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Analysis of Computer-Aided and Artificial Intelligence
Technologies and Solutions in Service Industries in Russia

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ABSTRACT

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The primary objective of this research study was to investigate the relationship between Computer-Aided and Artificial Intelligence Technologies and customer satisfaction in the context of businesses in Russia. The research focuses on methods of Artificial Intelligence technology application in business and its effect on customer satisfaction.

The researcher introduces Artificial Intelligence and studies the forecasting approaches in relation to business operations. The research also investigates the applicability of software architecture/Computing Languages used in Artificial Intelligence to business operations. The researcher gave due attention to the Computer-Aided Customer Service.

The methods of data collection used for this study were primary and secondary data collection. The data was gathered through questionnaires and semi-structured open-ended interviews with business managers, experts and customers. The researcher used quantitative research design combined with questionnaire technique to identify evidence of customer satisfaction after being served in the businesses under study. The research adopted an evaluative research study approach and the data collected was analyzed using comparisons and percentages, and presented in the form of diagrams and flow-charts.

This case study research was conducted in business enterprises in the studied service industry. This study has investigated the role of Computer-Aided and Artificial Intelligence Technologies. The positive impact of Computer-Aided and AI Technologies application on business enterprises was identified and evident. In addition, AI application approaches and possible solutions were discussed in various sectors of the economy. The researcher highlighted the criticisms of Artificial Intelligence in the modern economy.

Keywords: Artificial Intelligence, Computer-Aided systems, customer satisfaction, healthcare industry, Russia

CONTENTS

1 INTRODUCTION

1.1 Motivation and background

The main motivating factor of researching ~~on~~ this topic is to understand the benefits of implementing Artificial Intelligence (hereinafter AI) in business operations. In this research, AI is concerned with remote customer service. Customer satisfaction is the core goal of modern businesses as they strive to live up to the needs of the customers. It is therefore crucial to study AI and relate it to customer satisfaction in terms of quality, efficiency, and response to changes in demand. AI is one of the technologies that firms can use to improve customer satisfaction. This technology is one of the most recent technologies adopted in the service industry; hence it is necessary to comprehend its elements and requirements.

Intelligence refers to the ability of human beings to apply knowledge in making decisions; it is the ability to analyze different options and choosing the best option. AI is a branch of intelligence that deals with utilization of scientific knowledge to make decisions. AI differs from natural intelligence because it applies engineering techniques to make decisions; natural intelligence does not apply scientific techniques. (Russel & Norvig 2009, 1.)

The field of AI was founded at a conference that took place in Dartmouth College, in 1956. The conference was held by John McCarthy, Marvin Minsky, Allen Newell and Herbert Simon together with their students; they held the conference with the aims of exhibiting how they used computers to solve classroom problems such as algebra. (Madureira & Reis, & Marques 2013, 17). After the conference, the government initiated research to find out new ways of solving problems and making decision-making a simpler task. In 1960, the defense department had conducted a lot of research in this field, and it had developed more methods of making decision making easier. The department developed systems to help in maintaining security; for example, security cameras were developed to help the department in catching criminals. Systems of presenting information were also developed to help the department in carrying out

projects from different locations in a controlled manner (Madureira & Reis & Marques 2013, 24). AI, therefore, was developed in 1956, and since then, it has become a widely studied field because it is applicable in all other fields; it makes study of other fields easier and it helps in making all forms of decision better than man could do alone

Modern organizations have started using AI to attract consumers to buy their products; companies do this in order to be competitive within the industry that they operate. Organizations also do this to ensure that they deliver high quality products to customers as well as solve customers' complaints effectively and on time. Companies use software to collect raw data from different sources; the software then analyze this data and change it to become meaningful decisions. Supermarkets are an example of organizations that use AI to make decisions concerning the kind of products to sell, the price to offer and the marketing strategy to use when promoting their products. Supermarkets have systems that record every transaction that takes place in the shop on a daily basis. The management analyzes the information so that can be meaningful; for instance, demand for products that have discounts is assessed to find out how consumers perceive the discount. The analysis of this information helps the managers decide if they should continue giving out discount on the product; the management also learns if the discount is an effective marketing strategy for their products. Banks also use AI to help them in delivering better services to customers; their systems help them to know the amount of money that is demanded every day. This helps them ensure that they have sufficient funds to give to their customers. (Russel & Norvig 2009, 35)

The benefits of AI exceed the limitations; for instance, with AI, people can do actions that would otherwise be impossible or difficult. Scientists send robots to other planets to collect information about these planets (Russel & Norvig 2009, 972) The field has enabled people to save time and perform more tasks than they were doing before the invention of AI. It helps in reducing errors when performing tasks because technical equipment is able to perform tasks more accurately than a human, it can perform tasks for a longer time than human beings; they have also led to innovation of business ideas and new problem solving skills. (Russel & Norvig 2009, 4.)

1.2 Research topic and questions

The primary objective of this research study is to investigate the relationship between AI and customer satisfaction in the context of business. Therefore, to consider the different aspects of AI the researcher finds it necessary to analyze the theoretical literature of AI, to implement case study research on various business industries which use Computer-Aided and AI technology, to do detailed exploratory research in one special industry in order to find the relationship of customer satisfaction and AI application in business and to review criticism of AI use in business environment.

The research questions for this study include the following three questions:

- Which Computer-Aided and AI Technologies and tools could be used in service industry?

To answer this question, the researcher is to review the theoretical literature in order to understand the principles of AI Technology and Computer-Aided Systems and to identify applicable technologies and tools for business purposes.

- What is the business role of AI tools in customer satisfaction in the service industry?

To answer this question, the researcher is to uncover the meanings of the concepts of customer experience and evaluate customer satisfaction in the enterprises which use AI technology. In addition, benefits that organization get with AI systems implementation and losses other organizations without this technology incurred are to be identified.

- How could Computer-Aided Customer Service and AI tools be utilized in the service industry?

AI is applicable in many various fields. The most important of them are studied in this

research: e-government, healthcare industry, transportation industry, hospitality industry, telecommunications industry. The main objective of this study is to investigate how business enterprises use Computer-Aided systems to satisfy customers, to identify benefits industries get from Computer-Aided services usage.

1.3 Research methodology

The methodology of the research defines the road map to the research and identifies the primary activities that the researcher is involved in the course of the research (Major & Savin-Baden 2010, 20). The rationale of this research is to identify effects of the AI system on customer satisfaction. Through this, the research establishes a model or theoretical framework for the application of Information Technology strategies with AI principles in satisfying customers in the context of business enterprises.

This research uses both qualitative and quantitative research designs. Qualitative method is used in social sciences and engineering research to investigate the rationale behind human behavior and the factors that lead to their behavior patterns. (Major & Savin-Baden 2010, 45.) The qualitative research is considered to be advantageous as it uncovers the experience of people and tries to inquire the reasons of possible issues. This method of research design is more flexible as it allows the researcher to adjust tools and methods of data collection to enhance comprehension of the data collected. Another advantage of this method is that it is allowed for collection of statistical data and testing the validity of the collected. (Major & Savin-Baden 2010, 45.) The quantitative research design allows classifying features, counting them, and constructing statistical models in an attempt to explain what is observed (Newman & Benz 1998, 6). This method of research design is used to obtain strong numerical evidence for the research claims. The main challenge with using both quantitative and qualitative research was high time and resource consuming since it requires the researcher to carry out extensive research. The researcher tried to minimize this challenge by avoiding unnecessary expenditures and moderating the time in the field.

The research strategy for this study is evaluative research. Evaluative research is concerned with assessment of systems, policies and institutional frameworks to understand their capabilities, performance, effectiveness and outcomes (Dane 2011, 3). This type of research strategy proposed to assess, judge and measured outcomes of AI in relation to business standards. Evaluative research strategy fits for the studies where the researcher is concerned with evaluating systems implementation in relation to customer satisfaction (Card 2012, 35). The researcher is interested in evaluating how the AI improves customer satisfaction.

This research study uses both primary and secondary sources for data collection. "Primary sources provide the 'raw data' that the researcher use first to test the working hypothesis and then as evidence to support the claims" (Booth & Colomb & Williams 2008, 34). Secondary sources for data collection are considered to be advantageous in this study because it leads to the collection of accurate and reliable (Major & Savin-Baden 2010, 24).

1.3.1 Research plan and structure

The research plan section highlights the procedure of the research study and the basic objectives the study sought to attain (Major & Savin-Baden 2010, 51). The plan describes the steps that the researcher followed during data collection. Additionally, this section is to identify the participants in the research study.

The research is divided into several phases to illustrate the structure of the research process:

1. Theoretical review of AI in order to understand the technology principles.

2. Case Study research in different service industries in order to understand how AI technologies are applied in business industries.

3. Case Study Research in real organizations which apply AI technologies in their business operations. The aim of this step to identify the relationships between AI implementation and customer satisfaction.

4. Content analysis in order to identify why AI technology is criticized in business environment.

The research process was completed in accordance with the phases illustrated and discussed above.

1.3.2 Data collection, participants and analysis

The researcher was engaged in the collection of data during the stages of the research. These stages included the identification of relevant information for analysis and evaluation of facts relating to various phases of the research. The research techniques used for the Case Study research are observations, interviews and questionnaires. Due to its special nuances not every business industry studied allowed to apply all research techniques listed above at the same time. Therefore, the research techniques were used with their applicability in each individual case and implemented in a way to collect as much relevant data as possible.

Healthcare industry is very favorable for research. It enables to use of all the planned research techniques: secondary data analysis, interviews, questionnaires, observations. The research data collection process in this research contains four main phases as follows:

- Selecting appropriate medical institutions for research. Interviews and observation were used as research techniques to identify relevant for research organizations.

- Interviewing was also used with hospital management and staff to find out the impact of AI technologies implementation on hospital working processes and business operations.

- Identifying the criteria for customer satisfaction evaluation required interviews with open-ended questions to be used.

- Researching customer satisfaction in different institutions with questionnaires completed the main phases.

In order to prove the claims and uncover the relationship between customer satisfaction and AI technologies implementations it is essential to do case study research on health care institutions of Velikiy Novgorod. The institutions were determined during the research process.

The actual participants of the research in healthcare industry case study were hospital management, IT experts and regular employees. As the management representative was interviewed Boris Nikolaevich Drapanovskyi. Doctor Drapanovskyi is a 54-year old head physician of the State Municipal City Clinical Hospital №3 of Velikiy Novgorod. Boris Nikolaevich has the cardiologist specialization and 27 years of working experience. The interview was carried out face-to-face.

The System Administrator of Private Medical Center "Avicenna" Aleksey Stacenko was interviewed to identify the features of AI software applied in Private medical enterprise. In this research he was considered as IT expert in selected organization. The interview was conducted using video conference software "Skype".

The employees and customers interviewed for this research were 50 and 100 respectively. Their names are not provided here due to the large number of interviewees and unstructured interviewing process, in addition to the confidentiality of the information concerning their names. Also with a questionnaires research technique were interviewed regular customers of the health care industry in order to understand the AI application influence on customers and evaluate their satisfaction.

Regarding the analysis of the data collected for this research, this step of research deals with inspecting and transforming data with the aim of highlighting functional information. The researcher refers to case studies, historical studies and content analysis. At this stage, the data collected was examined and reviewed according to the different stages and phases of the project. Each phase of research was analyzed and interpreted to provide important information and guidance for the other phases. The data collected was organized and categorized based on noticeable patterns and themes. The data was then coded to ease its retrieval after analysis. The researcher compared various variables, i.e. business organizations/business industries, their differences in AI implementation, and rationale behind their plans to install the AI. Comparisons and percentages were relatively easy to compute and understand even by people who do not have mathematical backgrounds. The report was written using the verification method, whereby all the sources that used in the research study were affirmed. The final findings after the data analysis were theoretically presented for clarity.

In order to prove the claims and uncover the relationship between customer satisfaction and AI technologies implementations it is essential to do case study research on health care institutions of Velikiy Novgorod. The institutions were determined during the research process.

1.4 Expected research output

Research results of the use of AI on customer satisfaction can be used to recommend the best methods available to create AI studied fields. The demand for AI identified in this study should be pursued utilizing the available resources. The results can also be used to stimulate the growth of AI use in labor intensive fields to reduce on the number of errors made by humans, and also save on time. The findings can be used to write a report showing that all the research objectives have been fulfilled. This aids in filling research gaps that have been created by previous studies and delivery of recommendations.

The expected results are both valuable and valid. This is because customer satisfaction is beneficial to both an operator and their client. The use of AI generally makes work

easier. Recommendations from the study are valid because the study's objectives are clear and achievable. Use of AI in various fields will lead the growth in these industries because of saving on time and resources.

Beneficiaries from the use of AI include customers, laborers, employers and the economy. Customers get more appeased when care and concern is shown to them. They are satisfied when their complaints are quickly and reasonably attended to. The laborers work is made easier when machines are used instead and the risk of human error is reduced. Employers or company owners reap benefits in terms of increase in customer loyalty. Customer loyalty increases revenue and leads to the growth of an industry and this promotes an overall growth of the economy.

2 OVERVIEW OF COMPUTER-AIDED AND AI TECHNOLOGIES FOR SERVICE INDUSTRIES

2.1 Introduction on Artificial Intelligence

AI systems are used in forecasting techniques such as qualitative and quantitative. The review analyses three AI systems that are used in forecasting; these techniques are belief networks, neural nets, and expert systems. The literature focuses on different characteristics of the systems that make them suitable for different forecasting techniques. The architecture of different systems used in AI are analyzed; the systems to be reviewed include deliberative, interactive, and reactive systems. AI programming languages are discussed. These languages include IPL, Lisp, Prolog, STRIPS, Planner, and POP-11 among others; the literature review focuses on the identified languages.

Developers have found out that software engineering can design better software applications if they combine the field with AI. The fields communicate to solve problems that developers face in the process of developing the software. The developers have also found out that AI techniques such as programming can be used in SE; on the other hand, software engineering techniques cannot be applicable in AI. The literature analyzes the reasons for this phenomenon, and conditions that organizations have to observe when combining SE and AI in order to satisfy their customers. The chapter identifies different industries and the AI techniques that they use to increase customer satisfaction. Swarm intelligence and multi agent systems of data mining are discussed and their role in increasing customer satisfaction for the electronic service industry.

2.2 Forecasting approaches

Qualitative analysis, quantitative analysis or both serve as a basis for forecasts. Quantitative forecasting is known as objective analysis while qualitative forecasting is known as judgmental or managerial analysis. A tension exists between the two methods in which the bottom up approach is used to develop quantitative forecasts which are operation oriented while the top down procedure is used to come up with managerial based forecast which are preferred by the marketing department. For example, adequate supply is the prime goal of the marketing department while the operation aims at minimizing inventory. The two techniques provide an avenue through which AI can be implemented by pointing out forecasting errors.

The time series technique or the relational techniques characterize quantitative forecasting. The time series technique explains how the future looks and behaves similar to past, for example, the prices of gasoline remaining constant for the next four months as they were for the past four months. It involves recording data over sequential time periods. Relational technique on the other hand shows that the future is dependent on several variables. An example would be the construction of new houses being dependent on weather conditions or interest rates. It involves recording several variables after several observations.

The figure shows the typical forecasting procedure:
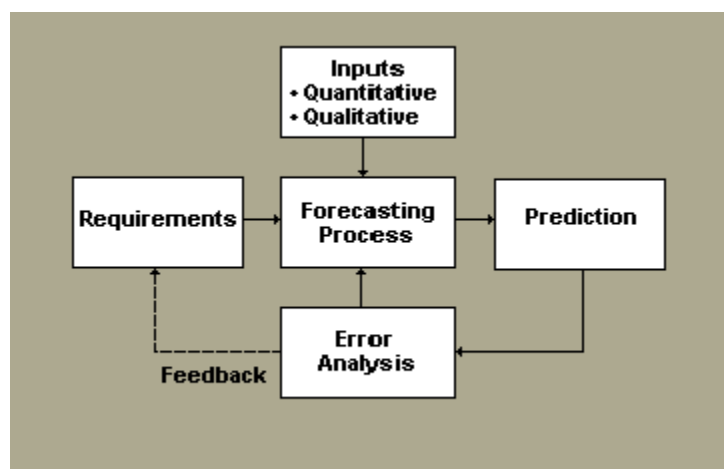
Figure 1. Typical Forecasting Process (Hall 2002)

By comparing actual results with predictions made, one is able to evaluate the final forecast. This evaluation is achieved by analyzing the errors. The difference between resultant outcome and the prediction is the error term. Forecasting is continually kept up to date through adjusting model inputs based on error analysis. In most cases, no forecasting technique serves all situations fully. Combining different approaches is more appropriate and results in achieving more concrete estimates.

2.3 Computing languages in Artificial Intelligence

2.3.1 Software architecture

The software architecture of a given system defines its module competences and how these modules work together as a single entity. AI structures can be classified into deliberative systems, interacting systems and reactive systems. In the past, a large number of architectures exist in the literature for these structures addressing their important features.

Deliberative systems have a significant representation of the world in terms of classifications such as goals; intentions or beliefs and which have logical assumption mechanism to make decisions on the basis of the world model. The AI planning structure may be regarded as the predecessor for the deliberative systems architecture. Presently, AI systems have their design on the basis of Beliefs, Desires and Intentions (BDI Architectures) (Heinimaki & Vanhatupa 2013, 32). A time tree is a temporal structure upon which the world is cast. It has a linear past and a branching time future. There exists a distinction between time and chance in this architecture. This is the ability for the system to choose its action from a pool of alternatives and the ambiguity of the outcome of the course of action, where decisions are made by the environment in lieu of the system. Interacting systems have the ability to arrange their activities through negotiation and communication.

Reactive systems are constructed according to paradigm based on behavior. These systems represent the world in a pure and easy to understand way as well provide tight matching of action and perception. Decision making in these systems is done at run time, based on uncomplicated circumstance action rules and limited information. These system architectures were in mostly referred to as behavior based, reactive or situated. Decisions made in the reactive architecture partially get direction from Hebert Simon's assumption. It states that the intricacy of the conduct of a system can be a display of the complication of the surrounding rather than the facade of the structures intricate internal design (Jain 2011, 3774).

2.3.2 Artificial Intelligence programming languages

A programming language refers to an artificial language modeled to pass on instructions to a machine especially a computer. This language can be used to make programs that regulate the conduct of machines and/or to articulate algorithms accurately. AI researchers have over the years come up with several languages for AI. They include IPL, Lisp, Prolog, STRIPS, Planner and POP-11 (Jain 2011, 3774).

The first language to be developed for AI was IPL. The language has features intended to aid programs that could carry out general problem solving, dynamic memory allocation, functions and arguments, associations, schemas, cooperative multi-tasking and recursions

Lisp is a systematic mathematical code for computer programs based on lambda calculus. One of Lisp's main data structures is linked lists. Lists make up the Lisp source code. This allows for Lisp based programs to manipulate source code as data structure. Resultant macro systems enable programmers to create new programming languages, which are domain specific or new syntax embedded in Lisp.

Prolog is an analytical language. Here, programs are depicted in terms of relations, and execution is achieved by running queries over those relations. This particular

programming language is beneficial for database, language parsing applications and symbolic reasoning. Prolog is vastly used in AI today.

STRIPS is a language used for communicating automated planning problem instances. It shows the goal states, a set of actions and an initial state. For every action post conditions and preconditions are specified.

Planner is an amalgam between logical and procedural languages. It provides a systematic interpretation to logical sentences where result interpretation is done using pattern- directed assumptions.

POP-11 language is a reflective, incrementally assembled programming language that has a majority of the characteristics of an elucidated language. It is the main language used in the Pop log programming environment. It is also used to introduce figurative programming methods for programmers who use more predominant languages such as Pascal and who are more familiar to POP syntax than Lisp. It supports first class features.

2.4. Implementation of Artificial Intelligence

Implementation involves installing an AI system in an organization; different organizations use different models of implementation in their companies to ensure that service delivery is effective. This happens because different AI techniques are suitable for different industries and hence different firms.

2.5 Artificial Intelligence and software engineering

Software engineering involves the development and maintenance of software applications; software engineers face challenges such as difficulty to reproduce the behavior of people and lack of perfect solutions for software problems (Jain 2011, 3774). Engineers have criticized the field for lack of validation of software and

development of designs that do not meet customer needs. AI, on the other hand, involves creating machines that have various components that communicate to each other to work effectively (Jain 2011, 3774). The field has experienced difficulties such as lack of proper reasoning and non-effective communication between the components. Researchers have found out that combining the two fields would give rise to more benefits than limitations; they have also found out that the two systems can work more effectively when combined that when each performs tasks independently. The essential factors of interaction between AI and SE include; objectives, communication, crisis, interaction (Jain 2011, 3775). Management of different organizations has to ensure that their systems are installed in a way that the system takes care of these factors; if these factors are ignored in the implementation process, the final system may not   deliver customer satisfaction.

Communication is an essential factor because it enables the two fields to interact in an effective way such that they produce effective solutions to existing problems in an organization. The two fields have different objectives and each works towards achieving its goals; for instance, SE aims at developing software applications economically and on time while AI aims at stimulating machines to behave for the human beings. The two systems, therefore, need to communicate extensively to ensure that the goals of the two are achieved; communication also helps the systems to find successful solutions to the problems that exist in an organization (Jain 2011, 3776).

The management should also consider the problems that they aim at solving in the organization when installing AI and SE systems; this is critical because the two systems solve different problems (Jain 2011, 3776). AI solves problems whose solutions are difficult to find while SE solves problems that the management has solutions in mind. Knowledge of the problem helps managers to decide on the best techniques to use in finding solutions to problems because the two systems apply different techniques. AI uses programming techniques while SE uses fixed phases and sequential (Jain 2011, 3777).

AI techniques can be used in SE because software engineering utilizes programming and environment for maintenance of AI are directly applicable to software engineering. SE techniques, on the other hand, are not applicable in artificial engineering because AI does not use fixed phases nor does it use sequential approach (Jain 2011, 3774). Software engineering cannot arouse a system to exhibit human behavior. Knowledge of the interaction between the two systems is essential when installing an AI system in a company.

2.5.1 Framework of interaction of Artificial Intelligence and software engineering

The framework for effective communication between AI and SE consists of four factors that are shown on the diagram below.
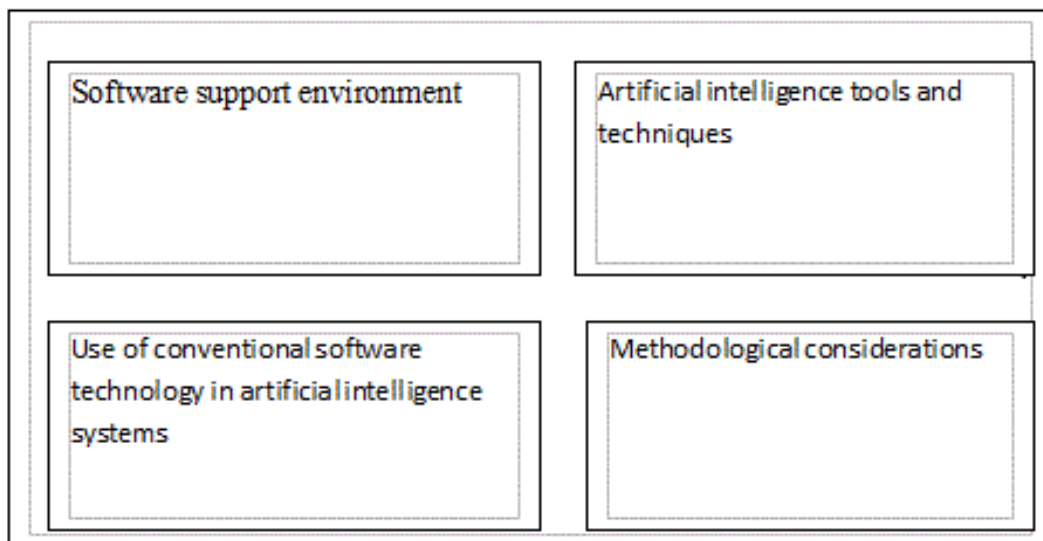
Figure 2: Framework of interaction between AI and SE (Jain 2011, 3774).

The environment helps to reduce complications that exist in developing software by ensuring that the computer performs more tasks than people do, but people play the role of supporting the system in completing the process successfully (Jain 2011, 3778).

Tools and techniques help the developer with the required knowledge of the process so that the developer can make effective decisions. AI offers ideas to the developer; the developer implements the ideas that are more efficient in the development process.

Conventional technology helps the developer in producing high quality products; it is critical because consumers are more satisfied with high quality products than with low quality products. The AI system helps in producing high quality products because it possesses more knowledgeable than human beings.

Methodology is essential because different methodologies give rise to different solutions; management uses the method that gives a solution to the problem at hand (Jain 2011, 3778).

2.6 Implementation of intelligence on e-services.

Electronic services refer to services that are performed electronically; the services are provided by a system of computers that communicate through a network. The network enables communication between the service provider and the customers. The service provider uses intelligence in the system to ensure that communication and delivery of the service is effective; customers get satisfied when the communication and delivery of services is according to their expectations.

Web mining is a critical concept in e-service; it refers to the process of searching through different resources on the web in order to extract some information (Shinde 2011, 4141). The process occurs in stages; the first stage is searching, which is followed by selecting then analysis of information.

Web mining applies intelligence techniques such as machine learning, genetic algorithm, neural networks, and fuzzy logic (Shinde 2011, 4141). The process applies these techniques in analyzing the behavior of the market for different products; knowledge of consumer behavior enables managers to provide goods that meet customer needs. This is because customers are more satisfied with goods that meet their

needs, and they tend to be loyal to a seller who provides them with such goods. Use of intelligence in web mining also helps companies to identify potential customers and their requirements.

Other AI techniques that are used in web mining are; swarm intelligence and multi-agent technology (Shinde 2011, 4143). The multi-agent system involves the use of an agent computer that performs tasks independently to meet the objectives of the user. The agent computer communicates with other agents in order for the system to function as required; the agents work to together to solve problems in the system. Agents receive signals from the web that contain information about the web; for example, they collect text, and followed links (Shinde 2011, 4144). This information helps companies to know the internet needs of customers so that they can provide customers with services that satisfy them.

Swarm intelligence involves the use of artificial decentralized systems that are organized privately to solve problems (Shinde 2011, 4144). The agents in the system communicate and work together to find solutions to problems; therefore, agents work together as swarms. The system has rules that every agent follows without being controlled. The agents, therefore, are able to find more solutions to problems when working together than when each finds solutions independently.

2.7 Use of artificial neural network in banking

High demand for multi-media services often results to low quality services; organizations often use resource reservations to ensure that they provide high quality services; the reserves are of two types. Instantaneous request and book ahead are the two types of reservations that managers apply in their organizations. Book ahead involves providing resources in advance while instantaneous reservation provides resources after they have been depleted (Ahmad & Kamruzzaman & Habibi 2012, 81). The major challenge of the two methods is that they involve interruption of services and lead to low quality of services because of the interruptions. Low quality of service results to low satisfaction of customers.

Researchers have come up with a new method of ensuring that services are provided without interruptions; the proposed method is use of Artificial Neural Networks. ANN solves problems such as control of call admission estimating traffic pattern and network control among others (Ahmad & Kamruzzaman & Habibi 2012, 81). ANN involves adjustment of some network parameters such as threshold, bandwidth in ATMs to ensure that high quality services are guaranteed. ANN, therefore, provides high quality services that increase customer satisfaction in the banking industry among other industries.

2.8 Artificial Intelligence in computer games

AI is used in computer games to create non-player characters such as human beings and animals; this helps in eliminating the boredom that exists in virtual worlds that do not have non-player characters (Heinimaki & Vanhatupa 2013, 2). AI is used to create characteristics of the non-player characters; such characteristics include moods, and knowledge. The characteristics of players dictate their behavior.

Games are developed by use of suitable engines for every game; the engines differ across games because some engines are more effective than others. Agents use conventional and script languages to write games. AI is used together with state machines to develop fascinating games in the virtual world. The use of AI in developing games leads to the development of interesting games that satisfy the needs of customers; it also leads to customer loyalty towards the games that are developed by use of AI system (Heinimaki & Vanhatupa 2013, 3).

3 CASE STUDY ON HEALTH CARE INDUSTRY

Service health care is crucial and demands continuous attention. Health care demand is increasing at an alarming rate due to high rates of population growth. The healthcare providers have created innovative ways of balancing quality and quantity to realize customer satisfaction. This is why most healthcare providers have embraced advanced technology in their operations to achieve service to multiple customers simultaneously (Anand & Mohantany 2012, 48). Healthcare services include diagnosis, treatment, prevention, trust and patient education. One of the technologies that healthcare providers have adopted is AI. AI involves implementation of Computer-Aided Customer Service, which is a common feature in modern healthcare centers. AI aids in enhancing the dimensions of service quality to ensure that customer needs are satisfied. (Anand & Mohantany 2012, 51.)

An excellent evidence of Computer-Aided Customer service among the healthcare providers is the increased use of telemedicine and remote-controlled equipment during surgery. The surgeons use these tools to improve the quality, speed of service and efficiency of the services provided to patients (Ripley, 2011, 45). AI in surgery is used in areas such as Lab-on-Chip for remote testing of HIV/AIDS, artificial retina, printing new skin, diabetes' artificial pancreas and Intelligent Pills Delivery to Specific Locations. The fast evolution of AI has come as a real transition within the healthcare sector.

Computer-Aided Customer Service fundamentally focuses on aspects of technological engineering applied in healthcare delivery systems and processes. It provides a basis for the exchange of advanced knowledge, innovative ideas and emerging technologies among the health care providers and patients. (Anand & Mohantany 2012, 58.) Computer-Aided Customer Service connects healthcare engineering researchers, managers and consultants around the globe with the main objective of ensuring customer satisfaction. Computer-Aided Customer Service primarily focuses on biomedical engineering, distance healthcare services, healthcare environmental

management, public health and epidemiology, healthcare safety, healthcare policy, clinical research experiments, conceptual designs and theoretical developments (Ripley 49). The elements of biomedical engineering adopted in the health care industry include devices, software, equipment and procedures, usually computerized. AI aids in planning, communication, knowledge, reasoning and perception in order to understand customer needs and meet them adequately. (Ripley 2011, 49.)

AI is used in record keeping in the healthcare sector. This is referred to as Electronic Healthcare Record (EHR), which has been implemented in the healthcare sector to avoid time wastage, which is experienced when using manual records (Ripley 2011, 63). The Electronic HealthCare Record integrates data from various healthcare providers to create a common record for each patient. This enables various healthcare providers to view the medical history of patients and provide the required medication. Doctors from different departments can access and rapidly communicate particular patient's test result such as x-ray as soon as it is entered in to the computer confidence (Soltan, Liao and Wang 2010, 678). During emergencies, doctors use the patient's identification card to access time-critical information such as allergies, blood groups, recent treatments and on-going medication. The EHR is a source of data for national statistics, which is used by health ministry's to identify health trends of the population, track health epidemics and monitor the use of public health funds to ensure they help the relevant populations (Ripley 2011, 79).

Another form of AI system adopted in the current healthcare service industry is use of robots. Robots work as intelligence decision-making devices, and research shows that the robotic capabilities outdo those of simple tools by approximately 70% confidence (Soltan, Liao & Wang, 2010, 685). iRobots quickens the process of questioning a patient's symptoms, analysing the symptoms, generating a diagnosis, collecting and evaluating the entire medical literature of the patient and coming up with a diagnosis with a high probability of confidence (Soltan, Liao & Wang 2010, 675). Research findings reveal that customers prefer assistance from humanoid robots because they can ask them questions without being judged, feeling foolish or being interrupted by a beeper interruption (Soltan, Liao & Wang 2010, 685).

Video audit tool is mainly used when receiving, diagnosing and treating patients suffering from traumatic experiences. The system used in this case is called Trauma Reception and Resuscitation (TRR) tool. The diagram below shows the TRR tool.
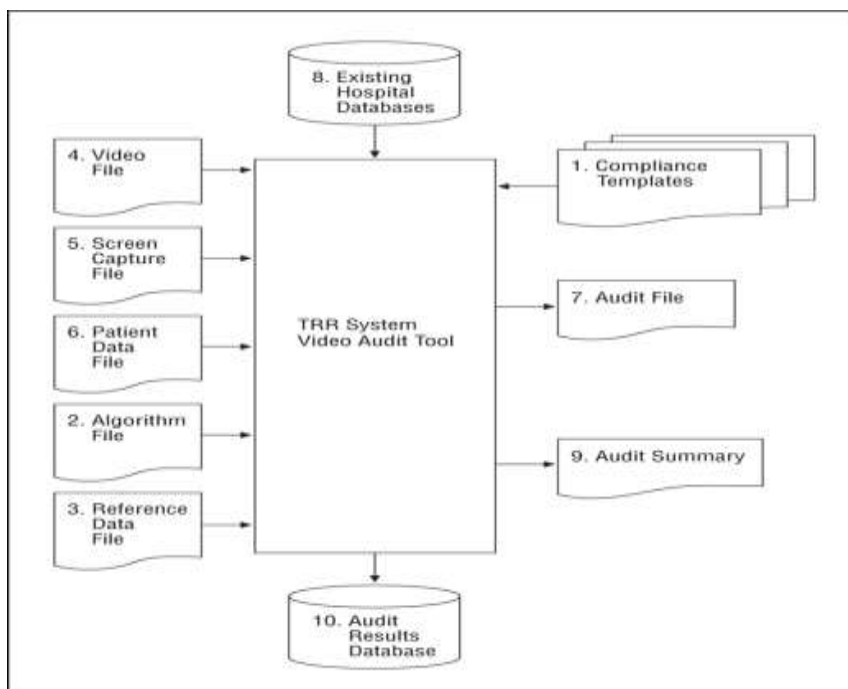
Figure 3. TTR tool working model (Soltan, Liao and Wang 2010, 679)

This TRR tool enables the auditors to compare patient treatment on video with the information available in the trauma care professionals.

AI has been extensively used in the healthcare industry. This technology is used to quicken service delivery and enhance the process of rapid response to emergencies. Computer-Aided Customer Service has been adopted in forms of biomedical engineering, use of robots and implementation of Electronic Healthcare Records. Through this, the healthcare providers achieve the dimensions of service quality and customer satisfaction.

3.1 Selecting appropriate institutions

The place for the study was chosen for reasons of location researcher at the moment, as the city is the hometown of researcher and it also meets all the requirements for relevant research. Velikiy Novgorod is an administrative center of Novgorod Region, population

in 2010 was 218,717 inhabitants (Federal service of government statistics, 2010). In the city operates more than 40 different medical institutions including hospitals polyclinics, medical centers, dispensaries and other types, 21 are state municipal institutions, which means are controlled by government parent organizations and city managers.

The first step of this case study research was seeking out three different medical enterprises and negotiation with management on research permit. The following criteria for the enterprises under research are caused by the objective to uncover customer experience with different service quality in dependence of AI application in business.

Enterprise A: State municipal institution which does not apply AI technologies for its automation and customer service.

Enterprise B: State municipal institution which has recently introduced AI technologies.

Enterprise C: Private medical institution; the business enterprise in health care sector which uses AI technologies for several years.

The study of customer experience in Enterprise A is important as it is considered to identify losses of customer satisfaction in business without implementing AI systems. Enterprise B is considered to identify how Computer-Aided Systems introducing has affected on business operations and customer satisfaction. Enterprise C is considered to show customer satisfaction rate in successfully using AI technologies business. The 'State Municipal Institution' for Enterprise A and B is caused by larger customers amount than private companies have and therefore potentially larger response rate. Also it was impossible to choose Enterprise A from private business enterprises as in a health care sector the rate of private companies using Computer-Aided Systems application is 100%.

The process elements of determining the eligible enterprises for research are:

1. Phone calls to the institutions with a question of using Computer-Aided Services in their business operations.

2. On place observation in order to identify ccomputer technology types and other important factors for research relevance such as amount of customers, burden on businesses,

3. Negotiations for research permit with institutions management.

During the determining process researcher has faced several difficulties:

- Lack of state municipal hospitals, polyclinics and medical centers use Computer-Aided systems (28.5%) in customer service processes.

- Also a problem was to determine which technologies to understand as Computer-Aided. It was a consequence of a poor plan of research at start. Almost every medical institution in Velikiy Novgorod has some type of technologies oriented on treatment process, also every institution uses accounting software. But for research it was important to study enterprises with customer service oriented Computer-Aided systems. In determining process computer illiteracy staff caused problems as the first "phone calls" stage helped to sift only a third part of all institutions and the future process required on place observation to determine exact technology type.

- The reluctance of management for research to be conducted.

Finally 3 appropriate institutions for research which meet the criteria were determined and research permissions were granted.

Objects to study:

Enterprise A: State Municipal Polyclinic №4 of Velikiy Novgorod.
  Founded 1982; never used AI technologies to improve their operations; In 2012 the patients number has been recorder 20000.

Enterprise B: State Municipal City Clinical Hospital №3.
  Founded 1990; Aplication of AI technologies in business operations was introduced in 2013, January; the exact number of active patient cards in a database to the moment of research was 80944.

Enterprise C: Private Medical Center "Avicenna".
  Founded 2003; Computer-Aided Systems with AI technologies were used from the foundation; the exact number of patients in a database to the moment of research was 13560.

State Municipal Polyclinic №4 of Velikiy Novgorod is providing health care service to the Northwest city district; boroughs №4, 6, 7. It uses accounting software technologies, several personal computers for management and medical technologies aimed on treatment process (such as ultrasonography, tomography, x-ray and others). It has never used any AI technologies to improve customer satisfaction or business processes. All the record keeping system, registration system, timetables and other working operations are on paper.

In January 2013 State Municipal City Clinical Hospital №3 of Velikiy Novgorod with Russian president administration subsides has introduced computer technologies in its customer service, its internal and external business operations. The institution's Computer-Aided system includes three elements: Medical information system MEDWORK, touchscreen front-lines registration and electronic queue.

Medical information system MEDWORK is developed by "Master Lab», Russian software development company. "Master Lab" states that this software is aimed to solve complex medical and managerial challenges facing modern clinics and hospitals. The features MIC MEDWORK provides are: patient card record keeping, coverage of all major stages of the treatment process, preparation and processing of medical and financial statistics, planning techniques and clinical work, billing patients and accounting services, working with other organizations and insurance companies, design and generation of report forms. MEDWORK software can be definitely considered as an AI software example as it "automates and accelerates the hospital, provides medical information to doctors, analyzes medical data and suggests possible solutions, solves a lot of routine tasks, helps in planning and competent time-management." (Drapanovskyi, 2013)

"Touchscreen front-lines registration and electronic queue are very effective in internal hospital operations. Electronic registration stands are integrated with MEDWORK software and allow customers independently make appointments to specialists, plan their procedures schedule. Electronc queue system helps to keep lines of patients in order, also it helps to escape conflicts." (Drapanovskyi, 2013)

Private Medical Center "Avicenna" is one of the most popular among private health care enterprises. It is the oldest one in its type of business holding in Velikyi Novgorod. During the phone interview system administrator of medical center stated that this business enterprise uses Computer-Aided systems very successfully from the beginning. Also he described the software and certainly declared in AI example. The software is medical information and complex system automation system Polibase. From his words this system provides comprehensive automation of their medical institution: accounting of patients and medical staff, maintenance scheduling and registrations, diagnoses record, medical services cost calculation and payment accounting, payroll medical personnel, preparation of any report on the work of doctors, receptionists, offices and clinics in general, also this system can monitor the efficiency of advertising (Stacenko 2013). The internet research confirmed the information about the software and the researcher agreed with the expert in the recognition program as an example of AI.

3.2 Artificial Intelligence technologies in hospital operation

Researcher presumes that for objective evaluation of enterprise automation system efficiency and identifying its implementation impact and benefits or losses is essential to undercover the experience of people who can see system work from inside, who works in an enterprise and participate in business operations. The participants of this research are hospital head physician and staff with different working positions.

Boris Drapanovskyi (a head physician of the State Municipal City Clinical Hospital №3 of Velikiy Novgorod) told about AI technology implementation process, described its work in entire hospital system. According to the interview process doctor Drapanovskyi was also asked about weaknesses, problems and issues such type of medical institution faces in its operations and shared the experience of AI Technology implementation in hospital.

The main motivation factors of introducing Computer-Aided system in hospital operation were increased over the years burden on the institution, system's inability to cope with the influx of patients, the inability of rational resource and time management

which led to overloads and non-medical burden on specialist. The outdated method of paperwork caused many difficulties as it was impossible to cope with this amount of papers, it led to time loss and document loss also. Customer satisfaction during recent years Boris Drapanovskyi has rated on low level.

Introducing Computer-Aided system helped in resolving these deficiencies. AI technology enabled to bring hospital performance to a new level, improve the efficiency of doctors and non-medical services, ensure the loyalty of the medical staff and increase patient satisfaction. New automation system benefits in improving internal medical records, optimizing the process of mandatory reporting to the parent organizations, presenting the results of clinic for management in real time.

50 more employees in different positions from nurses to department heads, from warehouse to kitchen workers were interviewed. These participants mentioned the same as Drapanovskyi, noting improvement the quality of medical services, increasing patient satisfaction, reduced load on non-therapeutic medical specialists, simplification of access to medical information and the speed of this information providing to staff. New Computer-Aided system also helped to improve the efficiency of provision services and to reduce the rate of accidental loss and unreasonable expenditure of medical supplies, equipment and tools.

Altogether research participants pointed huge improvement of hospital working system after introducing new technologies but some issues were mentioned as well. Especially aged workers evinced system complication, lack of adequate training. Also problems with customer learning of system were discussed. One of therapists shared the occasion in just the beginning of new technology functioning when aged patients were using electronic queue system incorrectly. Patients did not follow established system order and were distributing turn numbers with own reasoning.

3.3 Customer satisfaction evaluation criteria in healthcare industry

Customer satisfaction is a tool to rate the success of business. To evaluate customer satisfaction is essential to know the measurement criteria. To determine customer satisfaction criteria in health care business sector it was decided to ask customers themself what are the determinants of their satisfaction. The research used interview technique with only one open-ended question: "Please list the main factors affecting your satisfaction in health care services?"

The research took a place in State Municipal City Clinic Hospital №3 front doors and every visitor coming in or out was interviewed. The response rate was high and it was easy get more than 100 answers but most of respondents gave only 1-2 determinants. All the gathered data was filtered, analyzed, categorized and all significant factors were identified. These criteria were used in the next research steps to evaluate customer satisfaction:

- Speed of obtaining service
- Ease of obtaining service
- Individual service quality
- The effectiveness of treatment
- Availability of treatment, the cost
- Accessibility of information concerning treatment process

3.4 Customer satisfaction rate research

For this research step was used quantitative research design method. In order to evaluate customer satisfaction rate researcher has used questionnaires research technique.. Questionnaires were distributed in the halls of three medical institutions, the aim was to get 100 responses from each institution. The questionnaire structure was following: Participants were asked to rate with a scale from 1 to 10 several factors of health industry institution operation. From the previous research step these factors were identified as customer satisfaction determinants. Also was used one more criteria – Overall Service Satisfaction.

The research statistic is represented on the diagram below:
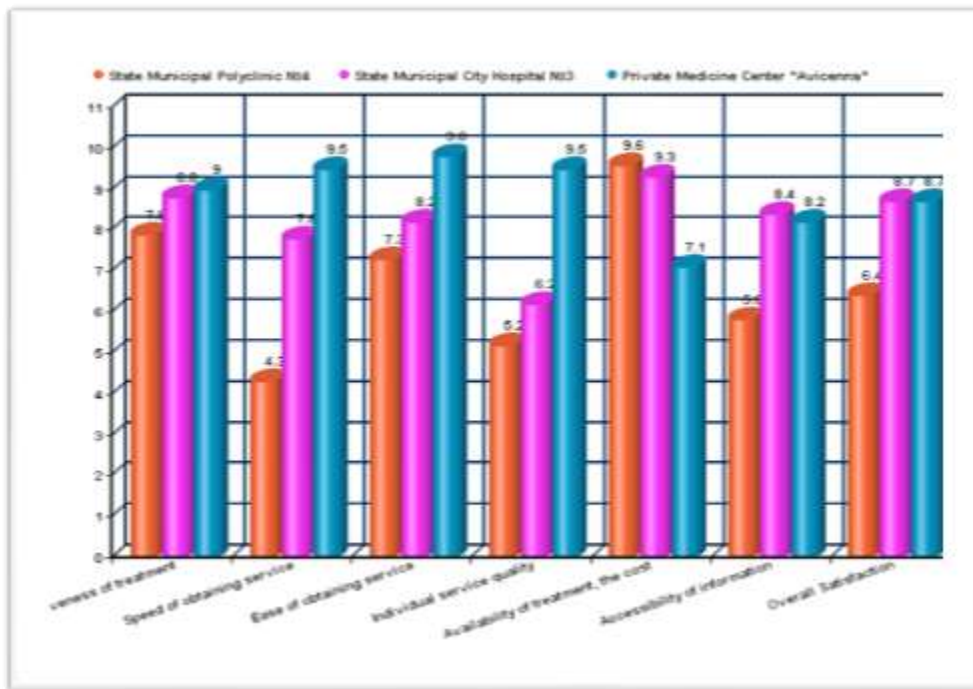
Figure 4. Customer satisfaction rate in the institutions under the study

During this step of research were collected 300 responses to questionnaires, collected data has been processed and presented with a chart. The values in the chart are the arithmetical mean of all rates.

3.5 Data analysis

The aim of research was to identify the relationship between customer satisfaction and implementing AI in business operations. The first step of data analysis is comparing

data gathered during enterprise workers interview with evaluating criteria given by customers themselves. The main objective of this analysis step is to identify which features of AI affect factors of institution operation defined as determinants of customer satisfaction.

The analysis results show the strong relationship between application AI technologies and the following determinants of customer satisfaction: speed of hospital operation, ease of registration and time scheduling. Even effectiveness of treatment and accessibility of information depends on Computer-Aided Systems was stated by Drapanovskyi. Comparison of research results from different institutions demonstrates difference in customer satisfaction level depending on AI technologies application.

State Municipal Institution Polyclinic №4 which has never applied any Computer-Aided systems in customer service showed very low rate in speed of obtaining service criteria 4.3, were noted plenty of questionaries' with rate 1. State Municipal Institution City Clinical Hospital №3 showed average rating 7.3, even in interviews workers and management stated big burden and patients flow, also was mentioned acceleration in business operation after introducing Computer-Aided system. Customers of Private Medical Center "Avicenna" are very satisfied by speed of obtaining service, 9.0. During interviewing process some respondents noticed researcher on marked improvement in speed and ease of obtaining service. State Municipal Polyclinic №3 customers rated as 7.4 ease of obtaining service criteria but still showed the lowest result. City Clinical Hospital and Private Medical Center were rated as 8.2 and 9.8 respectively. Effectiveness of treatment and Accessibility of information criteria also depend on Computer-Aided systems application as well as specialists qualifications, and experience, and workers attitude and customers own behavior. However, institution which does not apply AI technologies also demonstrated lower rates than two others institution. It is worth noting in the aspect of accessibility of information State Municipal Hospital №3 showed higher satisfaction level than the private enterprise. Nevertheless Overall Customer Satisfaction rate was high and almost equal in City Clinical Hospital and Private Medical Center, 8.7, Polyclinic's customers' satisfaction is on the medium level 6.4. Private Medical Center is very customer service oriented

institution and customer satisfaction is a primary priority, but other institutions are more oriented on successful institution operation. The research assumes that equality of customer satisfaction phenomenon is caused by cost of treatment and medical supplies criteria, which is also important in customer satisfaction evaluation even does not directly depend on application of AI technologies in enterprise.

3.6 Research results

The research objective was to undercover customer satisfaction level in relationship to AI application on the enterprises. The researcher states that the aim was fulfilled and increasing customer satisfaction in the institutions which apply Computer-Aided systems is proved. Implementing AI technologies accelerate and optimize enterprise operation, improve the efficiency of many processes, effect on staff loyalty and customer satisfaction.

The research results were demonstrated to State Municipal Polyclinic management and it was suggested that introducing Computer-Aided systems in the institution will result in many benefits. Management agreed with research results and suggestions but referred to the lack of finances.

Ssummarizing the results of research and drawing conclusions, the researcher submits that the application of AI technology in health care business sector is very recommendable.

4. CASE STUDY ON OTHER SERVICE INDUSTRIES

The researcher states that for the work relevance and full understanding how AI is applied in service oriented businesses it is important to study other service industries. The objective of research is to identify how Computer-Aided systems based on AI principles are used in other service industries. The main research technique for this study is secondary data analysis, it include studying relevant literature, publications and relevant internet sources.

4.1. E-government

Electronic governments commonly known as e-governments refer to the use of the internet to by the government to interact with its citizens. It involves the use of various technologies to deliver convenient and customer oriented services using electronic media.

The major objective of e-governments is to back and clarify the process of governance to the citizens and businesses. Other objectives include, providing a liable and transparent administration and addressing the needs of the public through reliable means. The quality of these services plays a key role in determining their acceptance of by the citizens. Quality refers to how well a program is integrated with delivery of service.

E-governments have had significant application in various fields of government operations (Yegnanarayana 2006, 189). One is the use of e-governments to the citizen. Computer-Aided customer services have enabled the citizens to access various government programs and benefits and makes it easier to share information with the government. Another such application is the use of e-governments to communicate with businesses. People in business have learnt of new laws enacted by the government touching on various business issues and accessing of legal business permits has become easier. Through e-governments, the government is able to communicate with the local

governments. Communication of critical and sensitive information has become easy between the government and its arms.

Employment of e-governments in governance has increased public participation in various projects. It has also improved the competence and productivity of the public sector, and improved governance. When the government has a good communication with the business sector, it supports the growth of other sector such as the private sector as well. This may lead to economic growth and development. Citizens of countries or states whose governments use e-governments believe in democracy and bureaucracy. (Jain 2011 3777.)

The quality of the service delivery by the e-governments has affected the acceptance of e-governance by the public. It is necessary for the websites for e-governments to offer quality service functions to make it easy and understandable for every citizen accessing them. Quality is fundamental for e-governments, because citizens may not always be aware of the administrative specifics addressed on such websites and they have to provide clear guidelines to advise one of how to go about them. In other commercial transaction dealings, consumers are usually well informed on what they want before accessing a given website. (Jain 2011, 3778.)

Several issues have emerged in the adoption of Computer-Aided customer service in e-governments. One of them is privacy (Jain 2011, 3778.). This is because e-governments often gather and store information about people going through their websites. Once information accumulates, it can easily be analyzed or shared. This means that confidential information about people or the government may be relayed to the wrong recipients. Another major issue is the participation of citizens. From findings, not every citizen is able to gain access to e-government websites. This is because of issues such as illiteracy and lack of interest in governance. An improvement in service delivery may eliminate the lack in interest in governance, by the public.

Studies show that effective operation of the government and other sectors is a necessity in any country. The use of AI plays a key role in governance. This is particularly

because the public is able to understand the government better and share ideas on various issues. This leads to the growth of a country in both economic and social terms. E-governments also promote new relationships and better understanding.

4.2 Banking industry

The banking industry also uses AI in an attempt to satisfy its customers. Banks use AI to organize their operations and to participate in trading. Banks have come a long way from ancient times to the modern age, with the development of modern day services. (King 2010, 12.)

Over the years, banks have developed and introduced a number of applications that ease the transaction process. One of these is online and mobile banking service. This service enables a customer to access banking services with ease and convenience. Mobile and online banking is a secure and a fast service, which also certifies the monitoring of one's accounts and transferring cash from account to account. Studies have shown that the use of checks has significantly gone down with the introduction of this service. Another such service that has dominated the industry because of AI is the payment of bills electronically (King 2010, 13). This service promotes the convenience of paying of bills. Bills such as electricity, water, and loans are easily cleared by use of mobile phones or computers. This service involves less transaction fees that would have been otherwise incurred when paying a bill through other institutions.

Progress in technology has also made depositing of cash in one's bank account easy. This, however, requires a customer to own a smartphone, with which they simply take a picture of themselves and send it to the bank to authenticate their details. After authentication, the bank then allows them to electronically deposit cash in their accounts. Results from findings show that the banking industry is prone to human error and the use of AI is a necessity.

Computer-Aided programs set up in banks send activity alerts to account holders. They often send emails or simple text message alerts, and this helps a customer keep track of

their account activity. This comes in handy when tracking theft through credit or debit cards used in banks. Some banks go further to provide a service in which a customer can pay bills to another person. This process involves the creation of an account where the customer simply enters details of the payee and the payment is electronically made. The merit of this service is it is not a requirement for the payee to belong to the same bank as the one making the payment. (King 2010)

Results from the studies show that financial systems have also extensively used AI with reference to data mining. Data mining is the process of quoting unknown, authentic, and comprehensible information from vast databases and using it to deliberate on business decisions. Data mining techniques include; time series mining, classification and clustering analysis. Data mining can help establish relationships between assets and generate forecasting models based on given data. Financial markets and institutions can apply data mining techniques to forecast short-term exchange rates, interest rates and stock prices. (Yeganarayana 2006, 112-114).

An expert system is a tool of AI applicable in financial systems. A computer-aided system acquires human expertise in a given field of knowledge and is commonly used to make decisions. Studies have shown that the use of expert systems is a common trend in financial markets and institutions (King 2010, 8) Expert systems have performed better than other decision-making techniques because they allow an alliance of different sources of knowledge. They give predictions in long-term periods for various trends in financial marketing, even those with low uncertainty (King 2010, 14). AI in the financial system has also adopted the use of artificial neural networks. These are tools used for prediction, classification, and control purposes. Artificial neural networks are able to establish functional relationships between various variables without aboriginal knowledge. (Yegnanarayana 2006, 133).

These techniques have succeeded in solving of problems of generalizing corporate bond ratings where other methods performed poorly. Artificial neural networks are particularly common in studies related to inflation. They are used to predict the patterns of inflation and from the predictions; financial analysts advise financial institutions on

measures to take to control inflation rates. Another tool for use in the financial system is the use of fuzzy systems. They are systems that are used to make decisions on the capacity of buying or selling of assets. Studies show that when fuzzy systems are combined with other AI tools as artificial neural networks, analysis of effects of separate events on stock markets is achieved. (Yegnanarayana 2006, 135).

The use of AI in banks allows them to reach their customer needs. Findings prove that customers have switched to banks that apply modern day technology for their banking needs. Use of machines also saves time and reduces the probability of error. Workloads that are accumulated when services are offered manually are eliminated and this saves on costs.

From previous studies, the use of AI has been emphasized in the banking system. Banks are places where people store their wealth in the form of money. An average person accesses their bank accounts frequently for transaction purposes. With the progress witnessed in the banking sector because of the introduction of computer-aided programs, banking has arguably become one of the easiest processes.

4.3. Transport Industry

Transportation problems present a number of features that make them responsive to remedy using AI approaches (Russel & Norvig 2009, 682). First, transport problems in most cases encompass both qualitative as well as quantitative data. Secondly, the behavior of systems in transportation may be hard to structure with the traditional approach. This is because of the uncertainty arising from the human component of the system or not understanding the interactions of unique system components. The third feature is that transportation problems usually result in challenging optimization problems which prove cumbersome to solve using traditional mathematical programming techniques. There are quite a number of AI applications, which may be viable solutions to the problems mentioned.

AI applications identify systems and approximate their functions. This involves the construction of dynamic models of systems from measured data or mapping system inputs to outputs (Russel & Norvig 2009, 639). Majority of the interrelationships in transportation systems between its components or variables is not fully understood. These being the case, empirical models are common phenomena.

Non-linear foretelling focuses on predicting the behavior of structures where an existing relationship between output and input is not linear. This is quite common in transportation problems including the degeneration of transport amenities as a function of environmental factors and traffic construction. (Russel & Norvig 2009, 647).

Control targets controlling a system in order to achieve a desired result. Control applications exist in abundance, in transportation. Some examples include dynamic route guidance, ramp metering on high ways, positive train controls on railroads, air traffic control and signal control of traffic lights at road intersections, which utilize AI so as to function efficiently. (Russel & Norvig 2009, 652).

Clustering defines the problem which involves the grouping of cases that possess similar characteristic together and highlight the number of classes or groups. In transportation, clustering can be used to identify particular classes of drivers, for example, on the basis of behavior. (Russel & Norvig 2009, 650).

In transportation, the aim of the transport planning process is to establish the transport needs of a community and recommend the best course of action needed to meet those demands. Several factors are taken into consideration including environmental, social and economic effects of transportation. Transportation planning based on AI support systems could be extremely useful, especially where precise analytical models are lacking.

Design is a profound activity of the transport engineering occupation. This includes the geometric design of highways, culvert design, guardrail design, interchange design, retaining walls design and the structural design of bridges and pavements. AI methods

add value to the quality of completed projects and enhance the capability of Computer-Aided design used for engineering design applications.

Pattern classification or recognition refers to a broad spectrum of problems where the goal is to categorize an object and rank it accordingly (Yegnanarayana 2006, 90). . Pattern recognition is mostly associated with image processing whereas prediction problems may fall under the pattern classification problems. Pattern classification or recognition problems include diagnosis of transportation equipment, image processing for data collection identification of cracks in pavements and automated incident detection (that is categorizing traffic state as incident free or incident).

Optimization is the study of the problems which an individual seeks to maximize or minimize a function. This is done by selecting values for a group of decision variables at the same time satisfying a given set of constraints. (Russel & Norvig 2009, 676). Optimization challenges are abundant in transport: designing an optimal transport network for a community, developing an optimal working plan for rehabilitating and maintaining a pavement network, advancing an optimal shipping policy for a company and establishing an optimal timing plan for a group of traffic signals are a few examples of optimization problems.

4.4 Hospitality industry

Accuracy is an essential aspect in the hospitality industry; it is required in recruitment of employees, regulating costs, and managing food and beverage operations (Jones & Kasavana 2012, 42). Forecasting in the hospitality industry is difficult due to frequent fluctuations in demand. This industry has been slow to adopt analytical technology despite the critical need for forecasting in its establishments (Jones et al. 2012).

By 2012, regression techniques, intuition, financial rations and the manager's experience were the main methods of forecasting demand in hospitality establishments (Jones et al. 2012, 116). These techniques are, however, inaccurate and inefficient as

compared to models that rely on technology. Most of the techniques adopted in the hospitality industry cause poor utilization of the human resources, and consequently cause reduced profit margins. Hospitality establishments are intricate enterprises that are affected by multiple variables. This results in low differentiation of interactions among target markets, current events and other variables. Long-time entrepreneurs in the hospitality industry do not use scheduling and forecasting as they consider them unreliable tools for predicting demand.

The use of capture ratios is based on the assumption that a constant variable can be used to predict demand in the hospitality industry. It is, however, essential to understand that demand cannot be calculated using one variable. The use of linear regression is also ineffective in predicting demand. Linear progression is based on the assumption that there is a linear relationship between variables in hospitality enterprises (Russel & Norvig 2009, 448). The discrepancy is evident when a graph of demand and any other variable is drawn.

An early adopter of AI in the hospitality industry is the Hyatt hotels. Its branch in Florida has room occupancy of 966, and is one of the largest in the East Coast. The establishment adopted an information system founded on AI principles. In San Francisco, the Pan Pacific establishment also adopted AI in its operations. The new system helped the company reduce its labor costs by 4% within the first year. In the consequent years, accuracy in forecasting in the banqueting, accommodation and restaurant departments increased by 90%. This helped improve customer satisfaction as the company could predict what its clientele wanted, where and when. (Jones et al. 2012, 73).

In the hospitality industry, 50% of operational expenses are incurred by the human resource department. The need for maintaining a well disciplined and motivated is

vital in sustaining customer satisfaction through a well-defined service culture. The hospitality industry can learn from other industries such as the healthcare industry that adopted AI in its early. An example is Covenant, which is a non-profit venture, has used AI to cut on its expenditure by up to USD 300,000 per annum (Jones et al. 2012, 262). The adoption of similar technologies in the hospitality industry would help reduce costs, and increase funds allocated in improving service quality.

4.5 Telecommunications industry

The telecommunication industry is characterized by use of high tech systems for daily operations. It is defined as a service industry with heavy detail that highly relies on the use of software. This industry has been a top beneficiary of technology advancements. (Yegnanarayana 2006, 82).

Software systems applied in the telecommunication industry are not simple; they have to bear various network frameworks and platforms. The systems, such as other high tech systems, are costly and must be highly dependable and effective, due to the ever-changing technology (Yegnanarayana 2006, 84).. The telecommunication industry is highly competitive and thus, the players in this industry have to constantly meet the rising user demands or users will always find other options and switch to them. The telecommunication industry would be redundant if there was no growth in technology.

Computer-Aided programs have been applied to this industry to help in its growth in order to compete with other similar industries. (Yegnanarayana 2006, 89). Globalization is one of the major causes of the increase in competition in this industry, and AI has intervened to promote healthy and fair competition. Another cause of the steady competition is the progress of technology.

Research shows that applications of AI in the telecommunication system include; network management, customer and market management, services and products management, expert systems, machine learning, natural language understanding and

distributed AI (Russel & Norvig 2009, 204-209). The first three techniques are largely used in telecommunication while others are frequently used. Network management encompasses the procedures and means needed to create and manage an effective network system. The management of network resources is crucial in the providence of services to user. Customer and market management analyses different customers and market behavior and predictions about these aspects can be made. New operators remain relevant by paying attention to customers and changes in the market. This means that old operators can easily overshadow them if they lack creativity and innovation. This competition translates to customer satisfaction. Services and products management entails identification of potential needs of customers from them and is the basis for designing new products and services.

Expert system is a technique that deals with the encoding of human ability on machines while natural language understanding involves speech recognition and synthesis by machines and their understanding of natural language (Krishnamoorthy & Rajeev 1996, 5). Machine learning refers to the learning expertise of a computer and distributed AI means solving different problems using a distributed method. Authorities especially the police to unearth criminal acts and serve justice to victims mostly use speech recognition techniques. (Krishnamoorthy & Rajeev 1996, 3.)

The telecommunications industry entails the use of telephones, personal computers and media. In previous ages, the communication of information was hard. Evolution of telecommunication dates back to the times when letters and telegrams were the only fast means of communication. This was followed by telephones and most recently cell phones. Technology advancement in the media industry has also played a key role in the growth of this industry. The use of AI has enabled easy transmission of waves to satisfy customers who rely on the media for information.

It is evident that AI techniques have been extensively used over the decades. The telecommunication industry is seen as one the largest beneficiaries of technology and a large user of AI. It is expected that future advancements in AI technologies will further

boost the growth of this industry. With customer satisfaction, the industry will register significant profit margins and this will lead to economic progress.

5 CRITIQUE OF ARTIFICIAL INTELLIGENCE USE IN BUSINESS ENVIRONMENT

Technological advancements always come with implications and never miss a point of criticisms. Scientists and users have criticized AI systems because of their reverse-engineering complex systems. AI has negatively impacted on the available chances of employment. Implementation of AI also tends to compare humans to machines and machines to humans, which many people consider unethical. To study critique of AI in the business environment was chosen secondary data analysis research technique. The sources to analyze are relevant literature, publications, internet sources.

5.1 Loss of employment

Technological advances in the first half of the twentieth century forced people to move from agricultural to manufacturing production. Increased use of technology again forced workers to move from the manufacturing sector to service industry. There are rising concerns that further advancements in technology especially AI systems may still push workers out of the service industry. This is because intelligence machines perform jobs that could have been done by many people.

AI machines have extensively replaced human labor. Some scholars believe that AI will impact more on employment than 19th century steam mills and textile engines ever did (Jong & Joolingen, 1998, 179). Economists argue that AI machines "hallow out" the economy. The main reason for this is newly created jobs come at the bottom of the economic pyramid while jobs at the middle level economic pyramid are lost to AI automations. Economic analysts argue that this trend will continue to increase as the complexity of the machines increases, leading to more economic impact (Jong & Joolingen, 1998, 181). Therefore, economic impact of Intelligence machines is likely to be disastrous not only to the displaced workers but also to the whole economy. People will tend to replace people with lower-cost machines, which will finally lead to the elapse of the traditional capitalism. People will therefore lose their earnings and may not afford to buy commodities (Jain, 2011, 3781). Since most intelligent machines are used

for performing middle level tasks, this puts the unskilled employees at a higher risk. Job losses throughout the economy will be too widespread, and its consequences may span to all sectors of the economy.

5.2 Comparisons human-to-human and human to service embodied agents (AEA) in the service industry

The world is currently undergoing a period of transition where computers humans may rarely understand the language of computers, but computers can understand more of people's language. Interactions are prevalent in the service industry, and communication is one of the primary requirements of these interactions. The type of communication used in a sector of the economy determines the extent to which the interacting agents understand one another.

One of the areas affected by AI machines is the communicative feedback. Communicative feedback implies the type of communication used by the communicators to ensure achievement of joint contact, understanding, perception and mutual satisfaction. These essentials are only possible where service encounters involve "yes" or "no" answers and even use of gestures is present. These allow to keep track of one another's willingness to interact and ability of each communicator to continue communicating. Human-to human communication has more communicative feedback than human to artificial embodied agents (Salomonson & Allwood & Lind & Alm 2013, 101). During human to artificial embodied agents' communication, there are no signs of feedback functions of the central processing unit.

Another critique of AI is on communicative relevance. One of the tools of communication between servers and clients is the desire of the communication parties to ensure relevance to the ongoing action or conversation. The foundation of customer satisfaction is based on the ability of the communication interaction to achieve particular goals as a means of achieving the objectives of the interaction. There are two pervasive types of relevance, which are global relevance and local relevance. In human-to-human interactions, these two types of relevance are continuously present

(Salomonson et al. 2013, 103). In contrast, human to artificial embodied agents exhibits global relevance but lacks local relevance due to prevalence of local keywords that trigger the global pre-planned expectations of the system creators (Salomonson et al. 2013, 103).

Customer satisfaction is based on proper turn management. There are usually overlaps of turns during customer-server interactions. The customer may want to inquire more about some commodity or add an extra question for clarification before the server responds. This is only possible in human-to-human communication (Salomonson et al. 2013, 94). In human to artificial agents, there are no overlaps or attempts to hold or take turns. Artificial embodied agents do not when the customer has finished or not finished since it follows a pre-planned structure of discourse. Unless the Artificial embodied agents provides clickable options for customer additions, these intelligent may leave customers unsatisfied due to is communication (Salomonson et al. 2013, 96).

Another factor to consider in regard to these comparisons is referential cohesion. Referential cohesion is necessary in business process interactions since it helps to maintain the relevance and co-constructed understanding to the subject matter of the communication endeavor. During human-to-human interactions, the customer and the server may constantly refer to previous parts of their conversation (Salomonson et al. 2013, 104). The most popular instance of this is when the customer and the flight assistant are talking about the type of flight arrangement the customer may prefer. In the case of human-to- artificial embodied agents interaction, the automated device repeats certain words being used a without clear understanding of what they really refer to. Only knowledgeable customer can be able to request for specific information, otherwise, the AI machines may give unwanted information to the customer.

Therefore, it is still questionable whether the artificial embodied agents can really improve the extent to which customers are satisfied in the service industry. This is because artificial embodied agents do not have enhanced communication features that can improve the quality between customers and servers interactions.

6 CONCLUSION

Organizations use AI techniques to deliver to customers products and services that suit their needs; such products satisfy the needs of customers and the customer becomes loyal to the company. AI systems have unique characteristics that help them in achieving the goals of a firm. Systems are developed based on beliefs, desires, and intentions of a company. The system communicates with the developer by use of artificial languages; different developers developed different languages that have different features. There are different AI techniques that are used by different organizations according to the nature of the decisions of these organizations. Despite of the different techniques, AI technology is utilized together with software engineering.

The research has showed that AI is commonly and successfully used in different service industries. Several industries have been studied: health care, e-government, banking, transport, hospitality and telecommunication industries and AI was identified as well as its beneficial impact on business processes.. In e-government industry it has increased public participation in various projects and improved the competence and productivity of the public sector, also the governance factor was improved. In banking industry AI is used to organize banks operations and to participate in trading. Results from the studies show that financial systems have also extensively used AI with reference to data mining. An expert system is one of the tools of AI which is applicable in financial systems. Transportation problems present a number of features that make them responsive to remedy using AI approaches such as non-linear foretelling, control applications, clustering, pattern classification, optimization and transportation planning. In hospitality industry Computer-Aided and AI technologies application enabled hotels to generate human resource schedules and forecast demand with a relatively high accuracy. The telecommunication industry is seen as one the largest beneficiaries of technology and a large user of AI. It applies AI Technology in network management, customer and market management, services and products management, expert systems, machine learning, natural language understanding and distributed AI.

Also has been proven the relationship between customer satisfaction and AI technologies implementation. The role of application AI and Computer-Aided Technologies is expressed in improving entire enterprise operation, showing increasing organization working efficiency, accelerating all the processes, increasing customer satisfaction and employee's loyalty. It was evident as customer satisfaction rate in the institutions under the study where Computer-Aided systems based on AI principles are successfully implemented was totally higher than in other institutions without this recent technology. Therefore AI in very recommendable for application in organizations in different industries as it improves business processes, accelerate optimize and automatize systems, brings the quality of service and customer satisfaction to a new level.

AI is criticized in business environment due its inability to completely replace human resources from one point and due to the loss of employment for other. The conceptual framework shows that only interactive competent use of AI technology and human resources results in full successful outcome.

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APPENDICES

APPENDIX 1: QUESTIONARRIES

Здравствуйте! В стенах этого учреждения проводится социологическое исследование. Результаты которого помогут вывести обслуживание пациентов в больнице на новый уровень! Для исследования важно мнение пациентов больницы о предоставляемом в её стенах сервисе.

Пожалуйста оцените по шкале от 1 до 10 такие факторы работы больницы как:

Насколько эффективно лечение в этой больнице?

1 2 3 4 5 6 7 8 9 10
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Насколько легко получить необходимые услуги в больнице?

1 2 3 4 5 6 7 8 9 10
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Насколько быстро Вы получаете необходимые услуги в больнице?

1 2 3 4 5 6 7 8 9 10
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Как бы Вы оценили персональное обслуживание в больнице?

1 2 3 4 5 6 7 8 9 10
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Как бы Вы оценили доступность обслуживания? Цена лечения и медикаментов?

1 2 3 4 5 6 7 8 9 10
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Насколько доступна информация о своём лечении?

1 2 3 4 5 6 7 8 9 10
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Оцените от 1 до 10 Вашу общую удовлетворённость от обслуживания в этом учреждении?

1 2 3 4 5 6 7 8 9 10
☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐ ☐

Спасибо!
Ваше мнение очень важно
для нас!

Translated:

"Hello! Within the walls of this institution conducted a sociological study . The results of which will help take care of patients in the hospital to a new level ! Important for the study of hospital patients opinion about the provided service within its walls .Please rate on a scale from 1 to 10 hospitals of such factors as:

How effective is treatment at this hospital?

How easy is it to get the necessary services in the hospital?

How fast you get the necessary services in the hospital?

How would you rate personal service in the hospital?

How would you rate the availability of service? Cost of treatment and medication?

How much information is accessible about your treatment?

Rate from 1 to 10 your overall satisfaction with the service at this facility?

Thank you! Your opinion is very important to us!"

APPENDIX 2: INTERVIEWS TRANSCRIPTS:

Stacenko Alexey Vladimirovich, System Administrator of Private Medical Center "Avicenna". Inteview was conducted using Skype software in 2013, August 5.

Researcher : Hello Aleksey, could you please tell about software that Private Medical Center "Avicenna" uses?

Interviewee: Yes, of course. Our medical center uses Polibase software. This system provides comprehensive automation of their medical institution: accounting of patients and medical staff, maintenance scheduling and registrations, diagnoses record, medical services cost calculation and payment accounting, payroll medical personnel, preparation of any report on the work of doctors, receptionists, offices and clinics in general, also this system can monitor the efficiency of advertising

Researcher: Thank you. Do you know what is Artificial Intelligence?

Interviewee: Yes I do.

Researcher: Then the last question: How do you think is Polibase software is one of examples of Artificial Intelligence?

Interviewee: Certainly it is.

Researcher: Thank you.

Drapanovskyi Boris Nikolaevich, Head Physician of State Municipal City Clinical Hospital № 3. Personal inteview.

Researcher: Hello Boris Nikolaevich. Thanks for your time and help. Could you please tell about new Computer-Aided system applied in the hospital?

Interviewee: Hello, Yes of course. It was applied in January 2013 with Russian president administration subsides. We have three elements: Medical information system MEDWORK, touchscreen front-lines registration and electronic queue. MEDWORK many features such as patient card record keeping, coverage of all major stages of the treatment process, preparation and processing of medical and financial statistics, planning techniques and clinical work, billing patients and accounting services, working with other organizations and insurance companies, design and generation of report forms. This system automates and accelerates the hospital, provides medical information to doctors, analyzes medical data and suggests possible solutions, solves a lot of routine tasks, helps in planning and competent time-management. Also recently introduced touchscreen front-lines registration and electronic queue are very effective in internal hospital operations. Electronic registration stands are integrated with MEDWORK software and allow customers independently make appointments to specialists, plan their procedures schedule. Electronc queue system helps to keep lines of patients in order, also it helps to escape conflicts

Researcher: Thank you. Why was it decided to introduce this new technology in hospital system?

Interviewee: During the years burden on our institution has increased. Also hospital system's inability to cope with the influx of patients was one of the reasons. It was not able to manage rationally resources and time which led to overloads and non-medical burden on specialist. The outdated method of paperwork caused many difficulties as it was impossible to cope with this amount of papers, it led to time loss and document loss

also And our customers were not satisfied with our services, they had to wait hours to get their treatment.

Researcher: Thank you. What impact did introducing of new technology make on hospital operations?

Interviewee: Introducing Computer-Aided system help in resolving listed before deficiencies. Now our hospital performance is on a new level. The efficiency of doctors and non-medical services is totally improved, the loyalty of the medical staff is higher nowadays. Also the patient satisfaction rate is increased. New automation system also benefits in improving internal medical records, optimizing the process of mandatory reporting to the parent organizations, presenting the results of clinic for management in real time.

Researcher: Thank you Boris Nikolaevich for your time and answers.

Interviewee: You are welcome.