ANALYSIS OF THE PCA ANALYSIS FOR ROBOTICS

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ABSTRACT

Introduction: *Multidisciplinary nature is the most set a part feature of Robotics. To design an excellent robotic system, an engineer must possess knowledge about control engineering, computer engineering, mechanical engineering, industrial engineering, electrical engineering, along with business and economics.*

Aim of the study: *the main aim of the study is Analysis on the PCA analysis for robotics*

Material and method: *The research paradigm was a combination of different concepts, variables and other issues related to methodological approaches and other related tools in the research.*

Conclusion: *Manufacturing systems will continue to rely on humans on the shop floor for decision making and dexterity in assembly tasks, and increasingly for the supervision and maintenance of technical systems and machines*

INTRODUCTION

ROBOTICS

Multidisciplinary nature is the most set a part feature of Robotics. To design an excellent robotic system, an engineer must possess knowledge about control engineering, computer engineering, mechanical engineering, industrial engineering, electrical engineering, along with business and economics.

Engineers, through best design procedures and scrupulous observation of details, have flourished in pertaining the science of robotics to a wide range of manufacturing and industrial problems. From a practical standpoint, robots are different from conventional electromechanical motion equipment by their handling abilities, in that robots can operate, position, and move tools and other items with far greater competence than other manufacturing machines.

The automobile sector in the United States was the first to successfully implement process robots on a commercial scale. Mass production of automobiles is no longer possible while respecting the quality and cost levels currently accepted without the use of robots. In early 1995, there were more than 25,000 robots in the American auto industry. Spot welding is the most common application for these robots. For all applications and industries, the global requirement for robots is expected to surpass one million units by 1999.

Productivity was the main issue in industrial sector which attracted the attention of business leaders at international level during previous decades. Automation is used to modernize the facilities of manufacturing industry by increasing productivity to possible one. Industries are concentrating on automation with the computer-based technology known as computer-controlled robots for improving the productivity and end products with high quality.

LITERATURE REVIEW

Carmo et al. (2019), This software is referred regarded as "robots" because of its inherent ability to accomplish jobs faster, more correctly, and 24 hours a day. Most support functions at banks are located in back-offices, where the tasks done are mostly repetitive and follow a set of rules. RPA automation is a suitable fit for these typesof activities. The banking sector in Portugal is still in the early stages of digitalization. Banks are generally innovative in their front offices, but their back offices, except for a few companiesin the industry, still rely primarily on paper and have a low level of automation. This study examined the impacts of the technology in Portuguese bank back-offices and the best practises that should be followed for future deployments to be successful by conducting interviews with subject experts who have been present in RPA installations in banks.

Andrade et al. (2020), Studied on The Challenges of Robotic Process Automation (RPA) for Automated Software Testing. By automating repetitive processes and delivering faster results than a human software tester, repetitive jobs automated using bots save money and extend the life of support. RPA delivers value to business software management, performance, and processes of any complexity in a company. The study's highlights examined the pros and disadvantages of RPA when applied to specific software testing difficulties using features available in both UiPath and Automation Anywhere. Authors' comments, case studies, indicators, and other thorough applications were all mentioned in the analysis of the data obtained for this study project. Pros and drawbacks, cost savings, and effective decision makingwhile picking automation were all compared. Artificial Intelligence (AI) and Machine Learning should be used to improve RPA software testing of business logic in the future (ML).

Madakam et al. (2019), Robotic process automation, essentially. RPA, or robotic process automation, is cutting edge tech. Cutting-edge research in computer science, e-communications engineering, mechanical engineering, and IT has led to the development of robotic process automation (RPA). Simple activities can be accomplished with the use of hardware, software, networking, and automation. Because of this, the research manuscript consulted secondary sources including the Internet and scholarly databases. The duration of the study was from January 1, 2018, to June 30, 2018. RPA, and in doing so, I came across a number of empirical publications, white papers, blogs, and other materials that I used to build my study. This investigation is speculative because of the current phenomenon. Blue Prism, Robotic Process Automation (RPA), Robots, and Artificial Intelligence (AI) were some of the search terms employed. As the research ended, it became clear that robots and robotic process automation technologies are rapidly becoming necessities for running businesses worldwide. Robotic process

automation is useful for a wide variety of tasks, including but not limited to: employee payroll, employee status changes, new hire recruitment and onboarding, accounts receivable and payable, invoice processing, inventory management, report creation, software installation, data migration, and vendor onboarding. In addition, robotic process automation has many uses in many other sectors, such as healthcare, pharmaceuticals, finance, outsourcing, retail, telecommunications, energy and utilities, real estate, FMCG, and more. RPA's proper placement in business processes is made possible by a slew of ancillary technologies, including AI, ML, DL, DA, DA, HR analytics, VR (second life), HA, BT, BT, blockchain, 4D printing, and others. It also features the work of numerous startups and well-established corporations, including descriptions of the RPA systems they've developed for global use. Academics, researchers, students, and practitioners will all be able to use this publication as a good jumping off point.

Gadre et al. (2020), Digital Transformation is a key component of Industry 4.0. The goal of this article is to look at the fundamentals of Industry 4.0, as well as the trend toward automation and data interchange in manufacturing technologies and processes. This paper offers a strategic roadmap that can serve as a basic guide for manufacturers as they move to Industry 4.0. The industrial and manufacturing worlds have been changed by digital technology. The major goal of this study was to give a general overview of Industry 4.0, as well as the problems and benefits of applying it. It has been discovered that the government and many private sectors are embracing and adapting to the current technological advances. As a result, Industry 4.0 will boost the country's economy by expanding opportunities in key industries such as agriculture, health, manufacturing, and transportation.

ENRÍQUEZ et al. (2020), Automation of Procedures by Robots. There has been a rising tide of curiosity around robotic process automation over the past few years. The majority of studies, however, examine either the theoretical foundations of RPA or the industrial outcomes of RPA deployment in particular settings, especially in finance and outsourcing. To better understand the current state of the art in RPA and to spot the gaps in the scientific and industry literature, this study delivers a comprehensive mapping analysis. First, all 54 seminal works that define the current state of the art in RPA are analysed in detail. These key studies were chosen throughout the systematic review's data collection and analysis phase. Second, this article analyses 14 of the most prominent commercial RPA solutions based on the Forrester RPA study, which establishes a classification scheme based on 48 criteria and analyses the coverage of each of them. The research indicates that the market has found solutions for numerous RPA lifecycle stages. However, analysis is typically left out of technological solutions. At this stage, automation is lacking mostly because there are no technology tools to identify the most promising processes within an organisation for automation. We conclude with a discussion of potential challenges and potential future directions.

METHODOLOGY

RESEARCH PARADIGM

The research paradigm was a combination of different concepts, variables and other issues related to methodological approaches and other related tools in the research. It includes the structure or framework of scientific ideas in a research study and the values and assumptions used in that study. Morgan (2007) conceptualized different versions of the paradigm. Paradigm versions were described by researchers based on the diversity of knowledge they acquired and the shared beliefs that influenced how they interpreted the information collected. The researchers also showed that a paradigm is nothing but the belief that different members with the same characteristics create the basic aspects of the above research question along with the research method. Therefore, previous research has established the fact that research paradigms are collective processes that include some reasoning processes such as positivism, interpretivism, and constructivism. Researchers have shown that the components of the research paradigm are related to pre-existing understanding of reality assumptions. The researchers also provided explanations about some of the research paradigms for a better understanding of the research paradigms. The current study used the interpretivism research paradigm to develop a conclusion with effective results and better understanding of concepts and facts related to research. Analyzing a person's behavior helps to determine the social world, and accepting a person's opinion helps to analyze the results.

RESULTS

ANALYSIS OF DOCTORS

Table 4.1: Summary of various aspects considered for robotic surgery from doctors

Educational qualification	Master’s degree	12	20
	PhD / Mch / DM	48	80
Employment status	Full time	36	60
	Part time	24	40
Income	500001 - 700000	4	6.7
	700001 and above	56	93.3
Working experience with organization/ healthcare provider	1 - 5 years	42	70
	5 - 10 years	6	10
	10 - 15 years	2	3.3
	Above 15 years	10	16.7
Idea of robotic production	Yes	60	100

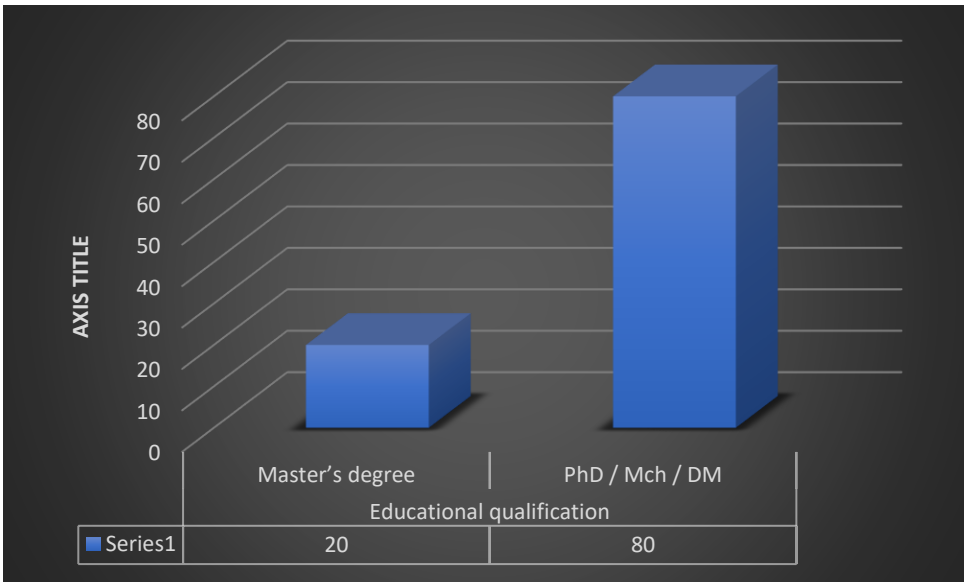

Figure 4.1: Bar chart showing the Highest level of education

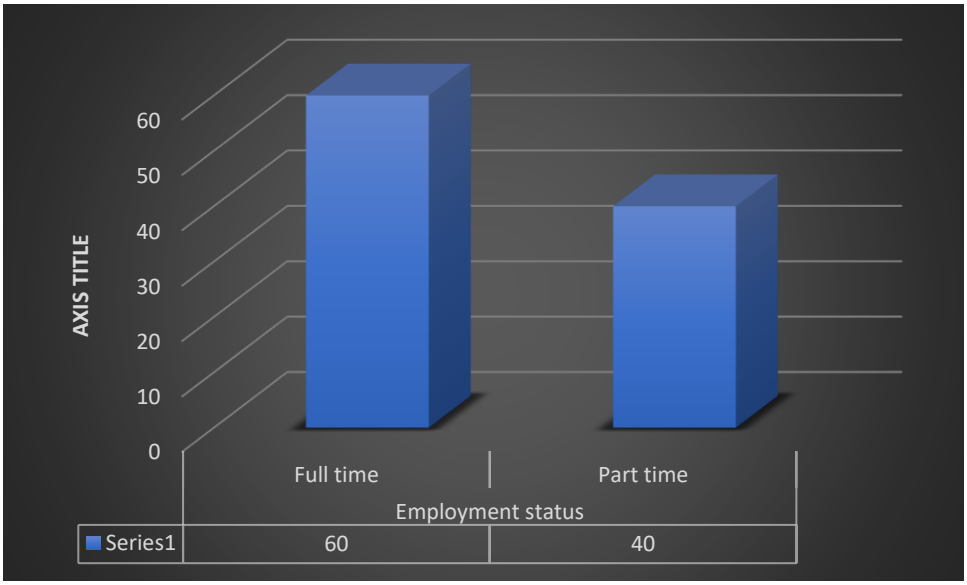

Figure 4.2: Bar chart showing employment status

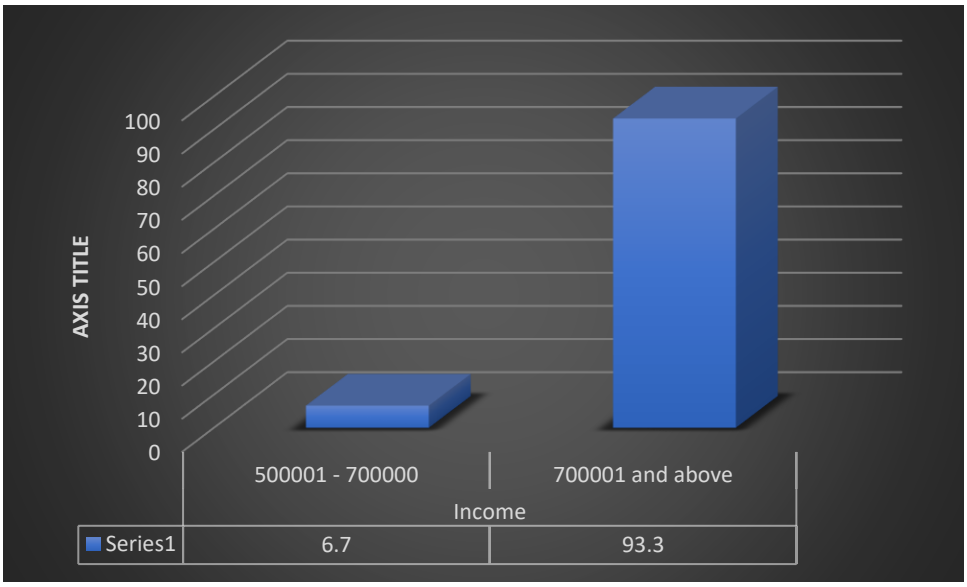

Figure 4.3 Bar chart showing income per year

Table 4.2: PCA analysis for various factor loading

Rotated component matrix															Anova
	Component														
	1	2	1	4	1	6	1	8	1	10	1	12	1	14	
Industrial robots is evolved in organizing the production system witnessing its substantial growth.												0.818			
Access to industrial robots is most directly related to its affordability within the system.	0.663											0.443			
Access to industrial robots is also related to location.		0.571													
Robots are involved in						0.403									

very small actuators and mechanisms with a high power-to weight ratio.															
Collaborative and embedded ethics have helped in addressing the ethics of industrial robots.		0.504													
Robotics leads to an ease of changing setup during the intervention								0.918							
Industrial robots enable easy production process	0.592		0.449												
Industrial robots enable many complicated tasks in easy manner									0.726						
Industrial robots provide more enhanced operations in industries.												0.68			
Supplies is delivered to stakeholders and staff by these robots, thereby optimizing communication between them	0.731														
It is a highly advanced and cost -effective indoor		0.518													

navigation system based on sensor fusion location technology for making the navigational capabilities of transportation robots more robust.															
It provides speed and accuracy in industrial system.															
It is effective in working inside scanner.		0.476													
There is no stress for the managers								0.907							
Less bulky robot: both internally and externally	0.563		0.518												
There is a possibility of new and innovative process									0.683						
Because of robotic intervention, there is less chances of production losses					0.81										
Industrial Robots lowers the risk of failures													0.827		
Industrial Robots has a lower operating procedure execution time					0.561				0.471						

Industrial Robots enables magnification of the working field, which helps in production				0.871											
Industrial Robots reduces postoperative tasks			0.731												
Industrial Robots causes less damages to material						0.894									
Industrial Robots speeds overall production process				0.534											
The robotic system needs lower space											0.738				
There is the limited workspace in the robotic system													0.827		
Integration of standard instrumentation n n is difficult in robot equipment.					0.561				0.471						
Cleaning is a problem in robotic system				0.858											
Industrial robots are expensive.			0.731												
There are technological constraints in industrial robots.											0.738				
There is a changeable end effector in a robotic									0.531	0.509					

system which hinders the function.															
Adopting industrial robots are likely to give rise to new industrial process.			0.811												
It will improve product delivery.		0.895													
It uses new technologies/reputation/marketing chances for its resume.														0.839	
It will increase legal practice in India as more legal cases will increase.							0.5				0.491				
It will expand the application fields of robotics.									0.542	0.551					
It will improve the cooperation of many research center.							0.905								
It will increase competition between the industries.			0.797												
It will increase common practice in the production market.										0.848					
The staff would be required to be trained extensively in case of robotic	0.663														

production.															
It will diminish the conventional practice of industrial operations.		0.883													
The outcome for all the procedures is not yet defined.														0.856	
New set -up would be needed to be defined.		0.492					0.4								
Big new training sessions for the managers and labors and assistants would be required.															
It will improve the cooperation of many research centers.	0.41									0.437					
It might increase Liability from accidents/mal functions of robots.							0.406				0.457				
															0.061
Extraction Method: Principal Component Analysis. Rotation Method: Varimax with Kaiser Normalization.															
a. Rotation converged in 31 iterations.															

CONCLUSION

Manufacturing systems will continue to rely on humans on the shop floor for decision-making and dexterity in assembly tasks, and increasingly for the supervision and maintenance of technical systems and machines, despite long-held industrial aspirations for fully automated 'lights out' systems with no direct human input. Even though human issues and behaviour are known as fundamental influences on overall system performance, they have not been considered properly in

the design or redesign of industrial systems in the past. It's been known for a long time that failing to properly account for human factors is at the heart of why so many attempts to deploy modern industrial techniques have failed. Despite the growing recognition of the need to better include human aspects into the engineering design of industrial systems and work processes, this focus is sometimes a step or two behind the more traditional emphasis on expanding technical capacity. Human ethical concerns in the context of emerging intelligent, interconnected, and cyberphysical systems are, therefore, likely to receive less attention.

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