Journal of Advanced Multidisciplinary Research Studies and Development

ISSN : 2583-6404
Nov - Dec 2023

STUDY ON THE NATURE OF EMPLOYMENT AND IDEA REGARDING ROBOTIC SURGERY

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Abstract

Introduction: The First Industrial Revolution happened in Europe and America during the 18th to 19th century.

Aim of the Study: the main aim of the study is Nature of employment and idea regarding robotic surgery

Material and Method: A research design serves as a proposal or arrangement for how to explain the results of a study over the course of the study.

Conclusion: There is widespread agreement that we are in the early stages of a fourth industrial revolution, dubbed "Industrie 4.0," in which traditional manufacturing settings will be replaced by highly automated, integrated, and digitally interconnected cyberphysical systems (CPS).

Keywords: Robot, CPS, Industry, Employment.

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Introduction

Industrial Revolutions

The First Industrial Revolution happened in Europe and America during the 18th to 19th century. During this period, primarily rural, agrarian societies became urban and industrial. Along with the steam engine, the textile and iron industries played vital roles in the First Industrial Revolution. Charles Beard [1] presented in his book the socio-economic conditions before and after the First Industrial Revolution.

The Second Industrial Revolution took place around First World War. It was a time of evolution for new factories and expanding of the existing ones. Using electricity, steel and oil industries created mass production. Light bulbs, phonographs, telephone, and the IC engine are significant technological advances during this period. Ruth Scwarz Cowan [2] explains the change in technology that can be used to reduce household works because of the Industrial Revolution 2.0. David A Collier [3] presents the implications of the simultaneous automation of goods and services on the workers and actions taken to smooth the transition in the United States. Britannica Encyclopaedia [4] shows how Industrial Revolution 2.0 crossed Britain and Europe and changed the world's lifestyle.

The Third Industrial Revolution mentions the furtherance of technology from analogue electronic devices and mechanical devices to the current day digital world. This is called Digitalization, which gained prominence around the eighties and is continuing. Preferences during the third Industrial Revolution are the personal desktop computer, the World Wide Web - internet, and information and communications technology. Lynn A Karoly et al. [5 to 7] presented in detail the advent of the information age and rapid space of technology advances (Moore's law), real private

ISSN : 2583-6404
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fixed investment in Information Technology. They presented the change in the world's relationship to community, time, craftsmanship, and human's own role in society.

Literature Review

Ribeiro et al. (2021), This research explores the application of RPA and AI to ERP processes. Online digital libraries (commercial websites and tools, blogs, and so on) and scholarly digital libraries were scoured for relevant material. We found a number of commercial (UiPath, Kofax, Automation Anywhere, and Win Automation) and free (Assist Edge and Automagica) options and analysed their Robotic Process Automation (RPA) features, ERP compatibility, and ERP support. The researchers examine RPA-related document and process libraries and found that the majority of proprietary products include algorithms relevant to AI goals like recognition, optimisation, classification, and knowledge extraction. Better optimisation and information exploration by users is another benefit. Among the many AI techniques and algorithms utilised by these instruments are those used for computer vision (such as image recognition using ANNs), statistics, decision trees, neural networks for classification and prediction, fuzzy logic, and the implementation of methods used in text mining, NLP, and RS. In contrast, the foundation of Industry 4.0 is the convergence of IoT, intelligent automation, IoT-enabled products and processes, and cyber-physical systems. When put together, these ideas and tools produce a radical shift in manufacturing procedures, which in turn affects how the company's digital activities are carried out internally and externally. They are currently actively embracing robotic process automation (RPA) to improve these processes. They also shown in this study that RPA now incorporates intelligent approaches and algorithms (AI) in many systems, enabling greater levels of intelligence in the automation of processes within a firm.

Kedziora et al. (2021), share their views on Robotic Process Automation (RPA) Implementation Drivers. The primary factors behind RPA installations (financials, employee effect, hazards) identified among professionals participating in the deployment of intelligent automation technologies at selected Nordic firms are discussed in this exploratory, empirical study. The findings emphasise the need of focusing on operational benefits such as relieving people from the most tedious, non-value-adding assignments, improving company efficiency, compliance, and quality, and so on. The strategic and external (customer) impacts were not at the forefront of the RPA decision-making process among the case organisations investigated. The findings imply that RPA is mostly viewed as a tactical instrument for automating and improving internal operations, with little thought given to its strategic and external implications, such as customer impact and service quality. This is consistent with the approach to calculating benefits, which focuses primarily on labour cost savings. The IT department did not play a consistent role in RPA development. Some implementations relied on citizen developers, while others enlisted the help of the IT department to identify procedures that could be improved, following the same path as other IT system implementations. As a result, RPA was similar to other systems, and previous experience could be leveraged to discover, improve, and automate operations. In certain cases, the implementation was outsourced to outside organisations or finished by internal personnel. Furthermore, in one instance company, the IT department assisted some employees who migrated from the business side to the RPA CoE within the organisation in changing their job profiles. Such activities have previously been documented in the literature.

Ranganathan et al. (2019), Wrote an article on survey on robot process automation application in various industries. Robotic Process Automation (RPA) is a critical component of most firms' digital transformation plans since it offers various advantages over traditional automation systems

ISSN : 2583-6404
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that are outdated. With non-invasive technical obstacles, RPA enables enhanced accuracy and productivity in sectors, resulting in cost savings and lower resource utilisation. The survey on the deployment of robot process automation in various industrial processes is presented in this study, as well as an overview of the benefits of employing RPA. Robotic process automation allows businesses to automate tasks that are similar to human activities but perform better. In the next section, the survey gives the literature survey, which includes the uses of RPA in many industries, as well as the benefits of RPA. It is clear from the survey that RPA aims to minimise human stress and enhance work accuracy.

Radke et al. (2020), studied on Enhancing the item master data maintenance process with robotic process automation (RPA). In order to manage their worldwide supply chain, manufacturing organisations must today deal with ever-increasing speed and complexity. RPA is confirmed to deliver various benefits to enterprises through structured automation, according to the findings. Based on the change management model, the researchers suggested a framework for deploying RPA to capture item master data. The framework is divided into three phases, each with critical tasks. Future research could use this work as a springboard for more cognitive RPA research, combining cognitive technology with RPA technology in order to attain a higher level of automation.

RAJESH et al. (2019), Studied on In the Indian context, the impact of automation in the industrial and service sectors is significant. This paper discusses a quick overview of automation, forms of automation such as fixed, programmable, and flexible automation, who automation is appropriate for, possible automation industries, why to say yes or no to automation, and the impact of automation on developing countries. Automation is one of the building blocks of Industry 4.0, which producers are embracing to reduce cost and time while increasing customer happiness. Automation has improved the flexibility of entire manufacturing processes, allowing large- scale manufacturing businesses to increase production more effectively. To properly handle automated equipment, many control methods are employed, and many claim that programming a machine is easier than training a labour to do equally well. Automation in big scale manufacturing industries where bulk output is done with consistency and commendably is more of a mandate now to be able to compete globally. Of course, there are obstacles associated with automation, such as finding qualified personnel, providing high-quality maintenance services, utilising expandable technology, and so on. Automation can be employed in both the industrial and service industries.

Methodology

Research Design

A research design serves as a proposal or arrangement for how to explain the results of a study over the course of the study. Data collection and analysis are very important factors in achieving research objectives and study design ensures that this objective is achieved in an efficient manner. Therefore, it is important to use the most appropriate study design to fully achieve the research objectives. There are major research designs, mainly descriptive, exploratory, and comparative research designs.

Data Collection

The research method depends entirely on the type of data collected. Therefore, it is considered one of the most important parts in facilitating research studies. Two main sources of data collection were involved in this research. Collecting primary and secondary data that fulfils the main research objectives. This study has used both primary and secondary data for the purpose of data collection

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for the research. Primary data has been collected using a questionnaire through a survey as a research instrument which will be designed keeping in mind all the variables that were to be tested. The questionnaire will be closed and will contain questions about the system, its application and SWOT analysis. The primary data shall be collected from managers involved in various operations performed in industries. The secondary data has been collected from the existing research literature, journals, publications, websites, and government reports.

Results

A. Analysis of Doctors

Demographic analysis of the doctors who participated

A total of 60 participants who were production managers were considered for the study. A summary of the various demographic features and details pertaining to education and employment are presented in Table 4.1.

Table 4.1: Summary of Various Aspects Considered for Robotic Surgery from Doctors

		Frequency	Per cent (%)
Gender	Male	56	93.3
	Female	4	6.7
Age	31 - 40 years	2	3.3
	41 - 50 years	42	70
	51 - 60 years	12	20
	> 60 years	4	6.7
Marital status	Single	2	3.3
	Married	56	93.3
	Divorcee	2	3.3

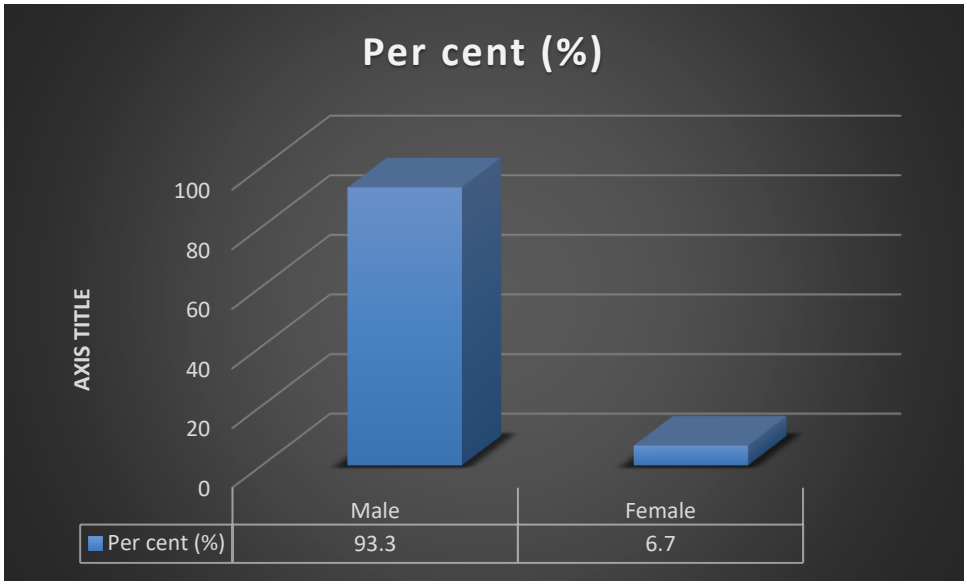

Figure 4.1: Bar Chart Showing Gender

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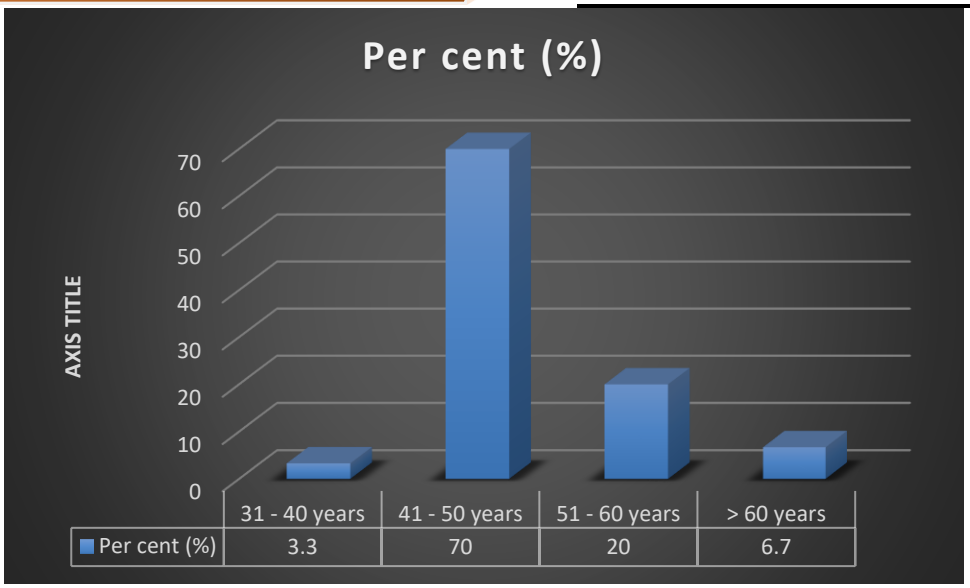

Figure 4.2: Bar Chart Showing Age

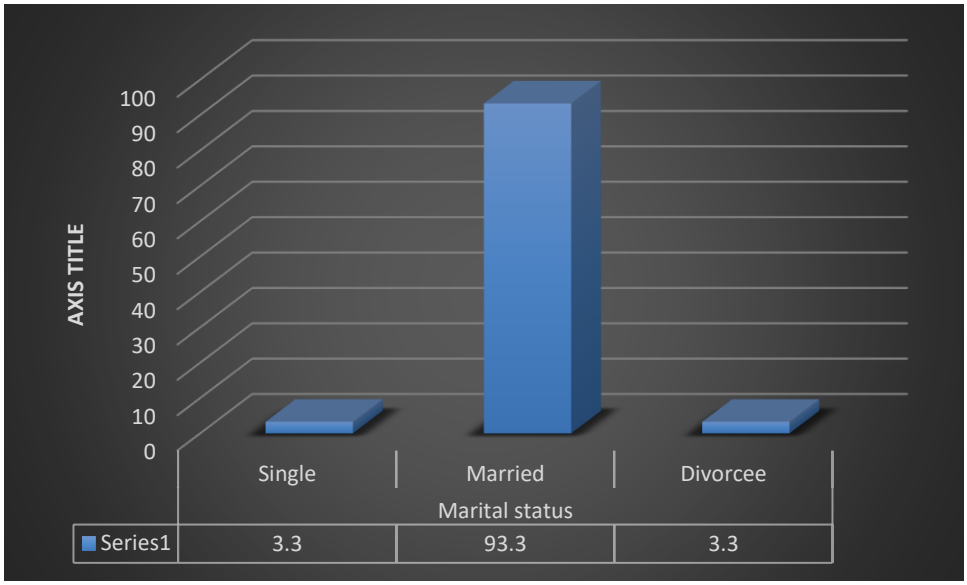

Figure 4.3: Bar Chart Showing Marital Status

Nature of Employment and Idea regarding Robotic Surgery

The participants working for an organization had an experience of 1-5 years which accounted for 70% of the total (Figure 4.9). All the 60 participating doctors had idea of various aspects of robotic surgery and were experienced in handling robotic surgeries (Figure 4.11 & 12).

ISSN : 2583-6404
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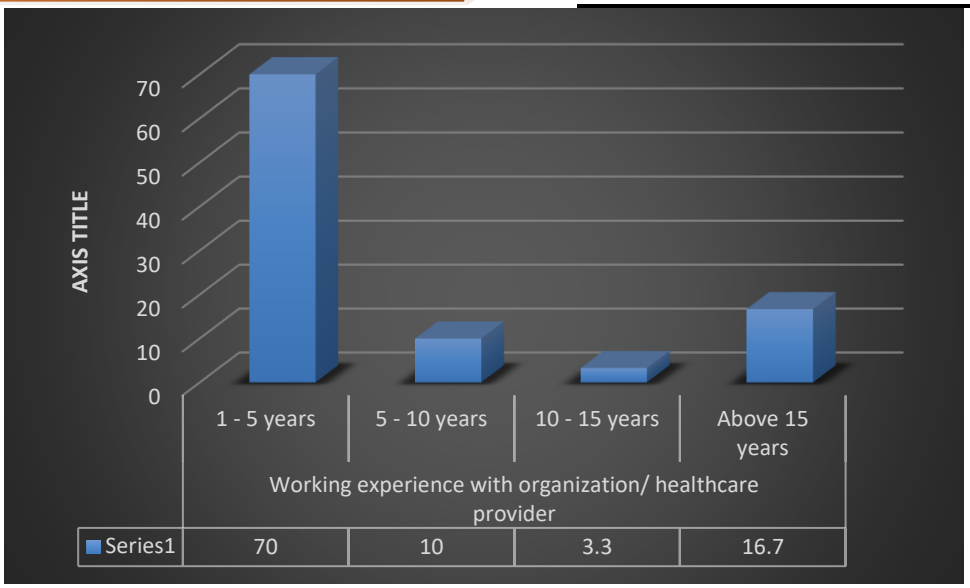

Figure 4.4: Bar Chart Showing the Summary of Years of Experience in Organization (B)

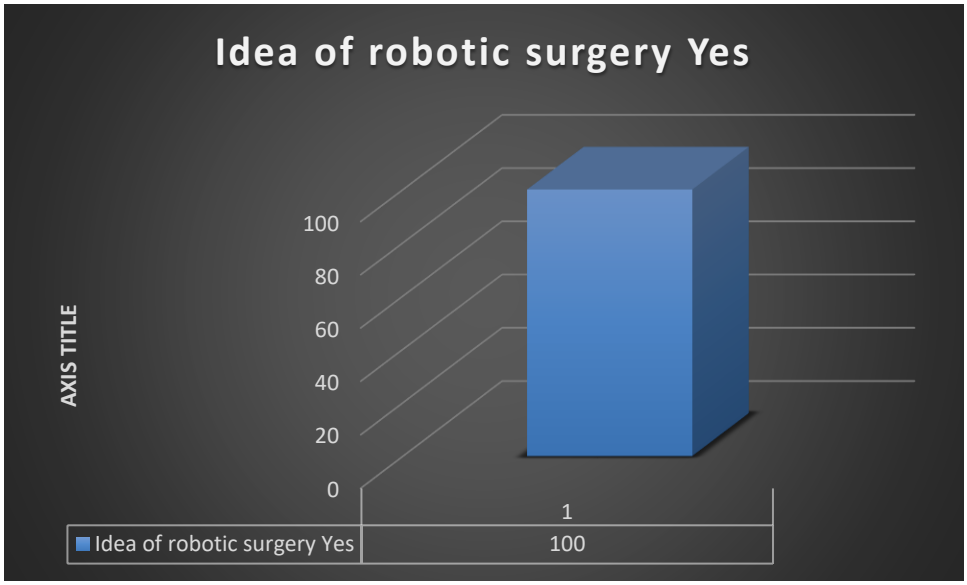

Figure 4.5: Bar Chart Showing the Idea of Robotic Surgery for Doctors

Reliability Analysis

A total of 55 items were tested for reliability analysis. The Cronbach's alpha was found to be 0.947 for the items analyzed. Thus, the items analyzed were highly reliable and so was further proceeded for validity using the PCA based method.

Table 4.2: Reliability calculation for various variables

Reliability Statistics	
Cronbach's Alpha	N of Items
0.947	55

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ANOVA Analysis for SWOT of Robotics in Medicine

ANOVA Analysis for SWOT scores between the different age groups was done and summarized in table 4.

Result of ANOVA: p value of 0.061 which was higher than 0.05.

Conclusion: No significant mean difference in SWOT scores between age groups.

Conclusion

There is widespread agreement that we are in the early stages of a fourth industrial revolution, dubbed "Industrie 4.0," in which traditional manufacturing settings will be replaced by highly automated, integrated, and digitally interconnected cyberphysical systems (CPS). In addition to facilitating adaptive control of systems, the proliferation of computer-mediated communications and information technologies will allow for a wide variety of intelligent interactions between physical and autonomous elements like robots. Traditional sequential man-machine production processes will be replaced by highly complex assemblages of highly digitised networks that not only communicate internally but also with other systems and organisations externally as a result of the development of more intelligent systems and 'cloud manufacturing', with the goal of increasing competitiveness and flexibility. Humans and machines, using tools like informatics, robotics, mobile devices, and sensors, will work together more closely in the future. Despite the notion that "Industrie 4.0 is not initiated on a shop floor level," current manufacturing environments will undergo significant change as a result of the advent of 4.0 technologies.

Reference

1. Rodríguez-Guerra, Diego & Sorrosal, Gorka & I., Cabanes & Calleja, Carlos. (2021). Human-Robot Interaction Review: Challenges and Solutions for Modern Industrial Environments. IEEE Access. PP. 1-1. 10.1109/ACCESS.2021.3099287.
2. Dzedzickis, Andrius & Subaciute-Zemaitiene, Jurga & Šutinys, Ernestas & Bubniene, Urte & Bučinskas, Vytautas. (2021). Advanced Applications of Industrial Robotics: New Trends and Possibilities. Applied Sciences. 12. 135. 10.3390/app12010135.
3. Luo, Dan & Yu, Lei. (2021). From Factory to Site—Designing for Industrial Robots Used in On-Site Construction. 10.1007/978-981-15-8670-5_4.
4. Lee, In. (2021). Service Robots: A Systematic Literature Review. Electronics. 10. 2658. 10.3390/electronics10212658.
5. Fu, Xiaoqing & Bao, Qun & Xie, Hongjun & Fu, Xiaolan. (2020). Diffusion of industrial robotics and inclusive growth: Labour market evidence from cross country data. Journal of Business Research. 122. 10.1016/j.jbusres.2020.05.051.
6. Sanneman, Lindsay & Fourie, Christopher & Shah, Julie. (2020). The State of Industrial Robotics: Emerging Technologies, Challenges, and Key Research Directions.
7. Andersson, Staffan & Granlund, Anna & Hedelind, Mikael & Bruch, Jessica. (2020). Exploring the Capabilities of Industrial Collaborative Robot Applications. 10.3233/ATDE200148.
8. Pilat, Zbigniew & Klimasara, Wojciech & Pachuta, Marek & Słowikowski, Marcin. (2020). Some New Robotization Problems Related to the Introduction of Collaborative Robots into Industrial Practice. Journal of Automation, Mobile Robotics and Intelligent Systems. 13. 91-97. 10.14313/JAMRIS/4-2019/42.

ISSN : 2583-6404
Nov - Dec 2023

9. Domae, Yukiyasu. (2019). Recent Trends in the Research of Industrial Robots and Future Outlook. Journal of Robotics and Mechatronics. 31. 57-62. 10.20965/jrm.2019.p0057.
10. Kangru, Tavo & Riives, Jüri & Mahmood, Kashif & Otto, Tauno. (2019). Suitability analysis of using industrial robots in manufacturing. Proceedings of the Estonian Academy of Sciences. 68. 383-388. 10.3176/proc.2019.4.06.