can trigger rating on any event, be it real-time or not, without requiring customization. New types of events can easily be defined and understood in the system and rated upon.

While 5G can dramatically boost the incremental revenue potential of service providers, it can only do so if service providers are ready to adopt new business and revenue models as well as a customer-centric digital operating model, leaving behind traditional

operating models and rigid IT (OSS/BSS) legacy systems. Consumers are moving away from the traditional purchasing channels, and the customer relation is mainly managed through digital media, like web and apps. This puts the requirement on operator to manage the channels with a 360 view and this must be seamless. (Ericsson Mobility Report, 2015)

Revenue Manager is the first business support system (BSS) solution designed to address these considerations. It is a convergent, end-to-end charging and billing system, that is designed from the outset using architectural principles that embrace new business models and use them to the operator's advantage. Its state-of-the art technology ensures the most advanced levels of flexibility, speed and scalability in a telecom-grade real-time environment. Crucially, it enables extreme levels of efficiency, enabling profitable monetization against the backdrop of new economics of the Networked Society. (Ericsson Consumer Lab, 2016)

2.9.2 Business Challenges Of Transforming Revenue Manager

Many telecom operators are seeing their margin and ARPU being lowered over several years. The mobile communication service has become a commodity, where the consumers have multiple identities with different operators and adapt their usage per the current offers of the operators. In certain regions and with certain customer types, this behavior is not significant, but this may be a question of time. As the consumers are opportunistic, one way of battling this behavior is to increase the additional services available through the telecom operator. (Reilly,2015)

To keep consumers, the products available need to be attractive and could be based on the momentary need of the user. This requires a short TTM and a continuous understanding of the individual consumer what services he/she is using and the status he/she is in.

The large future growth in users will be in the machine to machine type of applications. The requirements in this space is spread over a large spectrum, from one notification per day, like a house hold application, to a large data-stream with fixed bandwidth requirements and policies, like self-driven cars and medical applications. In this space

there will be a multitude of different relationships between the license holder of the radio resources and user, which can be an individual, partners, M2M, MVNOs and others. (Newman, Yee, 2017)

As margins is going down and the new possible markets will span over large difference in usage and revenue, the cost of management per identity and product must be reduced, as the cost per low revenue IoT device will set the ceiling of what can be spent on an individual connection.

As the future in the Networked Society is unpredictable the BSS system must support new data, devices and revenue streams with minimum effort. Naturally a system that is acquired today is not able to predict the future in the sense that all necessary functions are OOTB. The BSS systems must be configurable to manage new work-flows, revenue models and technical setups. (Ericsson Mobility Report, 2015)

  a. Creating and monetizing new services; IoT services take advantage of digital transformation capabilities, such as subscription-based services rather than product purchases, services mashed up from multiple parties, and digital marketplaces. Rapid time to market is essential to capture market share and revenue management solutions are key to success.

  b. Extending go-to-market; every company that connects large sets of devices or machine fleets will generate huge volumes of data. When analyzed effectively, this data becomes the basis for value creation, such as prioritizing the biggest and most attractive opportunities.

  c. Orchestrating infrastructure in real time; to meet dynamic IoT services, techniques such as dynamic orchestration and network slicing efficiently manage network resources and capacity with low Total Cost of Ownership. (Ericsson Consumer Lab, 2016)

2.9.3 Business Benefits Of Transforming Revenue Manager

2.9.3.1 Designed for cloud

The future is in the cloud. Revenue Manager meets the requirements on running in a

cloud and supporting Networked Society's requirements of scale. It can support hundreds of millions of connections and billions of transactions. For example, new application instances can be allocated on demand for periodic high load processes, or based on preset KPIs (key performance indicators) that automatically trigger the assignment of new instances to support traffic surges. (Genysis,2009)

Operators can optimize the use of hardware in their data centers according to need, and minimize total cost of ownership. In addition, marketers can work with greater freedom from IT, without worrying about the impact of new offers.

All Revenue Manager applications can scale-out and in, independently of each other depending on the need. No applications contain persistent data, this to support cloud operations. Therefore, at scale-out no concerns needs to be taken for the data used in the applications as the data resides in the Common Information Layer (CIL).

The current Revenue Manager cloud setup is optimized towards the use of VMWare hypervisor and management.

Revenue Manager's architecture is designed for the cloud. It is based on a modular approach where each individual application – such as charging or customer management – is self-contained and have defined data ownership. No application contains persistent data, apart from the resilient databases, like CIL. This ensures individual scaling per application and enables flexibility and automation for cloud deployments. (Newman, Yee, 2017)

2.9.3.2 No duplication of data

In current systems, customer and other data is often duplicated in e.g. the CRM, the billing system and the OCS. Each of the systems carry their own databases. This leads to duplication and mismatch of data, complex data re-alignment between system and a need to verify which data is correct. Revenue Manager provides a single data layer, Common Information Layer (CIL), where only the data owning applications are allowed to write to CIL, but where all different applications can read the data. (Willetts, 2015)

Figure 6.1: Traditional & New Digital BSS/OSS Comparision
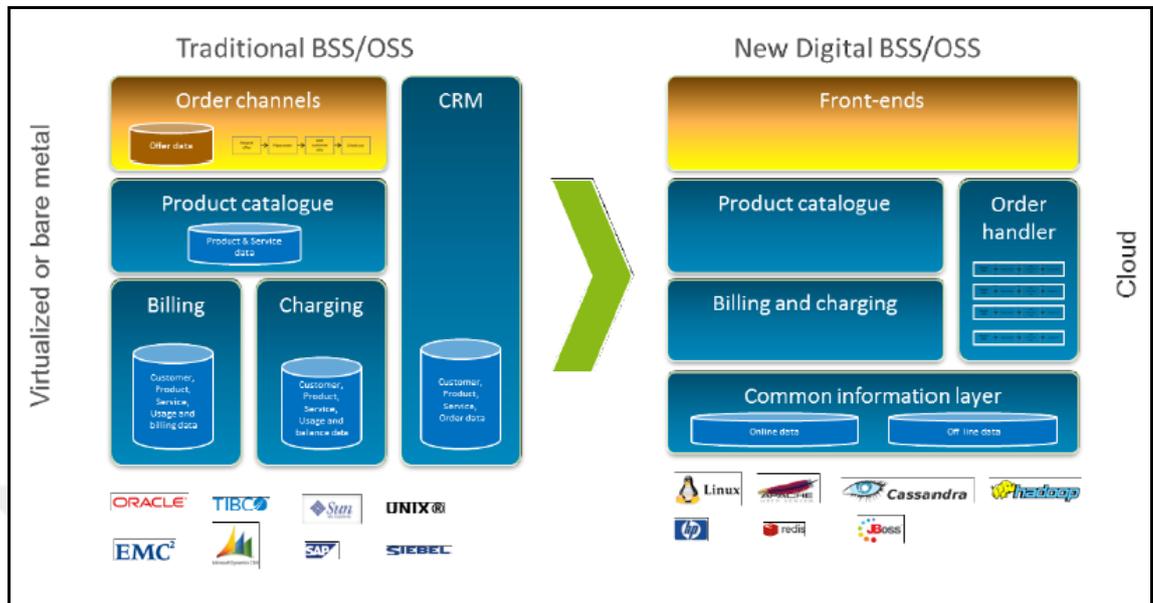
This model extends Telecom Management Forum Shared Information Model (SID) standards to simplify integration and interaction with external systems. Revenue Manager's CIL secures data persistency through the database technologies used. All applications are fed real-time data in an efficient and controlled way, with no unnecessary partitioning, duplication, or uncontrolled distribution of data. The result is the ability to flexibly scale according to business needs. (Bushaus,2014)

2.9.3.3 Single operational view

Revenue Manager is designed as one system from the start. This means that all Operation and Maintenance of the different applications is managed by one node in a ready-made setup. All alarms, logs, business configuration and scale-out and in is managed from this single node. As the view and setup of the different functions has a common framework for all needs and users there is no need of node specialists but only system specialists to run the system. (Ericsson Mobility Report, 2015)

The simplification of the system management optimizes the needed competences and resources. As the system management is done from a single view, and role-based authorization is used, the access to the system and roles that different users play can be

controlled to what a specific user is allowed to do within a specific application.

As Revenue Manager is designed for cloud from the bottom up, it requires no manual data balancing when scaling out or in, and hardware capacity balancing is controlled through the single operation and management. (Keathley, 2014)

Revenue Manager provides a 360-degree view for systems operation and management. All systems performance measurements – such as resource usage, traffic throughput, CDR and invoice handling or customer management response times – can be monitored in real time via centralized operations and management, through which users can view alarms, manage faults and apply systems back-ups, corrections, updates and patches. Operators gain greater coordination and control over business-critical systems and, importantly, require fewer resources for ongoing management and maintenance. (Newman, Yee, 2017)

2.9.3.4 Operation efficiency

With Revenue Manager, the operator can easily scale in both number of offers, connections and contracts, transactions, services, products and partner and business models, even to extreme levels, without a corresponding increase in cost. As fully virtualized software, it significantly reduces the need to have servers dedicated to specific tasks. It optimizes hardware allocation according to the irregular load patterns experienced by operator systems. (Ericsson Mobility Report, 2015)

Operators can benefit from both a lower primary capital expenditure (equipment purchase / leasing, maintenance, database and operating system licensing) and lower secondary operational expenditure (space, power, operating headcount). Based on typical procedures and data load, operators may be able to save up to 50% compared to a legacy physical environment. (Bushaus, 2014)

Revenue Manager's centralized operations and maintenance management offers significant efficiency and cost savings in addition to the hardware cost savings derived from virtualization. All applications can be managed through a single point, which could mean managing the entire BSS environment through a single point for unprecedented holistic systems insight and control as well a reduction in staff.

(Newman, Yee, 2017)

Operators deploying Revenue Manager have the potential to significantly reduce the amount of resources dedicated to managing and maintaining systems in favor of more profitable innovation and business initiatives.

2.9.3.5 Business flexibility

These flexibility features are available for many types of products and services depending on session context information.

Flexible features for Experience Management include various ways to manage quota and reservations by dynamically adjusting quota sizes and policy settings. Use of these capabilities can improve the experience of users, optimize charging resources, and reduce exposures to revenue loss. (Bushaus,2014)

Indeed, all applications are designed with flexibility in mind. Functions can be extended in a controlled fashion after deployment by structured use of the variation points. Each application defines different variation points where "post-design" extensibility has been foreseen. Variation points use different techniques. The most common ones allow GUI configuration, workflow changes, new actions to be plugged in, event data extensions, and data injection. (Little, 2015)

This provides flexibility in modifying system behavior including:

a. Product Configuration Extensions

b. Charging & Charging Contexts

c. Charging Parameters (AVP)

d. Rating Conditions

e. CDR content

f. Notification triggers & content

g. Information and Reports

Flexibility in handling loads, both normal and abnormal, is provided from Revenue Manager's cloud-aware services.

As all Charging processes scale according to traffic volume these are completely separated from the data layers that scale on subscriber volumes. Since system layers are completely de-coupled this yields optimal use of processing resources.

Multi-site horizontal data scalability removes both the need (and the concept) of node re-balancing. In addition, this provides a single point of configuration for all data within the multi-site system. With this capability of one-touch changes there is a reduction in operations complexity and costs. (Keathley, 2014)

The enterprise-aware and Catalog-driven flow-through processing delivers the maximum efficiency in business processes. Along with re-factoring of the BSS architecture these efficiency gains will result in less order fallout that requires costly manual intervention and corrective action and of course these benefits create a corresponding increase in customer satisfaction.

The system itself uses low cost of ownership software based on open internet community standards. Since it is highly configurable there is a big reduction in the need for any change requests or customization work.

In every manner the system has been designed to keep direct and indirect costs to a minimum whilst maintaining a robust, high performance solution that includes full business protection and integrity. (Little, 2015)

2.9.3.6 Agile product management

The product catalog holds all specifications for products, services, business agreements and resources in componentized form for easy assembly of new and custom services. It provides a single place for consistent product configuration, eligibility rules, and lifecycle management with clear data ownership of products, services and resources. (Reilly,2015)

In many Business Support Systems, product creation requires configuration in several parts of the system. In Revenue Manager, the product creation is done through a single

view, where the needed underlying resource facing service (RFSS), like a specific Diameter setup with unique AVPs, can be created through configuration, to create the final product using an hierarchical view to create the final Product Offer (PO).

All the underlying specifications and offerings can be re-used to create new consumer services in an easy fashion, at the same time being able to restrict the configuration setup to an individual with the authority and configuration skill on an individual basis, e.g. an individual setting up the RFSS does not have the right to create the final PO. As the authorities are controlled, there is less opportunity of mistakes, which then requires less verification on any new PO being created.

2.9.3.7 Time to market

As part of the enterprise architecture Revenue Manager makes a significant contribution to Time to Market (TTM) by providing a system that handles direct Web Service calls and executing all functions in real time. All requested updates can be made effective immediately throughout the system and across all sites from the single point of configuration. (Ericsson Mobility Report, 2015)

New products launched in the Product Catalog can be immediately activated and made live. Use of the advanced Charging features for handling Bonus and Promotions means offers can be sent to subscribers "at the right time" to drive subscription adoption in shortest possible time.

In general, the single system, fully distributed, real time processing design point for Revenue Manager ensures that it will not be the bottleneck in any go-to-market business processes.

2.9.3.8 Immediate understanding of customer event

An event that terminates in Revenue Manager and gets rated, can be exported within seconds to a receiver. This means that the operator can follow usage, revenue and customer behavior in near real-time. It requires an analytics system at the back-end that can treat and present the data as fast as it is generated in Revenue Manager. (Little, 2015)

2.9.3.9 Configuration versus customization

Revenue Manager has implemented the support of configuration of flows and parameters that normally is done through customization. A new Diameter AVP setup can be on-boarded with a new configuration and mapping. Workflows can be created that include among others information retrieval, waiting for customer response, manager approval. Revenue Manager supports the unpredictability through flexibility.

Revenue Manager utilizes the concept of system-wide "variation points" to meet the ever-changing demands of the Networked Society. With variation points, business behavior and standard capabilities can be extended and modified through configuration and adaptation in a service creation-like environment, instead of using lengthy implementation of Product Customizations. Business Logic and Business Entities needs to be flexible. Nobody knows what the next service or device is going to be so it's important that business logic can be modified in run-time and business entities can be extended in run-time. (Newman, Yee, 2017)

2.9.3.10 Rating

Revenue Manager's charging application serves as a big data rules engine. The Rating capabilities is based on the billing account, which can be used as pre-paid or post-paid account. The accounts can be setup to consume money, time, bytes and events. To manage accumulation of usage, a counter is used. There is no practical limits on the number of accounts and counters that can be setup per consumer.

Rating supports the following functions in rating: standard rating, thresholds, periodic actions, personalization, promotions, credit limit, product one-time charges, tiered recurring charges and pro-ration and apportioning. (Smith,2016)

In Revenue Manager the rating engine is independent of the payment form. All rating is done for the triggered or event based information on the subscribers account. The usage is deducted from an online account or added to the account for a later bill. The usage for a specific customer is calculated as soon as the events are terminated in Revenue Manager. A user can have a pre-paid account for certain services and post-paid for other services. The setup is done on per customer basis in the service setup.

The setup gives the operator total flexibility in payment forms where a user can e.g. can have a standard monthly fee for a package including Voice, SMS and Data and top-up for usage above the standard package. There is no need of operational setup for a customer that wishes to move between different payment forms. (Bushaus,2014)

2.9.3.11 Architectures of revenue manager

In current Business Support Systems, the final operator system is built up by different components with different individual requirements, process and database needs. The total system fulfills the operator needs, but maybe not in the most efficient way. Different databases contain the same fields and different information due to failed updates and failed processes. The systems are built on a number of disjoint products with different integrations and setup. (Newman, Yee, 2017)

To integrate a new classical system, requires System Integration and Customizations. This is a continuous effort where a large amount of integration is done initially, and during the life-cycle of a system, there will be additional integrations and customizations. This slows the business efficiency in regard to customer centricity, optimization and time to market.

Figure 7.1: As-is Achitecture
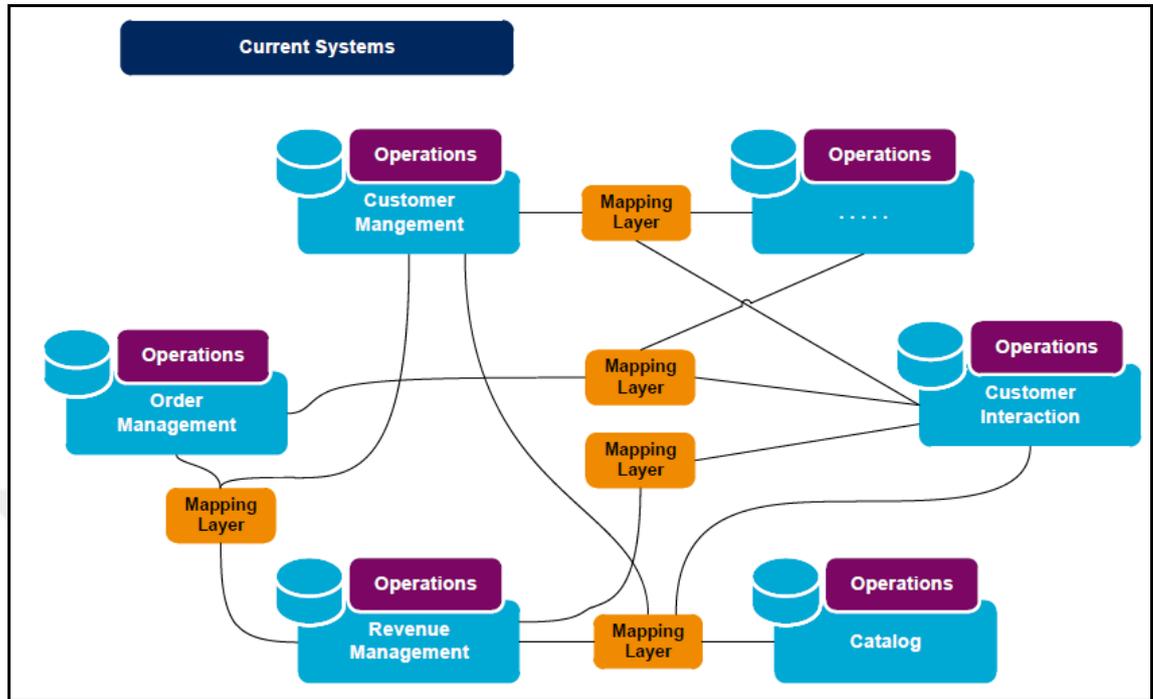
Revenue Manager has been designed from the beginning to support multi-sided businesses and with the Enterprise Architecture in mind, which means clear separation between the different TMF layers, Business, Application, Information and Technology. To minimize the operational effort, the system supports standard REST APIs as integration points and it has a Common Information Layer, where all data resides.

Revenue Manager is an all-IP convergent charging and billing offering that has been designed, from the outset, for the specific business needs of the Network Society and digital business transformation.

It represents an evolution of OSS/BSS portfolio design approach that all future OSS/BSS offerings will follow. Its state-of-the-art, metadata-driven technology enables the most advanced levels of flexibility in a real-time, critical telecom environment. This ensures extreme efficiency and the lowest possible cost of operations, enabling profitable monetization of new digital services. (Smith,2016)

Revenue Manager comprises separate layers to segregate its main attributes, therefore

eliminating the gap between business and technology.

Figure 7.2: Revenue Manager - Enterprise Architecture
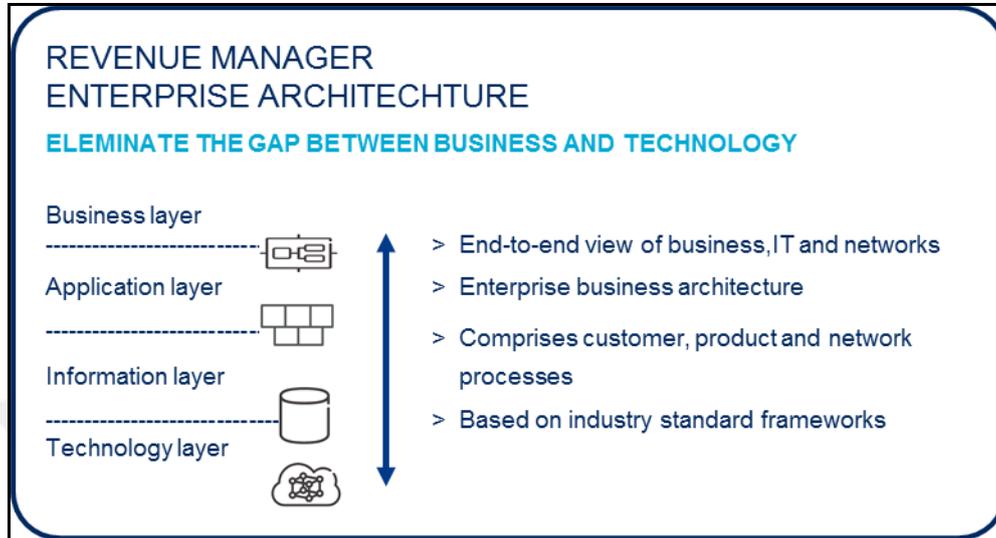
Source: Smith, 2016

Aside from providing outstanding support for full convergence in all of its forms – from rating convergence, market convergence, customer convergence, service convergence, payment convergence and device convergence – Revenue Manager also equips operators with the tools that enables them to achieve, cost efficiently, the flexibility and speed necessary to capture the value of (and monetize) the Networked Society and new digital business models. (Ericsson Mobility Report, 2015)

Specifically, operators benefit from a single system, with a single point of configuration that manages their entire business operation - customer management, product management and revenue management, for all of its business lines and customers.

Revenue Manager provides powerful monetization capabilities, the ability to support new types of partner-based business models as well maximizing the value from established consumer and enterprise segments. Crucially it also drives process efficiency enabling operators to get to market fast. (Reilly,2015)

Utilizing, and exposing a common information model, the Ericsson Revenue Manager platform incorporates an enterprise product catalog enabling true end-to-end business

support. It also provides extensive pre-configured process support reducing systems integration time and cost.

Revenue Manager is built on the following pillars: (Grant, Meadows, 2016)

a. Real-Time: All information presented to an operator or an end-user needs to be relevant and up to date. Revenue Manager operates always on real-time data.

b. Configurable: Business Logic and Business Entities needs to be flexible. Nobody knows what the next service or device is going to be so it's important that business logic can be modified in run-time and business entities can be extended in run-time.

c. Open & Modular: It's important to understand that Revenue Manager needs to work in a grander context and will be used in a different context almost at each installation. As such it needs to be both modular (not to bring with it unnecessary modules that would need O&M without bringing any business value) and it needs to be open to be able to integrate with other IT or Telecom structures. Revenue Manager uses TM Forum Frameworx, e.g. SID information model. (Grant, Meadows, 2016)

d. Automated: Many of the tasks that today are done manual (like scaling of applications) needs to be automated in the future. With the digitalization of the world, a lot more services and products will be offered to not only humans but also fleets of machines (IoT). With the volumes going up and the profits per volume unit going down the efficiency becomes the enabler for the business. (Grant, Meadows, 2016)

e. Scalable: With the digitalization and the networked society, any Revenue Management system needs to scale on connections and transactions rather than subscribers. There will not be that many more subscribers in the networks but the quantity of devices that will be used will increase as well as the traffic. This is how a future Revenue Management system needs to scale in an efficient manner.

Figure 7.3: Revenue Manager Pillars
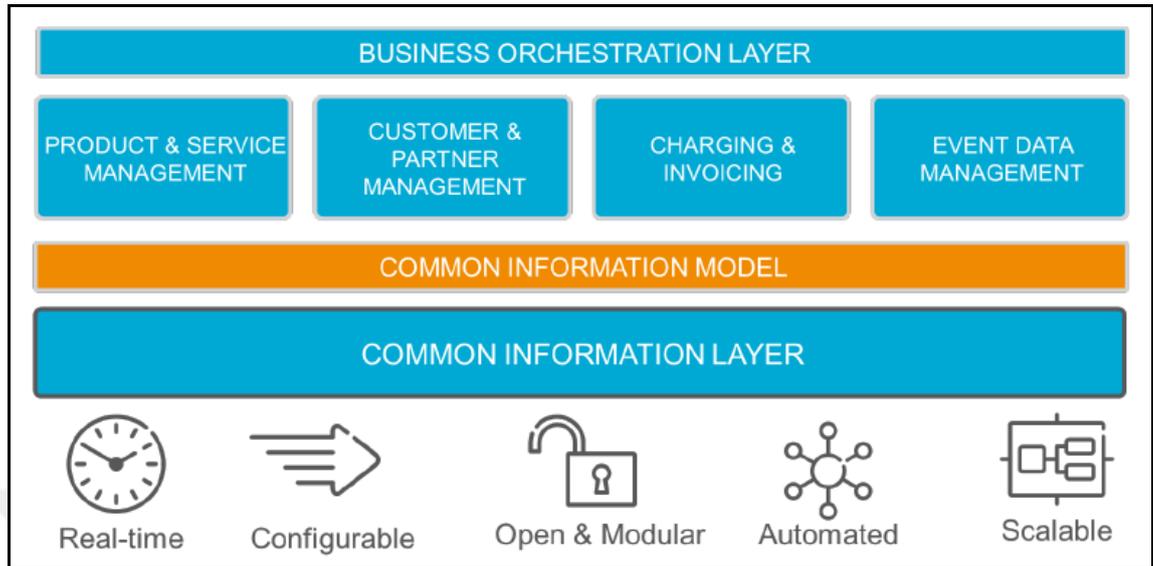
Source: Ericsson, 2015

Revenue Manager uses a modular architecture with self-contained application components, each designed to perform specific tasks adhering to clear separation of concerns, and according to delegated responsibilities. (Ericsson Mobility Report, 2015)

All processing is driven from configurable business data so that nothing is hard coded into any components (i.e. a Meta data driven architecture). This design delivers a fully converged system that will cater to any type of account management and payment, any type of business model, and any service types across fixed, mobile, OTT, or externally defined services.

The architecture is based on the principle of a central product catalog that manages the processing rules using a common information model that is industry accepted and aligned with TMF standards.

This common information model is easily extended offering the flexibility needed to quickly adjust business specifications to fit new market needs. There is a high level of configurability with variation points that allow easy adaptation to new service contexts and APIs, all from a single point of configuration. Whilst it handles the traditional telecom market it is designed to allow operators to quickly implement plans for expansion into new market areas and industry verticals. (Ericsson Consumer Lab, 2016)

Revenue Manager is also specifically designed to be cloud-enabled and maintains operational KPI parameters regarding internal status, such as traffic conditions, that can be used in virtualized or cloud environments to modify demands for virtual resources. This dynamic scale in/out elasticity produces robust and efficient operations even where traffic loads shift beyond normal operating conditions, thus delivering optimal TCO performance. (Ericsson Consumer Lab, 2016)

Figure 7.4: RM Architecture Overview
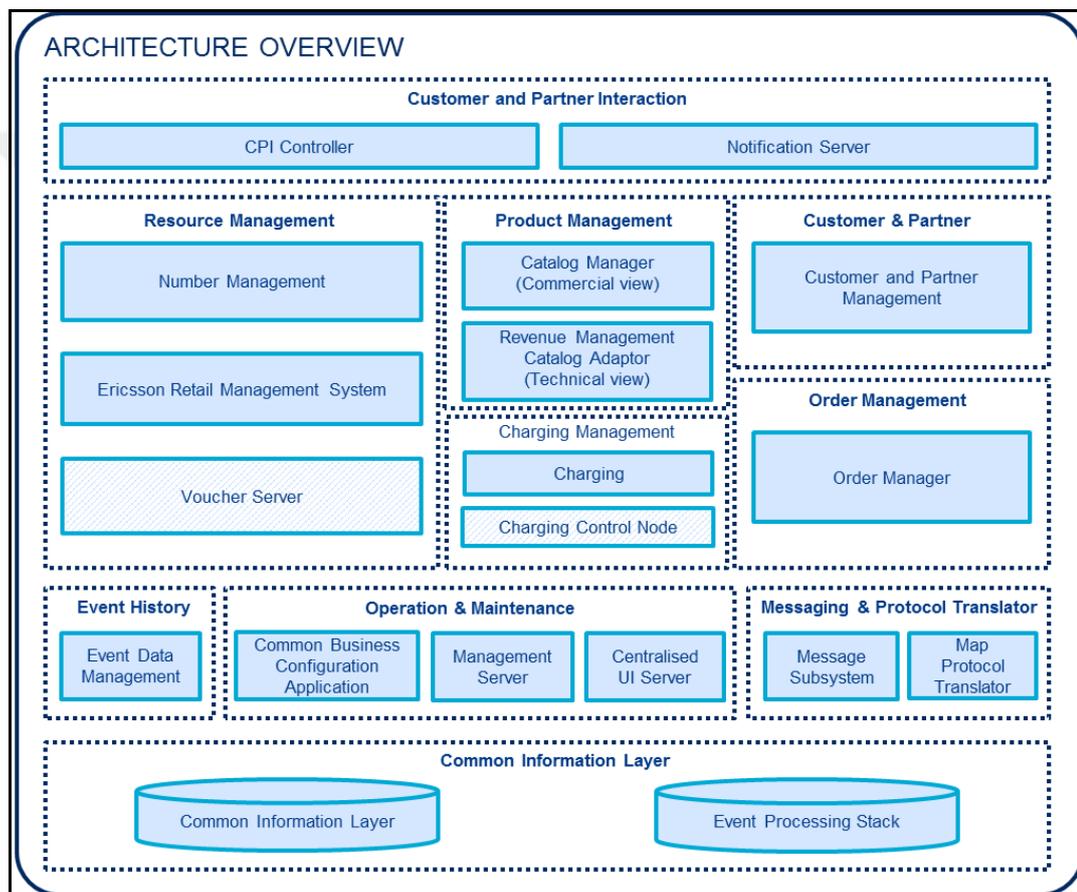
Source: Ericsson, 2016

Revenue Manager Platform makes IT a business enabler that helps operators cost-efficiently differentiate with the experience they offer their customers and realize innovation fast.

Usability has also been a dominant design consideration for the Revenue Manager platform. All user interfaces can be configured according to user role and comprise clear, intuitive and unambiguous graphical elements that support task-driven workflows,

all with minimal mouse clicks. (Ericsson Mobility Report, 2015)

2.9.4 Key Modules Of Revenue Manager

Revenue Manager is a completely modernized design that presents itself as a single system of distributed application components. Application components may be configured to execute in one or more datacenters based on the operator's datacenter cloud strategy. (Grant, Meadows, 2016)

2.9.4.1 Revenue manager catalog

The catalog manages the specifications for products, services and resources. It stores the rules and prices for Product Offers, such as rules of an Offer for a customer type.

2.9.4.2 Customer&partner management (Cpm)

CPM maintains customer and partner data in a consistent way for all applications. It controls lifecycle for customer contract and products within the system. CPM owns the installed base, i.e. customer, contracts and instantiated products.

2.9.4.3 Charging (Cha)

CHA handles all Rating, Balance Management, Reservation & Charging, Experience controls and network interface controls. It handles single point of rating for all (online, offline, re-rating, late arrivals, retail consumers and partners).

2.9.4.4 Event data management (Edm)

EDM manages history events in a big data environment. Reporting is also done by EDM. Aggregation for e.g. analytics and invoicing is also handled by EDM.

2.9.4.5 Invoicing (Inv)

Invoice creation, invoicing rules, taxation, G/L determination, bill run scheduling are responsibility of Invoicing.

2.9.4.6 Collections (Col)

Col allows the implementation of collection workflow, including charges for due invoices, dunning process and debt collection.

2.9.4.7 Notifications (Notif)

Notif provides the ability to send real-time alerts and notifications to end-user. Pushing out user information to customer about offerings, saving and spending limits is managed by Notif. Notif can also be used to notify/trigger other network elements.

2.9.4.8 Voucher management (Vs)

VS controls voucher usage, generation, distribution and state of vouchers. Voucher information is protected with encryption.

2.9.4.9 Finance (Fin)

FIN handles receivables, payments (ATM refills, bill payments) and interfaces to external financial systems (e.g. SAP). Taxation rules definition, G/L codes definition and currency conversion is done in FIN.

2.9.4.10 Self service (Sc)

SC is a rendering channel for balance enquiry, purchase and top-ups, through legacy channels like USSD, IVR and SMS.

2.9.4.11 Common business configuration (Coba)

COBA is used for centralized business rules configuration. COBA is the central application component taking care of the configuration of global business setup needed by multiple application components, e.g. currencies, languages, units of measurement etc.

2.9.4.12 Common information layer (Cil)

All applications use common information layer to access persistent data and is explained in following sections.

2.9.4.13 Revenue manager components

RM provides a large set of extendable unique functions, which can be arranged into the following areas. (Ericsson Consumer Lab, 2016)

Figure 8.1: Revenue Manager Detailed Architecture
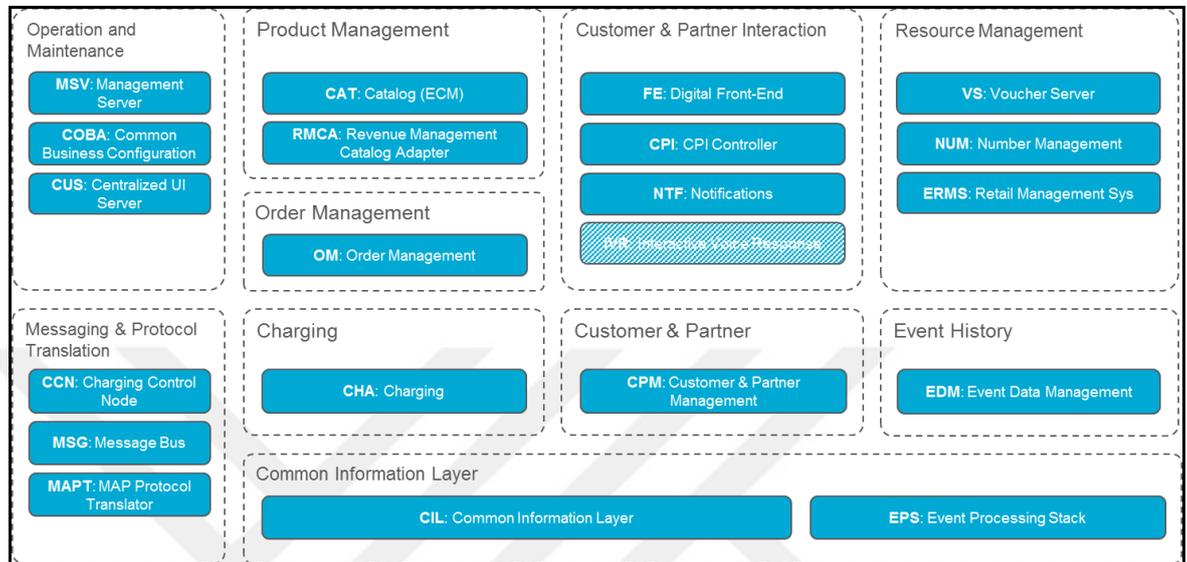
Source: Ericsson, 2016

An application component is a realization of one or several elements, e.g. functions, services, and interfaces, which address different functional aspects to be covered within a certain application area. Each application component has its own installation and deployment procedure, however centralized managed and automated by MSV.

2.9.4.14 Customer and partner management (Cpm)

Customer and Partner Management (CPM) maintain customer and partner data for all applications in one place and supply all information regarding those customers. It provides functionality and interfaces to create and maintain customers, provides an inventory of purchased products and services, and supports the creation of contracts to model business relations between the operator and its customers. CPM can trigger subscription life-cycle notifications. (Newman, Yee, 2017)

To each contract products can be assigned. In general, simple, and composite products exist which can be assigned, removed, or taken over. Resources, like MSISDNs and SIM cards and services can be created and assigned.

2.9.4.15 Charging (Cha)

Charging (CHA) provides rating and charging of online and offline consumption for prepaid and postpaid payment on both fixed and mobile networks. It translates incoming network data into service data and calculates charges and updates account balances accordingly. CHA is the execution engine for the business configuration created by CAT. (Parker,Alstyne,Choudary,2016)

CHA also triggers notifications to customers based on configured thresholds on billing accounts and products, for example when a data package has been completely used. For prepaid, hybrid and postpaid account payments CHA provides the functionality to refill account balances.

2.9.4.16 Catalog manager (Cm)

Catalog Manager (CM) provides a central runtime facility for cataloging an operator's product and service portfolio. CM can be extended to become an enterprise catalog that has the capability to integrates with one or more catalog management systems. It enables product teams to quickly create new products and services from reusable components. New products can be configured from new components contributed by service providers, or from existing product, service, and resource components. Similarly, new products can be configured using service management functions and services offered by third parties. (Newman, Yee, 2017)

CM is capable of modeling the end-to-end view of a product offering; from pricing through network policy, managing the creation, use, and retirement of all components, offers, products, services, and resources. It provides a single, consistent source of offerings, specifications, and underlying business rules that simplify product management and drive fulfillment, charging, and assurance. New offers can be configured without the need of domain-specific expertise, or IT involvement.

CM provides a common information model to create business models in the form of templates for product offers, price plans, rules, reference tables (look up tables), market segments, or business dates. These templates can be used by the business configuration personas to generate desired configurations in the catalog. These configurations are used

in the functions and feature layer. (Smith,2016)

2.9.4.17 Revenue manager catalog adapter (Rmca)

The Revenue Manager Catalog Adapter (RMCA) holds all specifications for products, services and resources in componentized form for easy assembly of new and custom services. (Parker,Alstyne,Choudary,2016)

It provides a single place for consistent product configuration, and lifecycle management with clear data ownership of products, services, and resources.

RMCA applies role based access allowing both technical and non-technical roles to work with the catalog.

High-level capabilities listed as below:

a. Versioning support for all specifications

b. Creation of Specifications for pricing logic and Prices

c. Creation of Policies and associated Schedule Definitions

d. Creation of Product Specifications (PS), Customer Facing Service Specifications (CFSS), Resource Facing Service Specifications (RFSS), Resource Specifications (RS)

e. Providing APIs for receiving the configuration of Product Offerings (PO) and Product Offer Prices (POP)

f. Validation of the Product Offer (PO) and Product Offer Price (POP) configuration in regard to rules required by Charging and Invoicing

g. Validation for the business configuration created for RM

h. Definitions of recurring options like recurring charge or recurring account reset

i. Reuse of products and definition because it is easy to reuse e.g. a Product Specification into many different offerings. It is useful to reuse e.g. rating rules

and also control from the product catalog which parameters that are possible or allowed to be personalized when the product later on will be used and instantiated.

j. RMCA Entity Read REST Interface provides the ability to read business configuration from RMCA.

2.9.4.18 Order management

Order Manager (OM) is a workflow management system designed specifically to orchestrate the order lifecycle by using the Orchestration Framework. OM inherits orders from an order capture system of a service provider and facilitates customer-specific order processing and work flows. The capabilities of OM include order decomposition, order fallout management, routing, status tracking, business rule validation, message mapping, jeopardy handling and notification, and automated workflow sequencing and control. (Smith,2016)

OM uses catalog definitions and rules. The OM application needs only the catalog client. The catalog client maintains its own cache of catalog definitions and uses a catalog server as the data source. With the deployment of OM, the service provider can successfully create an order to activate, deactivate or modify a contract in a customer install base. (Newman, Yee, 2017)

OM supports both commercial order management and service order management. While not all eTOM-defined processes under these two specifications are supported by OM out-of-the box work flows, OM can be configured to extend its support to these processes. OM supports order handling processes, such as:

a. Track, manage and report customer order handling

b. Issue, complete and close a customer order

2.9.4.19 Customer and partner interaction controller (Cpi)

Customer and Partner Interaction (CPI) is a layer of software that provides thin front-end applications with a central point of access to back-end applications. CPI leverages

the data and functions that are available in the back-end application stack by consolidating all business process logic and providing secure access to a common database. This architecture provides seamless integration between the back-end applications of RM and external front-end applications, which do not carry any business logic, but can trigger, through CPI, an array of back-end functions. (Parker,Alstyne,Choudary,2016)

CPI's main functionality is to provide a single and standardized interface towards RM to speed up and manage the Front-End applications' integration and interaction. It is a base for Omni-Channel functionality across different systems and users. Basically, the backend functions involved in this interaction are listed as:

    a. Customer Partner Management (CPM)

    b. CHA (Charging)

    c. RM Catalog Manager (ECM)

    d. NUM (Number Management)

    e. Inventory Management (ERMS)

    f. Order Manager (OM)

    g. Notification (NTF)

    h. COBA

Front End applications that can be supported:

    a. Customer Relations Management

    b. Point of Sales

    c. Self-Care

    d. Self-Service

CPI architecture is based on a business interaction framework which offers flexible

configuration options and the agility to easily change and adapt to different business needs. It consolidates business interactions by managing the flow of information for requests, responses, notifications and agreements between a service provider and a party. (Smith,2016)

2.9.4.20 Notification server (Ntf)

The Notification Server (NTF) transforms various notification events triggered by applications, such as Threshold crossed and Recharge success, into end user notifications. The transformation is based on configured customer notification preferences e.g., channels, languages, notified parties, schedule etc. for delivery to the respective Gateways. Notification Server supports notifications for Threshold Notifications, Refill Notifications, Promotions, Credit Limit, and Life Cycle events. The flexible event input mapping utilizes a rule engine combined with flexible templates with possibility to use keywords and optional conditional phrases.

2.9.4.21 Number management (Num)

Number Management (NUM) maintains the inventory of logical resources, including:

a. Supports atomic logical resources e.g. MSISDN

b. Supports operations to change the status of a resource

c. Maintains life cycle for logical resources

d. The Life cycle is a NUM entity

e. It will be loaded and maintained via RM/CPM Batch file interface into NUM

f. Sample Life cycle for MSISDN and IMSI will be provided

g. Life cycle could be modified according to operator needs

h. Supports reference to physical resource

A SIM card is a resource with physical and logical resource parts The logical part is the IMSI which is paired during SIM purchase process by external

system together with a paired ICC-ID (physical resource)

2.9.4.22 Retail management system (Rms)

Retail Management System (RMS) provides a single point solution for Sales Organizations (Dealer, Shop, Franchise, Warehouse), performing the inventory transactions, payment, sales functionality. (Smith,2016)

With RMS, operators can take control of their retail chain and deliver a uniform user experience across the retail channel. RMS supports functionality in the following domains:

a. Inventory Management

b. Product Management

c. Payment & Money Transfers

2.9.4.23 Event data management (Edm)

Event Management (EDM) function maintains the inventory of all the History Events that occurs in the RM.

EDM handles huge volume of Events that must be filtered, processed, correlated, stored, and exposed for the application which must do business logic processing on the historical information occurred in RM.

EDM is a Redundant, Highly Available, and Fault Tolerant System and support varied variety of input and output access

EDM presents historical information towards e.g. CSR and self-care which is very vital for solving customer issues and insights on the data which is essential for users who needs fresh business intelligence such as Product and Marketing Managers.

High-level capabilities listed as below:

a. Consume Events from multiple sources and formats

b. History available in near real-time, important for CSR and self-care

c. Present business insights data available for further processing i.e. act as an analytics enabler

d. Event Data Management (EDM) is a component that maintains the inventory of all the History Events that occur in RM.

2.9.4.24 Common information layer (Cil)

The Common Information Layer (CIL) of RM secures data persistency. All applications are fed real-time data in an efficient and controlled way, with no unnecessary partitioning, duplication, or uncontrolled distribution of data. The result is the ability to scale according to business needs in a secure but flexible manner. (Newman, Yee, 2017)

CIL is the distributed database used in the RM, and provides storage for common data that can be shared between components, for instance, customer information, product specifications, contracts and so on. The data is stored as key-value pairs where the values are in binary format, so called Binary Large Objects (BLOBs).

2.9.4.25 Management server (Msv)

MSV is the single interface for the RM system against a Network Operations Centre (NOC).

Management Server (MSV) provides centralized, harmonized operations and maintenance, enabling engineers to effectively manage a large scale deployment. The Administration variant (MSV-ADM) is the single point of entry for the Administration Portal GUI and Administration CLI for operations.

Every component which needs configuration is responsible to provide a configuration application which can be plugged into the Administration Portal.

2.9.4.26 Centralized ui server (Cus)

The Central UI layer host and orchestrate UI implementations of RM user journeys in a unified way to offer 'One system view' to users. Only One login for all Personas(SSO)

and provides personalized dashboards with customizable views to its users. Also helps in flow driven e2e business configuration and operations along with Omni Channel support. (Smith,2016)

2.9.4.27 Common business configuration application (Coba)

Common Business Configuration Application (COBA) provides the functionality to maintain common business configuration entities among different components.

Business need to support and handle various types of configurations. Business configuration sets the business behavior of systems components and software solutions, like work flows or product setup, that a service provider uses to run its business operations and support its customers, whereas system configuration covers system resources like IP addresses, memory settings and file systems. (Parker,Alstyne,Choudary,2016)

2.9.4.28 Messaging subsystem (Msg)

Messaging Subsystem (MSG) is a messaging system used for RM internal messages between the services. It uses Apache Active MQ features to send and receive messages.

2.9.5 Comparison of revenue management systems

The integrated revenue and customer management (IRCM) market consists of communications service providers (CSPs) with revenue and customer management business processes critical to digital transformation.

IRCM provides a complicated solution for a specific CSP, regardless of product, service, customer type or payment method. It includes a range of integrated customer and network-facing solutions that support customer acquisition, retention, and monetization. (Gartner,2017)

IRCM solutions generally provide solutions for all of the relevant modules including Billing, customer service, rating, pricing, pricing, partner relationship management, policy management, mediation, self service, analytics and more. Companies that offer these solutions in an integrated manner are comparable.

Compared basic functions include: (Gartner,2017)

    a. Analytics and reporting

    b. Balance management

    c. Billing and account management

    d. Customer self-maintenance

    e. Customer / service product life cycle management

    f. Dynamic discount

    g. Multi-channel support

    h. Partner relationship management

    i. Policy management (policy and charge rules function [PCRF])

    j. Product catalogue

    k. Real-time rating or charge

IRCM combines these functions into a single solution and is a process that simplifies and speeds up the cash flow process.

According to this, Gartner compares the IRCM systems of companies that provide IRCM solutions to CSP companies all over the world.

You can find Gartner's Magic Quadrant for Integrated Revenue and Customer Management for CSPs as below Figure 9.1;

Figure 9.1: Quadrant for Integrated Revenue and Customer Management for CSPs

More than 200 vendors worldwide offer various IRCM systems for CSPs. Most of these vendors are small in terms of revenue, they only provide point solutions or have a small geographical footprint.

According to the graph, Gartner collected these providers under 4 main headings; (Gartner,2017)

2.9.5.1 Leaders

Leaders are vendors that will be on the front lines as the standard for IRCM solutions for large-scale CSPs worldwide. These companies are performing profitably, increasing their incomes and having a serious presence in all major markets.

2.9.5.2 Challengers

Challengers perform well in selected specific markets or in private sectors. They have high capacity and performance in terms of sales and productivity.

2.9.5.3 Visionaries

Visionaries have efficient functional or technical IRCM skills, but their capabilities are limited geographically or financially. They have the ability to predict market transformation, such as increased analytical functionality or integration.

2.9.5.4 Niche actors

Niche players are still worth evaluating in spite of their existing capacities. When dividing the market is considered, buyers should think that any listing on this chart is a good indication of the reliability of a supplier. Niche players continue to operate within a limited geographical entity. (Gartner,2017)

3. METHODOLOGY

In the previous chapters, the concept of Digital Transformation, common modules of BSS applications and special modules of telecom-based Digital applications are mentioned. Finally, a conceptual model was established according to the findings in the previously mentioned sections.

This section of the study will include research methods including sampling design, measurement tools and hypothesis. This chapter will examine the research about the study.

In this section, the purpose of the research will first be mentioned. Then Data Collection, Sampling and Measurement will be examined in detail. Finally, the findings related to analysis and research will be mentioned.

Purpose of this study is to measure success factors of Digital Transformation of BSS applications. To measure them, literature was reviewed in above parts of the study. According to the findings in the literature review, a conceptual Digital Transformation BSS applications model was established for telecommunication industry. The research will be analyzed to this conceptual model. On the other hand, the research was developed to address the following issues;

    a. To measure the success factors of Digital Transformation of BSS Applications in telecommunication industry.

    b. Learn the role of each factor in the success of Digital Transformation of BSS Applications in telecommunication industry.

    c. Determine whether the success of the Digital Transformation Operational Process is connected.

    d. Learn the role of the Workflow Management Module Report Process The success of Digital Transformations

    e. Determine whether the success of the Digital Transformation Learning Process is

connected Performance of technical modules or not.

3.1. SAMPLE DESIGN

The study was applied to people working in different departments of telecom companies in Turkey. There were no other specific criteria for those who could participate in this survey.

The questionnaire was shared online via email and social media channels; We shared the data with all the telecom employees who are connected via LinkedIn. In Turkey, Turk Telekom, Turkcell and Vodafone applied to employees.

A total of 83 questionnaires were collected in 3 weeks. The return rate of the questionnaire is around 39.29. This is due to the fact that white-collar IT workers in telecom companies form a very limited cluster and that too many people do not work in this area.

In this study, convenient sampling was used.

3.2. RESEARCH DESIGN

This work is an empirical and systematic study. A measurable research method was used.

3.3. MEASUREMENT OF THE STUDY

In the research, a successful Digital Transformation of BSS applications model for the telecom sector was measured. The scale used in the questionnaire was adopted from a under digital tranformation Telecom Companies scale.

An online survey was used to collect data to measure this. The survey was created and hosted on the Google Forms Application.

Nominal and interval scales were used in the questionnaire. Demographic and other grouping variables used nominal scale. In addition, a five-level interval scale ranging from "Very Important" (5) to "Not Important" (1) was used to measure perception,

attitudes and intentions in the success factors of Digital Transformation of BSS Applications in telecommunication industry.

3.4. HYPOTHESIS

This study has several major hypotheses.

H1: "Digital Transformation of BSS Main Success" has a significant & positive impact on "Digital Transformation of BSS Workflow Success" in telecommunication industry.

H2: "Digital Transformation of BSS Main Success" has a significant & positive impact on "Digital Transformation of BSS Operational Success" in telecommunication industry.

H3: "Digital Transformation of BSS Main Success" has a significant & positive impact on "Digital Transformation of BSS Report Success" in telecommunication industry.

3.5. MEASUREMENT INSTRUMENTS

In this study, factors necessary for successful digital transformation in telecommunication sector are measured. A questionnaire was used as a measurement tool. The questionnaire consists of two parts.

Nominal and interval scales were used in the questionnaire. Demographic and other grouping variables used nominal scale. In addition, a five-level interval scale ranging from "Very Important" (5) to "Not Important" (1) was used to measure perception, attitudes and intentions in the success factors of Digital Transformation of BSS Applications in telecommunication industry.

The questionnaire used in this study was formed by sampling from the master thesis "Successful CRM Application Model in Telecom Sector" written by Özer KARAGÖL in 2007. The questionnaire created in the related thesis was consultant with Prof. Dr. Sule Isınsu who is in charge of the Marmara University Faculty of Social Sciences. There were 46 questions in the original questionnaire. The first four were demographic questions in which the respondents were asked to provide details about their CRM application-based demographic features. Others were all about to measure the success

factors of telecom-based CRM applications. These questions are answered to the sample of 102 employees of telecom companies. In that study Cronbach's Alpha is taken for reliability of measurement and the value was 0,818.

In this study there are 50 questions in the questionnaire. The first questions of the survey were asked to provide detailed information about the Digital Transformation of BSS application-based demographic features of the survey participants. Others were about to measure the success factors of Digital Transformation of BSS Applications in telecommunication industry. These questions were grouped according to the relevant modules as shown in Table 2 of the questionnaire.

Table 3.1: Groups in Questionnaire

MEASUREMENT OF SUCCESS FACTORS	GROUP NO	QUESTIONS
BSS APPLICATIONS	5	BETWEEN 9 AND 19
TECHNICAL MODULES	6	BETWEEN 19 AND 29
WORKFLOW MODULES	7	BETWEEN 30 AND 36
SALES MODULES	8	BETWEEN 37 AND 44
REPORT MODULES	9	BETWEEN 45 AND 50

Judicial sampling was used in the research. Judicial sampling is an unlikely sampling method in which a researcher chooses a sample based on an appropriate characteristic of sample members.

The data are gathered from telecom companies' technical and sales staff in different departments.

The e-mail and the author were taken through the colleagues in the relevant telecom companies in the network. The data was first imported from excel with the help of the google forms site hosting the survey. After that, redundant and dirty data were removed.

Finally, the data was made analyzable. The resulting data package was made available for processing in terms of SPSS (Statistical Package for Social Sciences). Sample recipes and frequencies of the demographics of the participants are given in the following parts.

4. RESEARCH FINDINGS

This section of the work emphasizes the research findings of the empirical study. The Statistical Package for Social Sciences (SPSS) was used to analyze collected data. Findings from descriptive and factor analyzes are briefly explained.

4.1. RESPONDENT'S PROFILE

This section shows the demographic profile of participants in terms of frequency and definitions. Profile frequency and descriptive analyzes are made to find the participants. Table 5 below shows the demographic profile and descriptive statistics of the demographic variables.

50 questions were prepared to measure these dimensions. These questions are answered with the sample of 83 employees of telecommunication companies.

Table 4.1: Demographic Questions Analyze

Variables	Descriptive Statistics	Percentage %	Mean	Standard Deviation	Median
Gender	83	100%			
Male	58	69,9%			
Female	25	30,1%			
Age	83	100%	1,542	,630	1
21-30	44	53%			
31-40	33	39,8%			
41-50	6	7,2%			

Education	83	100%	3,361	,531	3
University	55	66,3%			
Master	26	31,3%			
Phd and above	2	2,4%			
Departmant	83	100%	1,963	,187	2
Sales&Marketing	3	3,6%			
IT	80	96,4%			
WorkExperience	83	100%	1,951	1,034	2
1-5 year	35	42,2%			
5-10 year	26	31,3%			
10-15 year	15	18,1%			
15-20 year	5	6,0%			
20+ year	2	2,4%			
BSS Company	83	100%	2,963	1,098	3
In-House	11	13,3%			
Oracle	11	13,3%			
Ericsson	38	45,8%			
Etiya	16	19,3%			
Others	7	8,4%			
BSS Experience	83	100%	4,120	1,262	5

Less than 1 year	4	4,8%			
1-2 year	8	9,6%			
2-3 year	13	15,7%			
3-4 year	7	8,4%			
4 year and above	51	61,4%			
BSS Learning	83	100%	1,494	,503	1
Yes	42	50,6%			
No	41	49,4%			

As seen in Table 4.1 above, demographic questions have been analyzed. Descriptive statistical analysis represents the sample of the questionnaire shared in the Appendix of this study.

The total number of participants is 83. 58 of the respondents were men, 25 of the respondents were female. The participation percentages of both genders are 69.9 percent and 30.1 percent, respectively.

66.3 percent of the group is graduated from university, 31.3 percent has master degree graduate, 2.4 percent are doctorate and above.

The first eight questions of the questionnaire were taken to determine the demographics of the survey participants. The remaining questions were about measuring the success factors of the Digital Transformation of BSS Applications in the telecommunication industry. These questions were divided into 5 groups according to the related modules of the questionnaire. According to the grouping, 5 new variables in which mean median values of 5 main groups are taken are defined.

Table 4.2: Groups of Questionare and Variable Matches

GROUPS OF QUESTIONNAIRE	VARIABLE NAME
BSS APPLICATIONS	bss_ortalama
TECHNICAL MODULES	teknik_ortalama
WORKFLOW MODULES	workflow_ortalama
SALES MODULES	satis_ortalama
REPORT MODULES	rapor_ortalama

Each variable calculated with Mean function which include all question in group by SPSS.

According to this, some ANOVA and T test calculations are as follows.

Table 4.3: T - Test analysis between bss education and average bss success factors

	Education	N	Mean	Std. Deviation	Levene's Test for Equality of Variances	
bss_ortalama	Yes	42	4,0667	,47198	F	Sig.
	No	41	4,2146	,63268	,684	,411
teknik_ortalama	Yes	42	4,0649	,50886	F	Sig.
	No	41	4,1951	,64236	,768	,383
workflow_ortalama	Yes	42	3,9354	,61845	F	Sig.
	No	41	3,9443	,81433	2,107	,151
satis_ortalama	Yes	42	4,1190	,62283	F	Sig.
	No	41	4,2073	,85129	3,185	,078

rapor_ortalama	Yes	42	3,9444	,67038	F	Sig.
	No	41	3,9553	,71494	,041	,84

According to the t-test, it is seen that there is not much difference in the BSS achievement factors of BSS training in general. According to the table, it is seen that grouping is a significant difference compared to bss training. (Between F and .sig)

This difference is the sigvalue in Levene's test and is higher than 0.05, so the variance equation tells us the results of the t-Test analysis between the teeth.

There is no difference in terms of successful bss transformation expressions among groups of BSS training.

Table 4.4: ANOVA analysis between work experience and average bss success factors

	Experience	N	Mean	F	.Sig
bss_ortalama	1-5 year	35	4,1286		
	5-10 year	26	4,1038		
	10-15 year	15	4,2467		
	15-20 year	5	4,2200		
	20+	2	3,8000		
TOTAL		83	1	,367	,832

According to the analysis, it is seen that there is not much difference in the BSS success factors and work experience. A one-way ANOVA test was conducted to determine whether there was a meaningful difference in the bss success factors among the work

experience groups. The value of .sig was found, 887 which is larger than 0.05 was found. ANOVA analysis reveals that there is no significant difference in terms of importance of bss success factors when considered in work experience groups.

Table 4.5: ANOVA analysis between education and average bss success factors

	Education	N	Mean	F	.Sig
bss_ortalama	Universty	55	4,2200		
	Master	26	3,9538		
	Phd+	2	4,3500		
TOTAL		83	1	2,212	,116

According to the analysis, it is seen that there is not much difference in the BSS success factors and education. A one-way ANOVA test was conducted to determine whether there was a meaningful difference in the bss success factors among the education groups. The value of .sig was found, 116 which is larger than 0.05 was found. ANOVA analysis reveals that there is no significant difference in terms of importance of bss success factors when considered in education groups.

Table 4.6: Correlations analysis between average bss success variables

	bss_ortalama	teknik_ortalama	workflow_ortalama	satis_ortalama	rapor_ortalama
bss_ortalama	1	,814**	,756**	,720**	,751**
teknik_ortalama	,814**	1	,755**	,729**	,762**
workflow_ortalama	,756**	,755**	1	,718**	,758**

| satis_ortalama | ,720** | ,729** | ,718** | 1 | ,729** |
| rapor_ortalama | ,751** | ,762** | ,758** | ,729** | 1 |

**.Correlation is significant at the 0.01 level (2-tailed).

The correlation between the mean variables of the BSS success factors according to the analysis was examined.

The bivariate correlation test was used to determine whether there was a significant trend to affect each other among BSS achievement factors. .sig value was found and this value was found to be greater than 0.05 in all correlation results. Relations between them are very high and positive. That is, as one of the variables increases, the others seem to increase.

4.2. RELIABILITY OF MEASUREMENT INSTRUMENTS

The reliability method is to look at the intrinsic integrity of variables and ensure that the data presented are consistent among themselves when analyzed. In order to evaluate this, "Cronbach's Alpha" was taken.

Cronbach's Alpha shows that the very specific items or variables of the scale are calculating the same hypothesis and are thus linked to each other. The generally accepted minimum limit for Cronbach Alpha is 0.70 (Hair et al., 2006).

Before the analysis is started, reliability of the scale is calculated even though it is used by other academicians, teachers, academicians, students.

It is calculated in order to create unique data sets that can provide the findings of reliability test of the scale and different reliability results.

For this reason, we have measured the Cronbach's scale alpha value so that we can verify the reliability of the scale. Table shows the reliability of the BSS Success Factor Scale.

Table 4.7: Reliability Statistics

Reliability Statistics		
Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
0,967	0,967	42

Table shows that, BSS success measurement scale Cronbach's Alpha value is ,967 which is higher than 0,70. This means that items of each measurement scales are reliable and related with each other.

4.3. FACTOR ANALYSIS

Factor analysis is a technique involving different variables used to investigate interactions between them and difficulties to clear their mutual main directions. It is used when there are factors other than the proposed theories or hypotheses.

Multiple dimensions and techniques are applied to track data collection, which will be defined as grouped factors. Although factor analysis is consistent with the Pearson correlation coefficient analysis between variables, it is predicted as a rational method when compared with statistics. The analysis is based on the likelihood of similar mainstreams causing different interpretations. The deposition of elements is a qualitative judgment that researchers do not understand, while generating considerable evidence of superficial interactions between discrete facts. Furthermore, the analysis does not define the set of factors behind the information, but it can still reveal certain groups of possible variables.

Whether the factor analysis is correct or not is calculated before the factor analysis of the sampling adequacy measure so that the received information can be analyzed more accurately. Keizer-Meyer-Olkin (KMO) and Bartlett's sphericity test are methods that

can specify or verify smoothness. KMO shows that the data presented in the study is a uniform collection of variables with correlations. The minimum tolerance level for the KMO test was defined as 0.50 in the literature (Hair 2006). In addition, the Bartlett test shows an arithmetic result marking significant correlations between at least one of the variables (Hair 2006).

Table 4.8: KMO and Bartlett's Test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		0,861
Bartlett's Test of Sphericity	Approx. Chi-Square	1865,504
	df	528
	Sig.	0,000

A meaningful data evaluation was made according to the result of KMO. As a result of the KMO, 0, 861values were taken, which means that this value is greater than 0.6, indicating a data set suitable for factor analysis.

According to the results of the factor analysis, there are 7 factors of the data set, which corresponds to 69.2% of our data set.

Each group of questions was analyzed collectively. The questions with sub-factor loading values were excluded from the analysis results. Following a series of iterations, the result appears on the tables as follows.

Table 4.9: Factor Analysis

Factor 1	BSS Main Success	Variance=14,205	%=43	Item Loadings

	Reporting bugs in reports			,829
	Reporting delays in flows			,811
	Better communication between technical and sales departments			,651
	Direction in screens			,565
	Creating new strategies			,382
Factor 2	**BSS Operational Success**	**Variance=1,752**	**%=5,3**	**Item Loadings**
	No multi-recording			,785
	Reaching customer tickets immediately			,679
	Solve to data share problem with other departmants			,627
	Able to Add dynamic data in customer and contact			,497
	Automatic warning mechanism			,301
Factor 3	**BSS Technical Success**	**Variance=1,651**	**%=5**	**Item Loadings**
	Putting services into operation quickly			,793
	Fast modules			,744
	Managing services easily			,554

	Make jobs easy			,509
	Modules should have integration with external systems			,402
Factor 4	**BSS Sales Success**	**Variance=1,472**	**%=4,4**	**Item Loadings**
	Supply better services for customers			,697
	User-friendly screens			,694
	Fast modules			,618
Factor 5	**BSS Performance Success**	**Variance=1,331**	**%=4**	**Item Loadings**
	High performance			,851
	Get customer data quickly			,673
	Get customer data easy			,630
	Modules should have enough customer information			,466
Factor 6	**BSS Report Success**	**Variance=1,263**	**%=3,8**	**Item Loadings**
	Measuring performance of company			,740
	Measuring performance of employees			,697
	Putting services into			,584

	operation automatically	92		
	Estimation reports			,551
	Measuring performance of services			,508
	Managing services easily			,461
Factor 7	**BSS Workflow Success**	**Variance=1,172**	**%=3,5**	**Item Loadings**
	Defining documents in flows			,557
	Automatic warning mechanism			,551
	Documents must be filled by the flows			,430
	Training for the modules			,415
	Reaching service documents easily			,399

ANOVA and T-Test for Factor Variables

Table 4.10: T - Test analysis between bss education and factors

	Education	N	Mean	Std. Deviation	Levene's Test for Equality of Variances	
Factor 1	Yes	42	3,8571	0,75777	F	Sig.

92

	No	41	3,9463	0,86258	0,937	0,336
Factor 2	Yes	42	3,9667	0,55860	F	Sig.
	No	41	4,2146	0,70624	1,982	0,163
Factor 3	Yes	42	4,2286	0,56667	F	Sig.
	No	41	4,3366	0,64721	0,014	0,905
Factor 4	Yes	42	4,2778	0,57930	F	Sig.
	No	41	4,2195	0,86477	6,319	0,014
Factor 5	Yes	42	4,1488	0,52108	F	Sig.
	No	41	4,2622	0,76434	2,491	0,118
Factor 6	Yes	42	3,9484	0,67924	F	Sig.
	No	41	4,0122	0,71724	0,033	0,856
Factor 7	Yes	42	4,0048	0,59179	F	Sig.
	No	41	3,9707	0,80568	4,224	0,043

According to the t-test, it is seen that there is not much difference in the BSS achievement factors of BSS training in general. According to the table, it is seen that grouping is a significant difference compared to bss training. (Between F and .sig)

This difference is the sigvalue in Levene's test and is higher than 0.05, so the variance equation tells us the results of the t-Test analysis between the teeth. There is no difference in terms of successful bss transformation factors of BSS training.

Table 4.11: ANOVA analysis between work experience and Factor 1-BSS Main Success factors

	Experience	N	Mean	F	.Sig
Factor 1-BSS Main Success	1-5 year	35	3,9200		
	5-10 year	26	3,7769		
	10-15 year	15	4,0400		
	15-20 year	5	4,0000		
	20+	2	3,9000		
TOTAL		83	1	,278	,891

According to the analysis, it is seen that there is not much difference in the Factor 1 and work experience. A one-way ANOVA test was conducted to determine whether there was a meaningful difference in the bss success factors among the work experience groups. The value of .sig was found, 891 which is larger than 0.05 was found. ANOVA analysis reveals that there is no significant difference in terms of importance of Factor 1-BSS Main Success when considered in work experience groups.

Table 4.12: ANOVA analysis between education and average bss success factors

	Education	N	Mean	F	.Sig
Factor 1-BSS Main Success	Universty	55	3,9745		
	Master	26	3,7308		
	Phd+	2	4,1000		
TOTAL		83	1	,864	,425

According to the analysis, it is seen that there is not much difference in the Factor 1-BSS Main Success and education. A one-way ANOVA test was conducted to determine whether there was a meaningful difference in the Factor 1-BSS Main Success among the education groups. The value of .sig was found ,425 which is larger than 0.05 was found. ANOVA analysis reveals that there is no significant difference in terms of importance of Factor 1-BSS Main Success when considered in education groups.

Table 4.13: Correlations analysis between Factor1-7

	main_success	operational_success	technical_success	sales_success	performance_success	report_success	workflow_success
main_success	1	,610**	,551**	,613**	,575**	,666**	,709**
operational_success	,610**	1	,589**	,555**	,591**	,603**	,661**
technical_success	,551**	,589**	1	,528**	,562**	,653**	,675**
sales_success	,613**	,555**	,528**	1	,565**	,612**	,631**
performance_success	,575**	,591**	,562**	,565**	1	,596**	,606**
report_success	,666**	,603**	,653**	,612**	,596**	1	,690**
workflow_success	,709**	,661**	,675**	,631**	,606**	,690**	1

**.Correlation is significant at the 0.01 level (2-tailed).

The correlation between the mean variables of the BSS success factors according to the analysis was examined.

The bivariate correlation test was used to determine whether there was a significant trend to affect each other among BSS success factors. .sig value was found and this value was found to be greater than 0.05 in all correlation results. Relations between them are very high and positive. That is, as one of the variables increases, the others seem to increase.

When we look at the results of the correlation analysis, there is a high correlation of 0.600 among all the factors. This also indicates that there is a strong and positive relationship between all the factors.

H1: "Digital Transformation of BSS Main Success" has a significant & positive impact on "Digital Transformation of BSS Workflow Success" in telecommunication industry.

When we look at the results of the correlation analysis, there is a high correlation between 0.709 ratios between "Digital Transformation of BSS Main Success" and "Digital Transformation of BSS Workflow Success." This indicates that there is a strong and positive relationship between the related factors.

H2: "Digital Transformation of BSS Main Success" has a significant & positive impact on "Digital Transformation of BSS Operational Success" in telecommunication industry.

When we look at the results of the correlation analysis, there is a high correlation between 0.610 ratios between "Digital Transformation of BSS Main Success" and "Digital Transformation of BSS Operational Success." This indicates that there is a strong and positive relationship between the related factors.

H3: "Digital Transformation of BSS Main Success" has a significant & positive impact on "Digital Transformation of BSS Report Success" in telecommunication industry.

When we look at the results of the correlation analysis, there is a high correlation between 0.666 ratios between "Digital Transformation of BSS Main Success" and "Digital Transformation of BSS Report Success." This indicates that there is a strong and positive relationship between the related factors.

5. CONCLUSION

The purpose of this study was to make an extensive literature research and reveal the trends in regards to digital transformation of telecommunication industry. Specifically, the steps to be taken in order to achieve the necessary transformation in the digitalized world are being sought, owing to the decline in revenues from existing services served in the telecom sector.

"By 2020, more than 75% of the Standard & Poor's 500 will be companies that, just a couple of years ago, we had not even heard of and most of these will comprise a large digital component, if not entirely built on a digital model." (Ericsson Mobility Report, 2016)

This quote encapsulates the profound effect that the Digital Transformation will have on nearly every facet of modern life. The digital revolution it is creating is changing everything – to the point that we cannot truly envision what will be only five years away. The speed of change and unpredictability of business is being felt in many industries, but perhaps none more so than telecoms.

The study showed that with traditional telecom services revenue declining, staying profitable, competitive and relevant means big changes for many service providers. Being agile, able to take on any new services within the digital realm at minimum cost per "device" drives the "Digital" BSS. Additionally, services in the streaming area that will increase, like TV and other types of entertainment services, must be supported and be easy to integrate in a BSS.

With the help of literature review, Telecoms operators are facing a choice. They either have to adopt digital models and modes of operation, enabled by new, highly integrated and automated operational and business systems, or risk becoming irrelevant in the very society they helped create. These new systems represent the only way operators can master the sheer scale of data, connections and seemingly limitless diversity of transactions they will be facing – and facing soon. (Ericsson Mobility Report, 2016)

IT systems that were built and deployed to support traditional operator services such as voice, SMS, data (and even triple and quad-play services) are no longer relevant in an age where an operator must be enabled by its systems to act quickly and play a central role in the value chain - which requires commerce in both physical and digital goods and services.

Older platforms pay no heed to the flexibility and speed to market required by the digital age, with multi-vendor IT environments, operator-specific customizations and data replication adding to the huge costs associated with any changes.

Acording to Guzman and Pierron, To switch from a telecom or cable operator to a digital service provider, there should be a much higher level of customer service at a much lower cost. After this stage, selling at retail stores, using call centers and communicating with customers is no longer a sustainable option. Monthly invoicing is no longer a viable option. To speed up the transformation of the digital business model, telecom companies are considering a new way to switch to BSS. (Guzman and Pierron, 2014)

Applications themselves need to be easy, intuitive and put control back into the hands of the users. Processes need to be real time across the enterprise and be able to dynamically adapt to peaks and troughs by best utilizing the resources available to them.

Telecom industry changed information technology and business support systems, focusing on convergence, operational efficiency and cost reduction. Global communication services industry fixed, including mobile, broadband, cable and satellite service companies are a wave of digital transformation of their core systems.

Operators should required to redefine the role played by their IT and, specifically BSS systems, whereby they are no longer viewed as back-end systems but true business enablers that actually drive their businesses - allowing them to focus on true innovation instead of execution and are an integral part of the service delivery chain and their customers' experience.

Acording to Shepard, Operators should be adopted as a whole new digital

transformation organization. The deepest change for industries such as telecommunications is to understand change as a continuous process from a range of different projects. Adoption stems from extensive cultural changes, such as the integration of "design thinking" into product development and focus on customer feedback. To internalize the rapidly changing digital environment, companies move away from their engineering roots and prefer a strong customer-focused service-oriented culture. (Shepard, 2014)

Acording to Guzman and Pierron, During the transformation process, Operators' priorities should become an Integrated Digital Service Provider for their customers. Being IDSP will allow an operator to offer a new solution group. A sampling of future scenarios may include: digital home integrator, home health integrator, customized cloud provider, M2M activator, one-stop shopping for IT, smart city providers and road crossing partner. (Guzman and Pierron, 2014)

The study also showed that Revenue Manager covers the needs of the current operators that use their BSS systems in full, using buckets, inter-subscriber rating, and hierarchies. This makes it easy for current operators to move on without loss of revenue.

Consequently, the research findings stated that Telecom-based Digital Transformation model is highly dependent on "Digital Transformation of BSS Main Success", "Digital Transformation of BSS Workflow Success", "Digital Transformation of BSS Operational Success" and "Digital Transformation of BSS Report Success". From this point of view, the technical modules and the customer-oriented reports must be evaluated and be considered very efficiently and effectively while implementing a digital transformation in telecommunication application.

6. LIMITATIONS

One of the limitations of this study was that this study was not more specific to IT departments. Surveys and research could be extended by making the scope of incorporating different departments of the companies into a comprehensive one.

The survey was conducted with 83 participants, and the number of participation in this survey is one of the limits of the research. This is due to the fact that white-collar IT workers in telecom companies form a very limited cluster and that too many people do not work in this area.

In addition to the above detail, the study was made exclusively for the telecom industry. The work can be extended to similar industries and people who can show different applications of research.

One of the limitations of this study was that this study was not specific to the city. The study data was collected mostly from the main city of telecom companies is intense in Turkey. In order to increase the number of participants in the study, it can be applied to the telecom employees abroad in order to draw a more global level.

REFERANCES

Books

Aktan, C. C., 1993. *Telekomünikasyon Hizmetlerinde Yeniden Yapılanma ve Özelleştirme*. Ankara.

Altunışık, U., 2004. *Marka Değeri Yaratmada Reklamın Rolü*. Ankara.

Berson A., Smith S. and Thearling K. 2000. *Building Data Mining Applications for CRM*. New York: McGraw-Hill.

Booz,Allen & Hamilton. 2001. *Winning the Customer Churn Battle in the Wireless Industry*. Information Technology Group.

Blum, A., 2013. *Tubes: A Journey to the Center of the Internet Paperback*. Ecco; Reprint edition

Chang, Y.T.; 2009. *Applying Data Mining to Telecom Churn Management.* International Journal of Reviews in Computing. 69-77.

Coll, E., 2013. *Telecom, Datacom and Networking for Non-Engineers*. CTNS Study Guide & Companion Reference Textbook Kindle Edition.

Coll, E., 2016. *Telecom 101: CTA Study Guide and High-Quality Reference Book Covering All Major Telecommunications Topics...* in Plain English. Kindle Edition.

Çağlayan, M. U., BENER, A. B. 2006. *Avrupa Birliği Sürecinde Türkiye'de Bilişim ve Telekomünikasyon Teknolojileri Sektörü Üzerine Görüş ve Öneriler* . Yayın No. TÜSİAD-T/2006 - 06/419,TÜSİAD Yayınları.

Dağdelen, İ., 2002. *Bilgi ve İletişim Teknolojileri Ekonomisi: önemi, politikaları ve büyüme katkıları*, Ankara.

DE B., Paul, M., Peitz. 2003. *Regulation and Entry into Telecommunications Markets*, West Nyack, NY:Cambridge University Press.

Diamond, D. 2012. *DAM Survival Guide: Digital Asset Management Initiative Planning Paperback*.

Dodd, A. Z., 2012. *The Essential Guide to Telecommunications* (5th Edition) (Essential Guides (Prentice Hall)).

Erol, M., 2003. *Doğal Tekellerin Düzenlenmesi ve Telekomünikasyon Sektöründe Düzenleyici Kurum*. DPT Uzmanlık Tezleri.

Freeman, R. L., 2004. *Telecommunication System Engineering* 4th Edition.

Freeman, R. L., 2013. *Fundamentals of Telecommunications,* 2nd Edition.

Goleniewski, L., Jarrett, K. W., 2006. *Telecommunications Essentials, Second Edition: The Complete Global Source (2nd Edition)* 2nd Edition.

Grant, A. E., Meadows, J. H., 2016. *Communication Technology Update and Fundamentals: 15th Edition*.

Horak, R., 2008. *Telecommunications and Data Communications Handbook* 2nd Edition.

İçöz, Ö., 2003. *Telekomünikasyon Sektöründe Regülasyon ve Rekabet*. Ankara.

Keathley, E., 2014. *Digital Asset Management: Content Architectures,* Project Management, and Creating Order out of Media Chaos 1st ed. Edition.

Little, A. D., 2015. *Reshaping the Future with NFV and SDN*. Bell Labs.

Mckinsey, 2014. *Global Flows in a Digital Age*.

Newman, Y., 2017. *Revenue Management* Huawei.

Newton, H., Schoen, S., 2016. *Newton's Telecom Dictionary.* 30th Edition.

Olejniczak, S. P., 2006. *Telecom For Dummies 1st Edition.*

Parker, G. G., 2016. *Platform Revolution: How Networked Markets Are Transforming the Economy* - and How to Make Them Work for You Hardcover.

Reilly, J. P., 2015. *The Value Fabric: A Guide to Doing Business in the Digital World*

Reilly, J. P., 2015. *Frameworx: Mastering the Digital World.*

Reilly, J. P., 2015. *Implementing the TM Forum Information Framework (SID).*

Shepard, S., 2014. *Telecommunications Crash Course*. Third Edition 3rd Edition.

Smith, M. D., Telang, R., 2016. *Streaming, Sharing, Stealing: Big Data and the Future of Entertainment (MIT Press)* 1st Edition.

Ugarkar, J., 2010. *The Essentials of Telecommunications Management: A Simple Guide to Understanding a Complex Industry Paperback.*

Willets, K., 2015. *Unzipping the Digital World - How to Thrive and Survive* .

Periodicals

Accenture, 2015. *The Future Communications Service Provider.*

Aktan, C. C., Vural, İ. Y., 2006. *Telekomünikasyon Sektöründe Reform Süreçleri, Telekomünikasyon ve Regülasyon Dergisi*. Yıl:1 Sayı: 2, Ankara.

Ericsson, 2015. *Ericsson 2015 Mobility Report*.

Ericsson, 2016. *Ericsson 2016 Mobility Report*.

Ericsson, 2017. *Ericsson 2017 Mobility Report*.

Gartner Research., 2014. *Market Trends:Adjacent Market Revenue*.

Kentritas, S. (n.d.). *Customer Relationship Management-The SAS Perspective*.

Lejeune, Miguel A.P.M., 2001. *Measuring The Impact of Data Mining on Churn Management*. Internet research: Electronic Network Applications and Policy, 11(5).

Mattersion, R., 2001. *Telecom Churn Management*. APDG Publishing, NC.

Mckinsey, 2014. *Global Flows in a Digital Age*.

SAS Institute, 2000. *Best Price In Churn Prediction*, a SAS institute white paper.

Telekomünikasyon Kurumu, 2005. *Telekomünikasyon Kurumu 2005 Faaliyet Raporu*.

Telekomünikasyon Kurumu, 2006. *Telekomünikasyon Kurumu 2006 Faaliyet Raporu*.

Telekomünikasyon Kurumu, 2007. *Telekomünikasyon Kurumu 2007 Faaliyet Raporu*.

Türk Telekom, 2005. *Türk Telekom 2005 Faaliyet Raporu*. Ankara.

Türk Telekom, 2006. *Türk Telekom 2006 Faaliyet Raporu*. Ankara.

Türk Telekom, 2008. *Türk Telekom Türk Telekomünikasyon Anonim Şirketi 31 Aralık 2007 ve 2006 Tarihi İtibariyle Konsolide Finansal Tablolar ve Bağımsız Özel Denetim Raporu*. Ankara.

TeleManagement Forum, 2015. *eTOM,The Business Process Framework ,The Information and Communications Services Industry*. Public Evaluation Version.

Tmforum, 2014. *Tmforum 2014 Insight Research*.

Yen, D.C.; Wang, J.C.; Rygielski C., 2002. *Data Mining Techniques for Customer Relationship Management.* Technology in Society. 24(4), 483-502.

Other publications

https://inform.tmforum.org/webinars/revenue-management-monetize-current-future-services/

https://inform.tmforum.org/research-reports/revenue-management-monetize-current-future-services/

https://www.tmforum.org/

http://www.etiya.com/product/1/telaura-suite

http://www.ericsson.com/mobility-report

http://www.ericsson.com/thinkingahead/consumerlab

http://www.accenture.com/us-en/Pages/insight-digital-consumer-surveycommunications-media-technology.aspx.

http://www.accenture.com/us-en/Pages/insight-new-digital-operator.aspx?c=cmt_comsmtwt_10000042&n=smc_1013.

http://www.cmo.com/articles/2014/7/13/telcos_undertake_cus.html.

http://blog.matrixx.com/say-wantrevolution/

http://www.accenture.com/us-en/Pages/insight-digital-consumer-surveycommunications-media-technology.aspx.

http://www.accenture.com/us-en/Pages/insight-new-digital-operator.aspx?c=cmt_comsmtwt_10000042&n=smc_1013

http://www.cmo.com/articles/2014/7/13/telcos_undertake_cus.html

APPENDIX

Telekom Sektöründe Başarılı Dijital Dönüşüm Modeli

Anket içerisinde geçen BSS uygulamaları olarak Product Management, Customer Management(CRM), Revenue Management(Billing-Charging), Order Management, Campaign-Catalog Management olarak değerlendirebilirsiniz.

*Required

Cinsiyetiniz ? *

○ Erkek

○ Kadın

Yaşınız ? *

○ 21-30

○ 31-40

○ 41-50

○ 51-60

○ 60 ve üzeri

Eğitim durumunuz nedir ? *

○ İlkokul

○ Lise

○ Lisans

○ Yüksek Lisans

○ Doktora ve üzeri

Sirketinizde hangi departmanda çalısmaktasınız? *

○ Satış/Pazarlama

○ Teknik

Toplam iş tecrübeniz hangi aralıktadır ? *

○ 1-5 yıl

○ 5-10 yıl

○ 10-15 yıl

○ 15-20 yıl

○ 20 Yıldan Fazla

Şirketinizde daha çok hangi firmaya ait BSS uygulamalarını kullanıyorsunuz? (CRM, Faturalama, Katalog ve Sipariş Yönetimi, Raporlama vb.) *

○ In-house

○ Oracle

○ Ericsson

○ Etiya

○ Other: _____

Sirketinizde ne kadar zamandır BSS Uygulamaları kullanmaktasınız ? (CRM, Faturalama, Katalog ve Sipariş Yönetimi, Raporlama vb.) *

○ 1 Yıldan Az

○ 1-2 Yıl

○ 2-3 Yıl

○ 3-4 Yıl

○ 4 Yıldan Fazla

BSS uygulamaları ile ilgili eğitimler aldınız mı? *

○ Evet

○ Hayır

BSS uygulamalarında Dijital Dönüşümün başarılı olmasında aşağıdaki etmenler ne derece önemlidir ? (1=Hiç Önemli Değil, 5= Çok Önemli) *

	1	2	3	4	5
Performansının yüksek olması	○	○	○	○	○
Modüllerin egitimlerinin verilmis olması	○	○	○	○	○
Uygulamanin etkin kullanılabilmesi için belirli bir zaman geçmesi	○	○	○	○	○
Yaptığınız isleri kolaylastırması	○	○	○	○	○
Ne yapılması konusunda yönlendirebilmesi	○	○	○	○	○
Diger departmanlarla olan veri paylasım problemini ortadan kaldırması	○	○	○	○	○
Müsteri hakkında yeterli veriye kolayca ulasılması	○	○	○	○	○
Müsteri hakkında yeterli veriye hızlı bir sekilde ulasılması	○	○	○	○	○
Müsterilere daha iyi hizmet vermeyi saglaması	○	○	○	○	○
Müsteri ve Kontak bilgilerine dinamik özelliklerin eklenmesine izin vermesi	○	○	○	○	○

BSS Dijital Dönüşüm uygulamalarında Teknik Modüllerinin başarılı olmasında aşağıdakiler ne derece önemlidir? (1 = Hiç Önemli Değil, 5 = Çok Önemli) *

	1	2	3	4	5
Hizmetlerin devreye alınma süresinin hızlı olması	○	○	○	○	○
Hizmetlerin otomatik devreye alınabilmesi	○	○	○	○	○
Modüllerin yeterli müsteri bilgisi içermesi	○	○	○	○	○
Ekranların kullanıcı dostu olması	○	○	○	○	○
Modüllerin hızlı olması	○	○	○	○	○
Ekranların yönlendirici olması	○	○	○	○	○
Hizmetlerin yönetiminin kolay olması	○	○	○	○	○
Aynı verinin bir çok yere girilmemesi	○	○	○	○	○
Otomatik uyarı mekanızmalarının olması	○	○	○	○	○
Müsteri tarafından açılan sorunlara anında ulasılabilmesi	○	○	○	○	○
Modüllerin ilgili oldukları sistemlerle entegrasyonunun olması	○	○	○	○	○

BSS Dijital Dönüşüm uygulamalarında İş Akış Modüllerinin başarılı olmasında aşağıdakiler ne derece önemlidir? (1 = Hiç Önemli Değil, 5 = Çok Önemli) *

	1	2	3	4	5
Ürün, hizmete özgü farklı akısların tanımlanabilmesi	○	○	○	○	○
Akıslarda kullanılan dökümanların tanımlanabilmesi	○	○	○	○	○
Devreye alınacak servise ait dökümanlara kolayca ulasılabilmesi	○	○	○	○	○
Akıs tarafından olusturulan dökümanlarda gerekli alanların dolu gelmesi	○	○	○	○	○
Teknik departman ile satıs departmanı arasında iletisimi kolaylastırması	○	○	○	○	○
İs akısındaki gecikmelerin nedenlerini raporlayabilmesi	○	○	○	○	○
İs akısındaki aksaklıkları raporlayabilmesi	○	○	○	○	○

BSS Dijital Dönüşüm uygulamalarında Satış Modüllerinin başarılı olmasında aşağıdakiler ne derece önemlidir ? (1 = Hiç Önemli Değil, 5 = Çok Önemli) *

	1	2	3	4	5
Satış sürecinin ürüne baglı olarak özellestirilebilmesi	O	O	O	O	O
Satış sonrası otomatik hizmet devreye alma sürecinin baslaması	O	O	O	O	O
Ekranların kullanıcı dostu olması	O	O	O	O	O
Modüllerin hızlı olması	O	O	O	O	O
Otomatik uyarı mekanizmalarının olması	O	O	O	O	O
Ekranların yönlendirici olması	O	O	O	O	O
Ürün ve hizmetlerin kolay tanımlanıp yönetilebilmesi	O	O	O	O	O
Satış anında müsterinin mevcut durumunun görüntülenmesi	O	O	O	O	O

BSS Dijital Dönüşüm uygulamalarında Raporlama Modüllerinin başarılı olmasında aşağıdakiler ne derece önemlidir ? (1 = Hiç Önemli Değil, 5 = Çok Önemli) *

	1	2	3	4	5
Yeni stratejiler gelistirmeye yardımcı olması	○	○	○	○	○
Ürün ve hizmetlerin performansının ölçülebilmesi	○	○	○	○	○
Tahmini raporlamalara sahip olması	○	○	○	○	○
Müsterileri segmentlere ayırabilmesi	○	○	○	○	○
Çalısanların performanslarının ölçülebilmesi	○	○	○	○	○
Sirket performansının ölçülebilmesi	○	○	○	○	○

CURRICULUM VITAE

Name & Surname: Mehmet Ozkaya

Permanent Address: Haznedar Mah. Yıldız Sok. No :16-7 Güngören/Istanbul

Place and Year of Birth: Kütahya, 1986

Foreign Language: English

Primary Education: Osmanbey Primary School, 2001

Secondary Education: Nurullah Koyuncuoğlu Anatolian High School, 2003

Undergraguate: Kayseri Erciyes University, 2008

Postgraduate: Not Available

Name of Institute: Not Available

Name of Master's Program: Not Available

Publications: Not Available

Working Life:

Ericsson, Solution Architect – 2017

Turk Telekom, Lead System Analyst 2015 – 2017

TTNET, CRM Analyst 2012 – 2015

Ericsson, Senior Software Engineer 2008 – 2012