ADOPTION AND IMPACTS OF ROBOTS IN SERVICE SECTORS OF NEPAL

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ABSTRACT

Robotics is field of science and engineering which involves the concept idea, design, construction and operation of robots which can move and react to sensory input. The trend of implementing robot in service sectors for automation is rising. Service robots are robots that are semi or fully autonomous that have ability to freely move and interact with people and performs useful tasks for well-being of humans. They are capable of getting information from its surrounding and making decisions and acting independently in real environments to complete given jobs. The main objective of this research is to give future directions that guide for the adoption of robot in service sectors of Nepal. This study also covered technical, economic and operational feasibility. This placement of robots reduces the problems arise by human. Service robots are able to do every work more efficiently and effectively than that of man. One of the main advantages of service robot is service robot can operate 24/7 and minimize the problem of labor unavailability. Service robot are very much useful and feasible in terms of economical, technical, and operational and can be use in every service sector. Service robots are a boon for service sector it all depends how we look upon it and the way we react to the changing environment and upgrade ourselves. In this study information's are collected from questionnaire by 113 respondents, international journals, research paper, books and related website.

Keywords: Robotics, Service Robot, Human Robot Interaction, Adoption and Impact of Robot, Service Sectors.

1. INTRODUCTION

Robotics is a very attractive and challenging field of mechanical engineering, electrical engineering, and computer science which involves the concept idea, design, construction and operation of robots which can move and react to sensory input. (Rouse, 2015). The field of technology, science and innovation has progressed all through the most recent couple of decades. Among those progresses, robots have turned out to be critical by overseeing the greater part of our everyday errands and attempting to draw near to human lives. As robotics and autonomy, human-robotic relationships are getting more and more vital (Adam A, 2017).

In today's world, the use of service robots is going on increasing. The service robots are robots that performs useful tasks for humans or equipment excluding industrial automation application (Zielinska, 2016). Service robots are robots that are semi or fully autonomous that have ability to freely move and interact with people and performs useful tasks for well-being of humans (Calderone, 2019). Originally, robots have been carried out as a method of automation in an industrial area. Automation permits for techniques to be performed in a good manner while making sure regular exceptional level. Service robots carry out responsibilities in the human surroundings that help human needs. This improvement is in

particular exciting towards the historical past of the growing significance of service region. Our economy relies greater than ever at fee introduction by offerings, they may be key to destiny aggressive advantage. Similarly, to economic context, automation through the employment of service robots becomes a way to growth the competitiveness of a service (Niels Garmann-Johnsen, 2014).

1.1. Background of the Study

Robotics is field of science and engineering to design and build efficient robots that deals with looking at how any physical constructed technology system can perform a task. This robotics field intersects with electronics, artificial intelligence, computer science, bioengineering, mechatronics, and nanotechnology (Rouse, 2015). With the advancement of many new technologies like big data, sensors and artificial intelligence, robotics field also has become more advanced (Techopedia, 2017). Robots are broadly used in such industries as car manufacture to carry out easy repetitive duties, and in industries where paintings have to be accomplished in environments hazardous to people.

Many elements of robotics involve Artificial Intelligence (AI); robots may be prepared with the equivalent of human senses inclusive of imaginative and prescient, touch, and the ability to feel temperature. Some are even able to simple selection making, and modern-day robotics studies is geared in the direction of devising robots with a diploma of self-sufficiency in order to permit mobility and selection-making in an unstructured environment (Hosch, 2019).

In 1942 writer Isaac Asimov introduced term robotics. He presented laws of robotics in three ways:

1. A robot may injure a human being.
2. A robot must obey the instructions given by human beings except where such orders would conflict with the First Law.
3. A robot must protect themselves as long as such protection does not conflict with the First or Second Law.

As a means of automation, robots were first used in industrial sector which permits for tasks to be performed in a good way producing equal level of quality. Further the used of robots reduced worker cost, increased output, and for repetitive and dangerous jobs (Tobias Mettler, 2015).

Service Robots

Service robots are not new now, and this is the time to accept new technology, followings are the types of robot. They are able to do every work more efficiently and effectively than that of human. They are capable of getting information from its surrounding and making decisions and acting independently in real environments to complete given jobs. To serve the human needs service robots carry out responsibilities within the human surroundings. Since there is increasing in importance of the service sector development of service robot is very interesting (Tobias Mettler, 2015).

There are many reasons for implementing service robot, the main reason is to cut labor costs that is no need to pay for employees another is to increase quality, efficiency, sanitation etc. and lastly using robotics as branding drawing attention regardless of the practicality of its use. Adoption of service robot is relying on technology cost, labor cost and, customers' willingness and readiness to be served by a robot (Stanislav IVANOV, 2017). Since service robots must communicate and operate in an unconstraint human-targeted

environment, an excessive knowledge of autonomous is an inborn feature of them (Tamás Haidegger, 2013). This placement of robots in will reduce the problems arise by human errors. Main advantage of service robot is service robot can operate 24/7, much more than that of human and minimize the problem of labor unavailability.

As service robots have grown to be greater useful to distinct human existence areas, they have discovered their ways in research. While existing studies as a substitute specializes in technical elements of the robot, there is no context specific research on service robots (Niels Garmann-Johnsen, 2014). Our life will be changed with the use of this technology and at the same time our life will also become more advanced.

Figure 1: Service Robots (Source: www.ndtv.com)

1.2. Statement of Problem

Today many service sectors are facing the problems of increasing cost as well as shortage and unavailability of human resource. At the same time, they are also facing the problems that they are not able to provide services on time, less effective, poor productivity, owing to which human satisfaction towards their services is decreasing. Nowadays there are rising many human errors which directly effects on services that service sectors have been providing. Human are not willing to doing same repetitive task again and again due to which their motivation towards job is declining.

1.3. Purpose of the Study

Nowadays everyone is looking towards the use of service robots to overcome the problems of rising lots of human errors, high worker cost, unavailability of worker etc. The main purpose of this research is to give future directions that guide for the adoption of robot in service sectors of Nepal.

1.4. Objectives of the Study

The main objectives of this research are as follows:

1. To access the current pattern on uses of service robots.
2. To conduct feasibility study in following dimensions: Economic, Technical, and Operational.
3. To investigate the effectiveness of service robots.
4. To give future directions that guide for adoption of robots in service sectors of Nepal.

1.5. Research Questions

1. What is the effectiveness of service robots in service sector?
2. How service robots will gain human satisfaction?
3. What are the challenges to operate service robots in real working environment?

4. What are the impacts of service robots in service sector?

1.6. Scope of the Study

The major scope of this research are as follows:

1. Investigate and study the impact of robots in relation to the service sectors.
2. Investigate and study the current pattern of uses on adoption of service robot.
3. Feasibility study in following dimension: Economic (Is it cost effective?), Technical (Is it technically feasible?), and Operational (Is it easy to operate?)
4. Investigate and study the behavior of people in response to service robots.
5. Provide a guideline which will give future direction for adoption of robots in service sectors of Nepal.
6. Investigate and study the effectiveness of service robot in real working environment.

1.7. Significance of the Study

This research also emphasis on the use of technology by the adoption of service robots. This study contributes to the body of knowledge by recognizing the possible benefits and costs minimization with the adoption of service robots at various service sectors. This study is aiming to be a baseline for further researches, articles, readings and papers. The concerned authorities may use the findings of the study for further purposes and any interested researcher in this area may take it as a reference guideline.

1.8. Limitation of the Study

There are many service sectors but, in this study, only three service sectors hotel/restaurants, banking sectors and healthcare are included. This study doesn't include actual building of service robots.

2. LITERATURE REVIEW

2.1 Definition of Robotics

Robotics is the reality that the alternate related to the generation, operation and construction of robots – a wide and several areas linked with one-of-a-kind industrial sectors and customer utilizes (user, 2019). Robotics is field of science and engineering which involves the concept idea, design, construction and operation of robots which can move and react to sensory input. Robotics, design, creation, and use of machines (robots) to carry out responsibilities completed traditionally by people. Robots can likewise be classified utilizing different standards as industrial, service and harvesting robots (Bachche, 2015).

According to the studies done by Pew Research center, by 2025 robotics will spread wide segments of people daily life with extreme implications for a range of different sectors like health care, home maintenance, logistics, transport, customer service and many more (Kautish et al, 2008, 2012, 2013, 2020). In this the key reasons to be hopeful concerning robotics were: 1) Different types of jobs/work may displace due to advances in technology. 2) Human beings will adapt to those changes via inventing absolutely new types of work, and by way of taking benefit of uniquely human abilities. 3) Technology will free us from everyday drudgery, and permit us to define our relationship with work in a greater high-quality and socially beneficial way. 4) Finally, we as a society manage our own future via the alternatives, we make (Janna Anderson, 2014). More precisely, robotics makes use of the present Information and Communications Technology (ICT) infrastructure and also implies a persisted technological evolution of these networks (Lamber Royakkers, 2015).

2.2 History of Robotics

Machines had been a part of human reality for a long time. The commercial Revolution marked a chief step forward within the use of machinery and machines. The significance and

importance of machines were assessed in extraordinary methods: some regarded machines as threats whilst others noticed promising possibilities in them. Today, inside the generation of ubiquitous generation and proper inside the middle of a transitional phase, the scenario is comparable with clever machines and tactics everywhere. Robots ought to end up human assistants and, within the long-run, they could come to be co-employees. The person-gadget dating could end up an increasing number of included and interactive as smart machines come to the assist of man within the most diverse contexts at work and within the unfastened time (Kaivo-oja, 2015).

1801: Joseph Jacquard builds an automated punched card.
1890: Nikola Tesla builds 1st autonomous vehicles (Tesla)
1921: Capek introduced the word "Robot"
1938: First programmable paint sprayer was designed by Pollard & Roselund
1941: "Three Laws of Robotics" is writer by Isaac Asimov
1946: George Devol patents a playback device.
1954: First programmable robot referred to as Unimate designed by Duvoll
1962: Unimate was introduced as the first industrial arm robot. To use in General Motors assembly line unimate finish repetitive or risky tasks.
1970 - 1st robot arm developed at Stanford University
1976: Soft Gripper is designed at the Tokyo Institute of Technology by Shigeo Hirose
1981: Direct drive arm builded by Takeo Kanade which was the first that installed motors into the joints of the arm.
1989: At MIT, Mobile Robots Group unveiled walking robot named Genghis.
1993: at Carnegie Mellon University, walking robot with 8 legs developed named as Dante.
1996: Honda debuts the P3, a humanoid robot.
1997: NASA's wheeled robot landed on mars that sent images and data to Earth.
1999: AIBO robotic pet released by SONY.
2000: ASIMO a new humanoid robot debuted by Honda.
2006: LEGO MINDSTORMS 's second generation was launched (Connection, n.d.).

2.3 Human Robot Interaction

HRI is a very new area of research that targets broadening the functionality and usability of robots via making their interactions with people increasingly common and well matched with human desires and abilities (Manuela Veloso, 2012). Human–robot interaction (HRI) is presently an extremely broad and assorted research and structure action. The literature is growing quickly, with hundreds and thousands of publications every year and with activity by various expert and organizations for the most part in the specialized orders of electrical and mechanical and engineering, computer science, and artificial intelligence (Sheridan, 2016).

Designing robots can be compelling to study advance ideas in Human Robot Interaction (HRI), develop new protocols and models for communication (Salmiya Afsheen, 2018). Social Robotics (SR) and Human-robot interaction (HRI) are sub-branches of Human Computer Interaction (HCI) which include conception, designing, executing and analyzing robotic systems (Muneeb Imtiaz Ahmad, 2017). The necessity of imposing Adaptive Social Robots (ASRs) or Adaptive Robot Interfaces (ARIs) has additionally emphasized in Human Robot Interaction literature (Iolanda Leite, 2013).

2.4 Service Robots

According to report on 2012 on service robots stated that approximately 2.5 million service robots had been sold in 2011 that include both personal and domestic robots and that the sales fee increased by way of 19% to US $636 million (Robotics, 2012). The specific form robotics that focus on different solutions for helping people is service robots (Anas Mathath, 2016). The emphasis of business and information systems (Kautish et al, 2016, 2018, 2019) engineering research is constantly shifting to a greater centered view (Walter Brenner, 2014). This shift is empowered by innovative improvements just as by integration of Information Technology (IT) into real life surroundings leading to a design of digital-physical information systems (Thomas Hess, 2014).

Service robotics is one region of digital-bodily information systems. Technical device which perform useful task for well-being of human in autonomous manner are service robots (Robotics, 2015). The difference between service and industrial robots is based on closeness to end-users and area of application (Edson Prestes, 2013). Since service robots must communicate and work in an unconstraint human-targeted environment, an excessive knowledge of autonomous is an inborn feature of them (Tamás Haidegger, 2013).

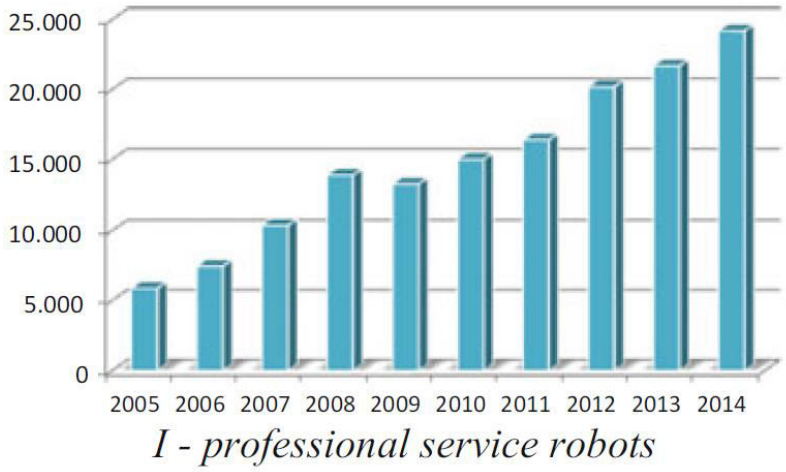

Figure 3: Professional service robots

Service and social robots (Agah, 2016), (Ferreira, 2017), (Jochen Wirtz, 2018) are commonly used in education (Timms, 2016) and elder care (Sebastian Glende, 2015). For the reason that service robots, be a part of the human environment, they should meet exclusive necessities. Better technology must use that help robot blend with human targeted context so as to make better HRI. Since robots are capable to carry out difficult responsibilities, they are capable to enhance from economic to the service context (Tobias Mettler, 2015). Nowadays, service robots have more than one software regions provider robots are finding their manner into the human targeted surroundings, however somehow distance they will progress has but to determined out (Tobias Mettler, 2015).

2.5 Service Robots and Service Sectors

2.5.1. Service Robots in Health Care

In health care sector huge number of service robots are expected to develop in the following couple of years (Hay, 2013). Robots, for example, the Aethon TUG, as indicated by the organization, out of 7 days a week running only two shifts, spares the work of 2.8

fulltime employees, yet costs not exactly a fulltime employees (Mohammed Owais Qureshi, 2014).

In health care, service robot has emerged as the nurse's avatar into the attendant's symbol as the robot is ready to talk and recognize the requirements of the patient. For patient, humanoid robot enables the patients who are bother to move. Patient can likewise talk to robot and see the robot as another presence of person (Chen-Hunt Ting, 2014).

For the treatment of mentally disabled young individual age of only 5-12 years old, specialists used a robot known as known as Cosmobot. Treatment can be more interesting and fascinating by the usage of this robot for youngsters and considers better achievement when accomplishing long term treatment (McNickle, 2012). Robots can carry out a role in supporting to complete nurses their daily responsibilities so as to deliver good healthcare (Mohammed Owais Qureshi, 2014).

DG Information Society and Media, European Commission had funded for study in healthcare robotics, with the intention to analyze as well as broaden a roadmap for robotics in health care and medicine (Mohammed Owais Qureshi, 2014).

According to indicated by Kinetic counseling, by 2050 1 of every 4 individuals in the UK (United Kingdom) will be more than 65 years old age. 25% of population that is 30 million of people in Japan will be more than 65 years of age and it rapidly growing. One likely technology is applying robotics to address this old aging problem (Jervis, 2013). In comparison with humans, robots may be faster to teach, less expensive to hold, less difficult to repair as well as much less liable to be fed up by way of monotonous duties. They can support the older, decreasing the requirement for care and the demand for care homes (Jervis, 2013).

In health care robots had been suggested as a shape of assistive technology which may assist to cover a gap between the demand and supply of services (E. Broadbent, 2009). The normal development in the portion of the older population inspired analysts to structure imaginative arrangements, incorporating robots in the field of aged care (Chiara Piezzo, 2017).

2.5.2. Service Robots in Hotel/Restaurant

A robot can be used to operate/control a restaurant to collect orders and deliver the same (Nandini Ammanagi, 2016). Service robots are useful for restaurant. There are some human errors that can reduce the branding and popularity of restaurant also requesting depart by means of waiter will deliver the labored-up condition in (Ashish Dutt Sharma, 2018).

In hospitality sector, robotic technologies and service automation have made their way affecting its exceptional sectors (López, 2013). Hotels carried out kiosks for self-service that allow guests to complete Check-In and Check-Out via robotically without involving front desk retailer (Kim, 2014).

(Akkharaphong Eksiri, 2015) in his work described about development of service robots and its evaluation in real restaurants. Developing two types of service robots that is the one that taking orders from customers and second one the robot that deliver ordered food to the table. For the six months each of robots are evaluated in real working environment in five branches in restaurant of MK groups which are located inside the Bangkok. Robots have attracted more than 235,680 customers with around 14,280 services.

Stakeholders Responses: Customer and general staff are the stakeholders that were observed. Behaviors of stakeholders is observed and their experience and responses is described as below.

The customer of three sub-groups have different behaviors. Elderly customers aren't surely familiar with robot. Adult customers are acquainted with robotic and them probably to take photo video with robot. Young customer has eager interest with robotic and they prefer to have meals served from the robot. These younger customer's willing to make more food orders. The young customers below (kind of) 12 years old had surprising behaviors like pulling and pushing different parts of the robotic. Staffs are there to control and supervise such different behaviors. Many of the customer including young and adult have positive respond towards robots. It is likewise found that robots help to make better relation with customers.

A restaurant in Kathmandu, Naulo restaurant is first digitalized robotic restaurant in Nepal. There are five service robots which can be working and those robots are used as waiters to serve the food. Since these robots seems to be user friendly and very easy in terms of operation, it is expected that these robots are one of the most advanced service robots in the world. In Naulo restaurant food ordering system is likewise specific, customer can make order by using the use of digital display which is set up inside the tables. Once the orders are placed and it'll received without delay by the kitchen due to which it's no want human involvement to take the orders and passing to kitchen phase. Once the food is prepared to serve, the robots accumulate the food from the kitchen counter and serve in customer table (Today, 2018).

(Neeti Malik, 2016) the use of robot is growing today. They're able to do the work greater efficiently and successfully compared to human. Such service robot is one the application of robotics. In traditional restaurant all process is manual like inquiry meals to serve, ordering food, putting order on table, reminding dishes of customer, this is tedious and required large quantify of manpower. So, to improve the provider great for customers efficaciously through using advanced technologies has made this easy that is service robot.

Advantages of service robot are effective and efficient service, reduces customer waiting time, only one-time investment in the system and get benefit forever, service can be improved, faster and reduce the cost of laboring and no need of staff to make order, since customer can make order by themselves. Service robotic can work in different areas of human societies like restaurants, hospitals, banks, libraries and educational institution etc. (Neeti Malik, 2016).

(Lee, et al., 2018) described that in restaurant, robotics has been entered for serving customers by taking food order and serving to them. Service robots continually draws attention of customers and clear up the hassle like worker's unavailability, training and rate of turnover. Owing to such reasons, service robots might become essential restaurant experiences in future. The investigation and research are made via interviewing supervisor of different restaurant. The outcomes display that mind-set definitely marks usefulness and reputation.

(Luo, 2015) has described in restaurant business, service robots are getting extra not unusual. In China, Japan, Singapore and United States many automatic restaurants had been beginning. FuA-Men restaurant robotic in Japan, automated robots without intervention of human chef it used for making ready dishes. This robot is efficaciously delivering the dishes in very short time frame to put together eighty bowls of noodles in step with day which expenses around seven dollars each. MIK, the Japanese agency manufacture robotic that designed for computerized dish cooking like stir-fried veggies and fried rice is another example of service robotic.

India's first robot-themed restaurant was released in Chennai. The restaurant named 'robot', which changed into formerly referred to as MOMO, turned into established by Venkatesh Rajendran and Karthik Kannan. It was relaunched to make it match with the theme along with the entry of the 4 robot waiters. In the hotel and restaurant business, food is not most effective the things that matters in the current scenario the experience matters (Biswas, 2017).

2.5.3. Service Robots in Banking / Financial Institution

Robotics has allowed artificial intelligence and device studying to be a game changer in financial services. It reduces the price and time both which in turn will increase the operational performance and productiveness. According to CB Insights the investment in robots have multiplied from155$ in 2011 to 587$ in 2015. These robots have modified the face of modern-day day banking which in turn has helped satisfy the millennials requirement of technology. RPA also gives full audit developments for each procedure with a purpose to assist to attain manner compliance and decrease risk (Nair, 2018).

The humanoid robotic market will develop from $320.3 million in 2017 to $3,962.5 million, or $3.9 billion, in 2023, at a CAGR of 52%. -ReportsnReports, 2017. This boom will be focused via the advent of greater superior capabilities on this humanoid robot. Demand for robots in warehouses and logistics methods is set to majorly effect deliver chain operations, in line with a report from Tractica: In 2016, there were an expected 40,000 robot units shipped international—but via 2021, there can be 620,000 (Rayome, 2017).

Retail banking is a service enterprise centered towards the patron's money and its control (Jayshree Chavan, 2013). With the growing competition in the retail banking enterprise and fast technological evolution, how do banks innovate to meet those challenges? Most recently, with innovation in generation, banks are considering the adoption of RPA to automate repetitive tactics. With the implementation of RPA, it permits Banks to acquire clients' demands. price and expenses charged with the aid of banks from its customers is one of the factors influencing purchaser delight (Ayad Hendalianpour, 2017).

Pari has been deployed in the branch of the Nepal SBI Bank. This branch is known as in Touch branch, functions as a customer service which provide information and guide customer. This robot starts its work by interacting with customer with greeting like saying good morning, good afternoon "Welcome to Nepal SBI InTouch". According to the bank officials, the robotic received a very good comments from customers, due to which the Nepal SBI bank was endorsed to use the second one advanced robot designed and developed by the same company within few months (Xinhua, 2018).

In line with CB Insights, investment into robotics rose by using one hundred 15% in 2015. Robotics process automation can convey amazing time and price performance enhance productivity and operational upgrades. For the past years, investment into the robotics region has risen hastily. In line CB Insights, globally the range of investment deals in robotics almost twice from round $273 million in 2014 to $587 million in 2015. Funding increase in 2015 turned into 115%, in comparison to 45% in 2014 (Banker, 2017).

Figure 4: Investment growth in robotics rising in 2015 compared to 2014 (Source: http://www.theasianbanker.com)

According to the IFR (International Federation of Robotics) guesses, there may be a complete supply around 1.4 million service robots during 2016 and 2019, forecasting a mean increase charge of 13% within the delivery of robots during 2017 to 2019 (Banker, 2017).

3. RESEARCH DESIGN AND METHODOLOGY

Research means approach to looking again to cursory and curious appearance on a phenomenon that the research is interested in studying. Extensively speaking, research is the technique of locating out the answer to a problem. Research is a clear activity with assume that its result will make a contribution to or represent the solution of an actual problem (Dr. Mcchester Odoh, 2014). Research is an intellectual activity (Rani and Kautish, 2018) (Kaur and & Kautish, 2019). It is answerable for bringing to light new understanding. It is also responsible for correcting the existing mistakes, eliminating present misconceptions and adding new gaining knowledge to the current fund of knowledge (Dr. Prabhat Pandey, 2015). Research design and methods are different but however intently related, due to the fact appropriate research design guarantees the information you gained will assist you answer your research question extra successfully.

3.1 Research Design

A research design is a step-via-step technique utilized by a researcher to conduct a systematic study. It is the framework, a blueprint for the research take a look at which guides the collection, analysis and evaluation of data. In simple words it is overall plan how you will perform your research. It includes various techniques and strategies so that a research problem can be handled effectively. The feature of a research design is to make sure that requisite information according with the problem at hand is gathered correctly and economically (Relivingmbadays, 2013). A good research design ensures there are less error which can be considered as best research design (Bhasin, 2019).

Good research design must include following things:

- What is the research all about?
- Why is the research being done?
- Where will be the research be performed?

- What kind of data is needed?
- What durations of time will the study encompass?
- What techniques of data collection will be used?
- How will the data be analyzed? (Relivingmbadays, 2013)

Following are the types of research design that are most frequently used.

3.1.1. Descriptive Research

In this research, research design that was followed is descriptive. Descriptive research design includes the traits of human beings, socio-economics traits inclusive of their marital status, age, education, earnings and many others. The qualitative data is basically gathered like understanding, attitude, ideals and view of the human beings (Farooq, 2013). Research design is primarily based on easy questions like How, Who, When, What and to what extent. This form of research is used to calculate averages, frequencies, and statistic of data. To identify which variable is important worth studying, the descriptive design offers a general review of the study which is useful to determine beneficial guidelines (Bhasin, 2019).

3.1.2. Exploratory Research

This form of research design is used for the researches on which no research is achieved earlier than and haven't any research to consult. The point of interest of exploratory design is to get understandings and know-how for later research. This research determines study is possible for future or not and later strategies may be evolved for extra research. It is beneficial to collect information for a selected topic. This type of research will answer all questions like “how” “what”, and “why” (Bhasin, 2019).

3.1.3. Experimental Research

This form of studies design is regularly used while there may be a priority of time which includes cause will constantly precede impact and when there is balance in a causal relationship such as specific reason will constantly cause the same impact. Experimental research design is the blueprint of the procedure that allows researchers to govern all factors of the experiment. It can provide an excessive stage of evidence for a single research. This research determines what the reason of something to take place is. Experimental research is not actual and it may not suit into the real world. Due to using special equipment and facilities the experimental researches are usually high priced (Bhasin, 2019).

3.2 Research Method

The techniques, procedures that are applied within the collection of data can be simply called as research methods. Different research method uses different tools while collecting data as per their objectives. There are mainly two types of research method, Qualitative research method and quantitative research method.

3.2.1. Qualitative Research Method

Qualitative Research Method collect information about lived experiences, feelings or behaviors. It assists in allowing researchers to achieve good knowledge of complex ideas, social interactions. This kind of research is beneficial within the investigation of why or how matter has been taken place, explaining actions and understanding events. Interviews, focus groups, observations, document analysis and oral history or life stories are qualitative techniques or tools.

3.2.2. Quantitative Research Method

Quantitative research method collects numerical statistics which may be ranked, measured or labeled via statistical evaluation. This form of research method is beneficial for

determining to what extent, how much, how many, or how often. Surveys or questionnaires, Document screening and experiments are quantitative techniques or tools.

3.2.3. Mixed Research Methods

Mixed Research Methods combined both Quantitative research as well as Qualitative Research. This research method offers a complete method of combining as well as analyzing the numerical record with deep contextualized understandings (guides, 2019).

3.3 Data Collection Methods

Data collection is the manner of gathering the desirable data carefully, with least distortion, so that the analysis can also provide solutions which might be credible and stand to logic. Data collection is very much essential in any kinds of research. Poor data collection effects at the end result and in the long run result in unacceptable consequences which shouldn't be done (J. E. Osang, 2013). There are different methods of data collection were used during this study; data are collected with two different source, primary source and secondary source.

3.3.1. Primary Data

Primary data is first hand data collected by researcher. The researcher collects such data on purpose, due to the fact no previous information of the data exist to be accessed by using public. Primary facts can be collected by the usage of a variety of methods like field observation interviews, surveys, focus groups, and so forth. Such data is considered to be pretty reliable.

Interview

An interview is supposed to record and examine human being's opinion, experiences, beliefs and ideas on applicable topics. The respondents are required to provide greater exact records and information. This gives a deeper perception into the social phenomena, as compared to the quantitative methods which include surveys and questionnaires.

Questionnaire

Questionnaires is used to gather records via a chain of questions from a set of respondents. Widely different groups of people are involving in questionnaire. Since the respondents need to give answer to questions themselves questions need to be prepared accordingly. Researcher can email questionnaire to different group of people or it may accept to them by means of hand and be accrued after some time (Nayeem Showkat, 2017). The information that collected from above sources permit for suitable interpretation, analysis, compilation, and arranging of the whole research.

3.3.2. Secondary Data

Data that are already gathered and compiled by someone else, and are reachable to the general public are called secondary data. The secondary data refers to those data collected from various journals, magazines, website and newspaper, books and statistical data on the related topics. Such data are used by the researcher from the preceding studies and different sources. The selection about which tool to apply for data collection is guided by the research questions (Nayeem Showkat, 2017).

4. DATA ANALYSIS AND INTERPRETATION

3.1 Respondents Background

For this questionnaire respondents are of different age, gender, employers and employees of different sectors, some are working in banks, health care, and hotels/restaurant. The questionnaire was done through online survey which was made accessible and available for

the respondents. The questionnaire was distributed to 140 respondents via google survey form, among them only 113 respondents completed surveys.

4.2 Analysis of Data

The analysis part is always important as a prerequisite in order to being able to come up with a result. It is difficult to visualize raw date, thus presentation of data in more meaningful way is required. They provide simple summaries approximately the pattern and the measures together with easy graphics evaluation, they form the basis of in reality each quantitative analysis of records. Descriptive and Inferential analysis are used for analysis of data.

4.2.1 Descriptive Analysis

There are three types of description analysis, frequency (count, percentage), measures of variability (range, standard deviation) and measures of central tendency (mean, median and mode). In this study frequency was used. The questionnaire is usually used to get perception of research domain of the respondents in research domain. The respondent is a prospective user. The analysis on the basis of questionnaire are as follows.

Frequency analysis of respondent's age

Table 1: Frequency analysis of respondent' age

	Frequency	Percent
18-24 years old	16	14.2
25-34 years old	91	80.5
35-44 years old	6	5.3
Total	113	100.0

Among the respondents of 113, the above table shows that 14.2% of the respondents are 18-24 years old, 80.5% of them are 25-34 years' old which is very high as compare to other ages and the remaining 5.3% of the respondents are 35-44 years old. There are no respondents below and 18 and above 44 years old. The graphical representation on the basis of respondent's age is shown below:

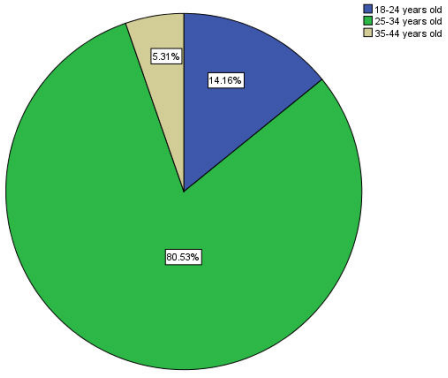

Figure 6: Age wise frequency analysis

Frequency analysis of respondent's gender

Table 2: Frequency analysis of respondent' gender

	Frequency	Percent

Male	79	69.9
Female	34	30.1
Total	113	100.0

The above table shows that 69.91% of the respondents are male and the remaining 30.1% are female. This shows that there are more male respondents who have responded to questionnaire. The graphical representation on the basis of respondent's gender is shown below:

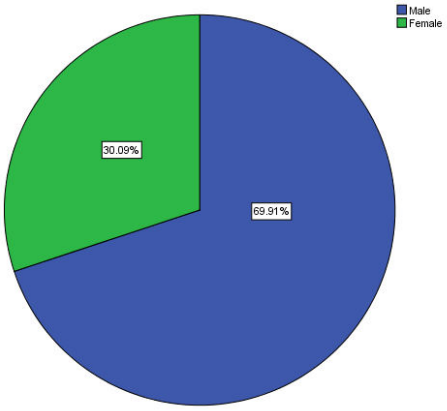

Figure 7: Gender wise frequency analysis

Frequency analysis use of service robots

Table 3: Frequency analysis of use of service robots

	Frequency	**Percent**
Yes	97	85.8
No	16	14.2
Total	113	100.0

The above table shows that 85.8% of the respondents have used service robot and the remaining 14.2% have not used service robot. This shows that most of respondents are familiar with service robots. The graphical representation of the use of service robots by respondents is shown below:

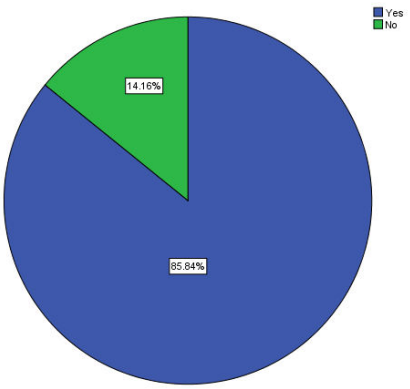

Figure 8: Percentage of use of service robots

Frequency analysis of respondent's perception on implementation of service robot

Table 4: Frequency analysis of respondent's perception on implementation of service robot

	Frequency	Percent
Strongly Agree	7	6.2
Agree	66	58.4
Neutral	31	27.4
Disagree	8	7.1
Strongly Disagree	1	.9
Total	113	100.0

The above table shows that 64.6% of the respondents have agree and strongly agree, while only 8% have disagree and strongly disagree. This shows most of the respondents thinks it is good to implement service robots in service sector. The graphical representation of the respondent's perception on implement of service robot is shown below:

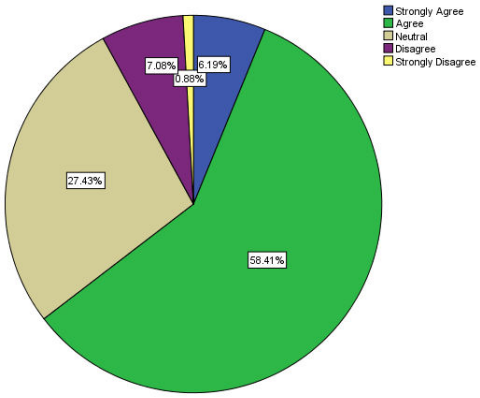

Figure 9: Percentage of respondent's perception on implementation of service robot

Frequency analysis of respondent's perception on adoption of service robots in service sectors

Table 5: Frequency analysis of respondent's perception on adoption of service robots in service sectors

	Frequency	Percent
Strongly Agree	14	12.4

Agree	73	64.6
Neutral	19	16.8
Disagree	4	3.5
Strongly Disagree	3	2.7
Total	113	100.0

Regarding the adoption of service robots in service sectors, the above table present that 77% of the respondents have agree and strongly agree, however only 6.2% have disagree and strongly disagree. Which mean there are more respondents agree that service sectors are likely to adopt service robots to improve their services. The graphical representation of the respondent's perception on adoption of service robots in service sectors is shown below:

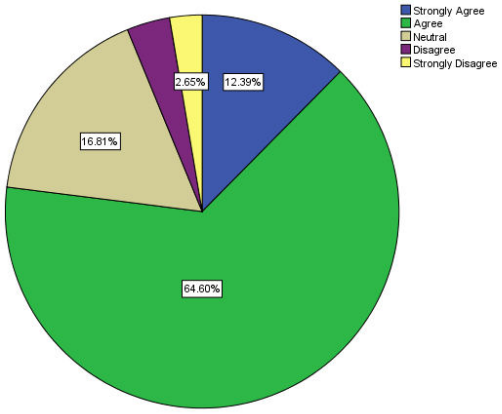

Figure 10: Percentage of adoption of service robots in service sectors

4.3 Results

The objective of this study was to collect and analyze data related to adoption of robots in service sectors of Nepal. Above data analysis has been done as per the result of questionnaire. For the analysis data are gathered from respondents of different ages, gender, employers and employees of different sectors (banks, health care, and hotels/restaurant). Though service robots are new in Nepal, most of people are familiar with it. Young individuals of the age group 25-34 years are more likely aware of use of service robots. More men have used service robot as compared to female.

Most of the people think that it's good to implement service robot in service sectors. The results show that people are more agree in terms of adoption of service robots in hotel/restaurant is more as compare to health care and banking sector. The service is robot is very much feasible in terms of technical, economic and operational. The result also show that service will be able to gain human satisfaction and there will be good interaction between human and robot. Service robots not only steal job but also create more job opportunities. Adoption of service robots seems to be positive in overall.

FINDINGS AND CONCLUSION

5.1 Findings

Objective 1:

To access the current pattern on uses of service robots

Based on the data analysis performed to find out the current pattern on uses of service robots, the total of 113 respondent's data has been collected for analysis. Among the respondents of 113, 85.8% of the total respondents have used service robots. The data has been collected from the age group of 18-24, 25-34, 35-44 years' old, among them 80.5% of respondents are of 25-34 years old. For this analysis of data both male and female have participated and 69.9% them are male. Among the age group 83.50% are of 25-34 years' old who have used service robots. Among the male 83.5% of them have used service robots and among female 91.2% of them have used service robots.

Objective 2:

To conduct feasibility study in following dimensions: Economic, Technical, and Operational

In this research feasibility study has been done in three dimension, economic, technical and operational. So the total of 113 respondent's data has been collected for this analysis. Chi-Square Test is done for economic feasibility and technical feasibility. Among the respondents of 113, 52.6% of the them agree that use of service robots is technically feasible. Chi-Square value is .035 which shows that there is significant association between technical feasibility and the use of service robots at 5% level of significance. Among the respondents of 113, 82.5% of the them agree that use of service robots is economically feasible. Chi-Square value is .035 which shows that there is significant association between economic feasibility and the use of service robots at 5% level of significance. The variable implementation is devised in order to collect the significance of operational feasibility and the data has been evaluated via T-Test. In T-Test the significance (2-tailed) value is 0.22, which is less than 0.05 which means, there is significant difference between mean of operational feasibility and use of service robots.

Objective 3:

To investigate the effectiveness of service robots

Based on the data analysis performed to find out effectiveness of service robots on uses of service robots, the total of 113 respondent's data has been collected for analysis. Among them 86.5% of them agree to effectiveness of service robots on the basis of use of service robots. Chi-Square Test is done and chi-square value is .005 which shows that there is highly significant association between effectiveness of robots and the use of service robots at 5% level of significance.

Objective 4:

To give future directions that guide for adoption of robots in service sectors of Nepal

These are some of future directions that are derived from this study, that guide for adoption of robots in service sectors of Nepal which are as follows:

1. The cost and benefits of service robots are very various and service sector needs to consider all of them before deciding to adopt or not.
2. Human are not used to interacting with robots, it is necessary to find out if human is readiness as well as willing to be served by service robots
3. After adoption of service robots, it is necessary to give training and awareness to employees about the usage of service robots.

4. Employees are the asset of every company, so it is necessary to find out if the employees are satisfied with the usage of service robots and are motivated towards it.
5. It is necessary to determine if service robots are performing well according to assigned task while operating in real working environment.
6. It is necessary to find out if service robots are becoming problem like over dependent upon service robot, human skills devaluing etc.
7. Service sector need to think if service robots are implemented it might steal human job opportunities.

Research Question 1:

What is the effectiveness of service robots in service sector?

Service robots are very much effective to be used. They are able to do every work more efficiently and effectively than that of human. Service sector would increase productivity as well as improve quality. Service robots don't need break they can operate 24/7 minimize the problem of labor unavailability. Nowadays the cost of hiring labor is very high, it sometime unaffordable for small and sometimes for medium size company. The main reason of adopting service robots is to cut labor cost. Service robots also contribute to sales of product, goods and services. Once it is adopted it can be used forever but sometimes it might require maintenance. Time is money, humans value time greater than whatever so with the advent of robots in the monetary zone it's going to ensure higher great of offerings at minimal time with minimum waste of resources. Service robots are able to enhance customer experience. Service robots also helps in branding, marketing and empower the business to improve. They likewise commit less errors than people saving companies time. Other effectiveness of service robots is that they can work in any condition, adding to their adaptability.

Research Question 2:

How service robots will gain human satisfaction?

Service robot are able to gain human satisfaction in many different ways. On the basis of co-operation of robot with humans, they are able to make human free from unpleasant physical, heavy-duty jobs and repeatability work, thus human can focus on more creative work. Service robots will become part of human life in few decades.

Research Question 3:

What are the challenges to operate service robots in real working environment?

Though service robots will be easy to operate robot in real working environment. There are some challenges that need to understand which are as follows:

1. Human is end user who get services from service robots, so the biggest challenge might be human readiness as well as willing to be served by service robots.
2. In the case if service robot's breakdown, the cost of repair and maintenance of service robots might be high.
3. Since service robots and human are working in same environment, coordination between them needs to be taken care of.
4. Employees need to be trained and aware regarding the operation of service robots.
5. While operating service robots in real environment, how well they going to perform according to assigned task.

6. Since service robots are smart, software needs to be updated and upgraded as per changing environment.

Research Question 4:

What are the impacts of service robots in service sectors?

There are huge impacts of service robots in service sectors which are as follows:

1. Abilities of service robots is better as compare to human, since work is done by service robots the quality of service will be higher than that of human.
2. The usage of service robots will directly and indirectly help in branding and marketing of their goods and services.
3. Employees get motivated and can dedicate to new productive work since they will be free from doing same repeatability task.
4. Since service robots can be used forever their overall cost might be cheaper than employees.
5. Robots will consistently convey quality and they're less inclined to commit errors.
6. Service robots will solve the issue of shortage of labor.
7. The usage of service robots attracts and enhance more customers.

5.2 Conclusion

Service robots are not new now, and this is the time to accept new technology. The trend of implementing service robots in service sectors for automation is rising. Service robots are capable of getting information from its surrounding and making decisions and acting independently in real environments to complete given jobs. After detailed study it was found that service robots are very much useful and feasible in terms of economical, technical, and operational and can be use in every service sector. There are many benefits of implementing service robots such as increase quality, efficiency, reliability, reduce cost of labor, improve service, and robots can be operated 24/7, only one-time investment in the system and get benefit forever. Human are not used to interacting with robots, it is necessary to find out if human is readiness as well as willing to be served by service robots. Service robots are a boon for service sector it all depends how we look upon it and the way we react to the changing environment and upgrade ourselves.

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