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Challenges in Automation - A review

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Abstract

Automation lessens the amount of repetitive or boring labor that humans must do, which typically results in a better customer experience and lessened stress for your teams. It involves technology that transfers a function individuals perform to pieces of gear or software. A streamlined process with fewer or no manual stages is automation. Automation comes in two flavors: attended and unattended. Both may be combined in some automated processes. Automation has benefits that are frequently attributed, such as higher production rates and increased productivity. Less waste results from improved process control because materials are used more effectively. In comparison to human workers, automation systems often complete the production process with less variability. This translates to better safety and more control over the quality of the products. Safety of the workers is an important reason for automating industrial processes. It also helps in overall reduction in work hours of factory workers. Despite the advancements over the last ten years, businesses will need new automation technology to keep up with demand. Personalization at scale will be made possible by integrating human touch into an automated process and using cutting-edge technology like AI and machine learning.

Keywords
Automation, Industrial automation, forensics, internet of things, home automation, data analysis

1. Introduction
Fixed automation, commonly referred to as "hard automation," describes an automated production facility where the equipment setup determines the order of processing processes. In reality, the machines' cams, gears, wires, and other hardware—hardware that cannot readily be switched from one product style to another—contain the programmed commands. Significant production rates and a high initial investment define this typing of automation. Therefore, it is appropriate for products that are produced in huge quantities.

A type of automation for batch production is programmable automation. The goods are produced in batches of between a few dozen and a few thousand pieces. The production machinery must be reprogrammed and modified to accommodate the new product style for each new batch. Programmable automation can be called a subset of flexible automation. The time needed to reprogram and switch over the production equipment for each batch of new products is a drawback of programmable automation. This results in costly lost manufacturing time. The diversity of goods is sufficiently constrained in flexible automation so that equipment may be switched out fast and automatically.

2.Literature Review
An undertaking has been made in the following paragraphs to bring out the challenges in automation across multiple industries and paths of life.

2.1 Automation in Construction
Computer technology has multiple applications in the construction industry and artificial intelligence is more commonly being used to address complex field problems. Having an automated system can provide continuous high accuracy results unlike fluctuations or errors that can be caused by humans. There will be an increase in productivity and any heavily laborious task can be performed with ease. Automation is perceived as the deciding factor for the market success of robotic systems, and is determined by the analysis of the costs and benefits associated with their development and field implementation. Automation and robotics bring about a complex environment to work in.

Construction sites can be in areas of harsher climates which in turn might cause the machines to not be at optimum performance or might even damage the machines over time. Due to differences in the way humans and robots work, new procedures to deal with how construction is done will have to be made. Pure predefined automation will also not always be feasible due to certain tasks being intricate and requiring high precision, hence a need for real time sensors and operations will be a need. Also, when working in various environments, the robots should automatically be able to recognize parts of it in case it has any significance to the construction they have been made to perform. There will be a large number of parameters for the robot to work with in different environments.

2.2 Automation in Digital Forensic Investigations

Using automation in something as sensitive as digital forensic investigations can bring about a lot of issues technologically, while also having social and political complications. When using automation to handle forensics, most of the criticism is usually from 2 directions. First being that there will be some deterioration of expert level knowledge by relying too much on automated digital forensics and the other being that there will be a lower quality investigation if there is too much reliance on automation. Although critics do accept some level of automation to aid them in their day-to-day tasks like pure mathematical tasks. The judgment increases when tasks like analysis which are more complex become automated, as this also leads to investigators losing understanding of the nitty-gritty concepts of investigation. This has already become a reality in our lives and investigators rely on a high level of automation during their investigation. In the long term this could cause investigations to have quality issues. Due to the increase in population over the decades and centuries, the number of cases has also increased so automation was always and is seen as a way to help solve cases faster. But there can be more margins for errors, for example if a programmer who is not from an investigatory background change or attempts to improve the digital forensic tool without any help from professional investigators. Automation in forensic analysis has its advantages and disadvantages.

2.3 Internet of Things In Industrial Automation

Internet-of-things permits associations to turn out to be more dexterous and forceful in chasing after new income streams and business models. It can possibly change the customary way of expenditure speculation on building, keeping up with, and overhauling individual foundations for various products. Numerous organizations have begun to see the potential chances of the Internet-of-things and its effects on giving solutions that could offer functional benefits. adaptable and helpful automation needs an all-encompassing modern IoT solution that tends to business, advances, and structures viewpoints to provide real-time continuous uptime and control for optimized processing (Figure 1).

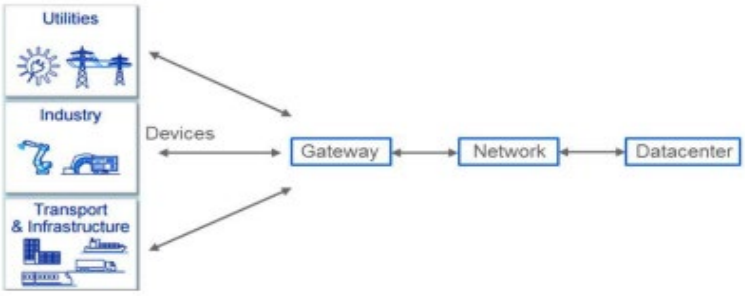

Figure 1. Industrial IoT from edge to cloud

Industrial automation ranges over various kinds of control systems and can be found in a variety of domains for executing different processes. Although the requirements of automation itself are very specific, the complexities of the control systems are similar in principle. In industrial automation, any unplanned stops that are caused due to failure in certain components can then cause production losses. Due to the complex scale of control systems, it gets costly to combine all the diverse integrated components. There needs to be 24/7 availability and operation of the industrial automation system in order for it to achieve its original objective.

2.4 Home Automation in the Wild

Smart homes qre networked devices have been expected for quite some time. Research and other forms of smart homes have been made, there has also been an influx of devices that enable to have smart homes via devices. Although, home automation has been very commonly adopted and it is surprising that it has not been adopted more so as the devices needed to be able to do so have been available for decades (Figure 2).

Figure 2. Remote control for lighting

The first issue to more adoption of smart homes is the high cost of owning home automation. When asked by many people, most described that they were not willing to spend much money or time on home automation. Second being that currently, the installations are quite inflexible, often having the person require a choice between an integrated system or a flexible system. There also needs to be some structural changes in quite a lot of installations which limits when and where this can be installed. Third being that there is management needed when living in a smart home. Fourth being that most people that were interviewed said all people present in the house could access the automated functionality, raising concerns for safety. Remote access and protected access are a necessity nowadays.

2.5 Automation of Public Health Data Analysis

Most of the causes of cervical cancer and deaths in a single year occur in low median income countries where screening resources and prevention is limited. Recently, the research studies have been using machine learning to help the initial screening phase of detection of the cancerous lesions using cervicography. These techniques need healthcare workers who are comfortable with technology, which are not so common (Figure 3).

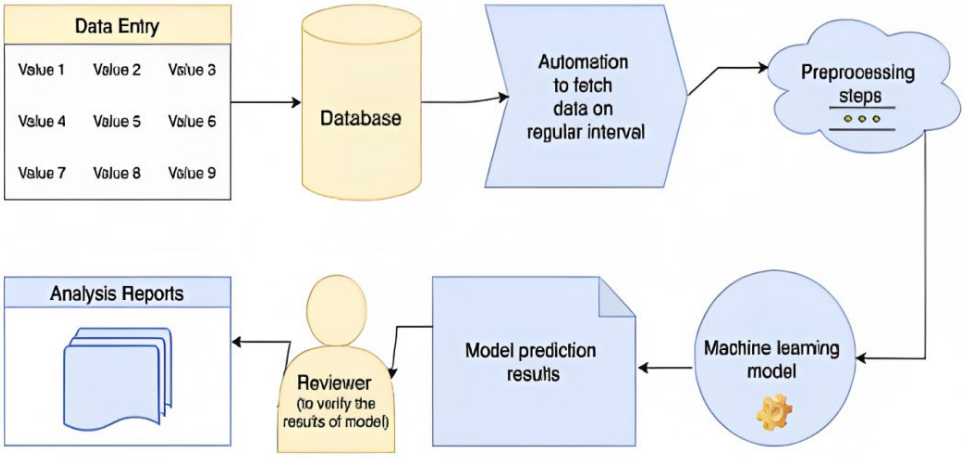

Figure 3. Project pipeline illustrating automation of public health data

The first challenge is that there is quite a lot of effort needed for changing the generalized data entry practices. There will be a need to train staff to log error free and correctly formatted data.

The second challenge would be to make sure patients have privacy for their personal health records. The third challenge would be to make sure that the data preprocessing is done properly. It is a time-consuming challenge and if not executed properly, it can hinder the model's performance and delay the study of the patients.

The fourth challenge will be that there will be a need to prepare to handle large amounts of data as the public health studies will continue having more participants each year, hence resulting in large amounts of data. The fifth challenge would be that there will be a need of cross validation by experts to make sure the model is not biased and to errors in the diagnosis by the algorithm.

The sixth challenge would be that there will be a need for a fairly high amount of human control so more parameters can be explored and verified during the process. The seventh challenge would be that the entire process should be easily understandable to all people, non-medical or non tech savvy stakeholders involved. It is important that they understand the meaning of the project so that it has any chance to be successful.

2.6 Library Automation

A library is the heart of all academic and research institutions. Newer heights and achievement in technology have made changes to various fields, including Library information services. The recent establishment of library networks has been seen via the use of newer automated technology. Using information technology tools helps have a fast and large flow of information to the end user. It helps change a traditional library to an e library. It helps provide effective services without any previous limitations.

Arranging library automation will include appropriate practicality investigation of the venture to keep away from misuse of time, cash, energy and to guarantee the progress of the venture. Computer hardware and software doesn't come with a small price tag. Institutions that are willing to upgrade their libraries must be sure they have adequate resources and time to make the changes required to successfully become an automated e library. Applications that provide management for libraries must also be chosen with the scope of the idea in mind. The staff should also be trained to use the new hardware and software for a continuous flow of use. There should also be professionals in case of any failures or problems in the automated system.

2.7 Using Automation to Enhance and Accelerate Social Science

While automation has played a major role in the main sciences, social science has yet to take advantage of the technology and methods offered by automation. With the major changes in advances in technology, the time taken to do research and complex mathematical procedures has reduced significantly. The technology itself has reduced in price over the years, computer and mobile devices being widely affordable for the general population to use. There is likewise a grave absence of logical foundation in the social sciences, which frequently get substantially lesser funds than different sciences — and the issue is especially intense in a lot of developing nations, further expanding the requirement for worldwide data sharing initiatives. While there are legal restrictions for sharing of data of human behavior, there are other challenges faced which cause social sciences to not take advantage of automation.

The largest barrier for highly scaled application of automation would be that there is a lack of standardization in how data is represented across the world. Most automated technology performs some operations on readable data. An example would be how many research papers have their own format to be followed and there is no clear generalization. Although forcing a singular format would be too harsh and not possible, having some common standards for easier readability should be widely adopted. Ahead of standardization of data, the way the data is represented varies from study to study. Having field wise conventions to have basic organization would be immensely beneficial. Even other ways like having specific formats for metadata representation or a specific file naming format would also be helpful. Another challenge that researches face in multiple fields of social science is related to the lack of access to data related to human subjects. There are a lot of legal barriers when it comes to accessing the sort of data aforementioned. The challenge is now to develop systems that provide more range of access to data when faced with ethical, legal etc barriers while also respecting them.

If automation were to be introduced to social sciences, it would take considerable time for people to get used to the major changes caused by standardization and other new technologies. People would have to learn new methods to

make sure their research is accepted worldwide but the process, if automated correctly, would speed up the process by a large margin compared to human based authentication.

2.8 Human Factors in Automation Design

Automation seems to be the future as more and more designers seek ways to implement automation to decrease the involvement of humans, increase safety and improve efficiency, but as automation develops more to become nuanced and complex in its working, different factors come into play that make the implementation exponentially harder. Automation can never fully replace a human; it can only augment the work of a human and make it more efficient and productive. This means that as automation develops, the skill of the human operator must also be taken into consideration. The work that previously needed simple instructions for mundane labor, now requires specialized training to perform the same task using the platforms implemented to introduce automations.

This poses a major challenge, as skilled labor is more expensive and harder to procure. The promises of increased productivity, safety and reduction in human error fall short as the responsibility of humans operating automated systems increase tenfold compared to old, unorthodox systems leading to unexpected accidents that are hard to predict and account for with fail safes.

To make sure the development of automation happens smoothly without any unpredictable mishaps, we must make sure to plan and carefully supervise the implementation of automation technology in various industries, all the while making sure to consider all factors before carrying them out. There is no doubt automation is the future, but keeping in mind the human factor will be key going forward.

2.9 Human resource automation

The way HR departments operate in firms has evolved as a result of technology, which has become the new architect of the contemporary work environment. HR workers are expected to accomplish more with less as a result of the rapid technological advancements and significant changes (Figure 4).

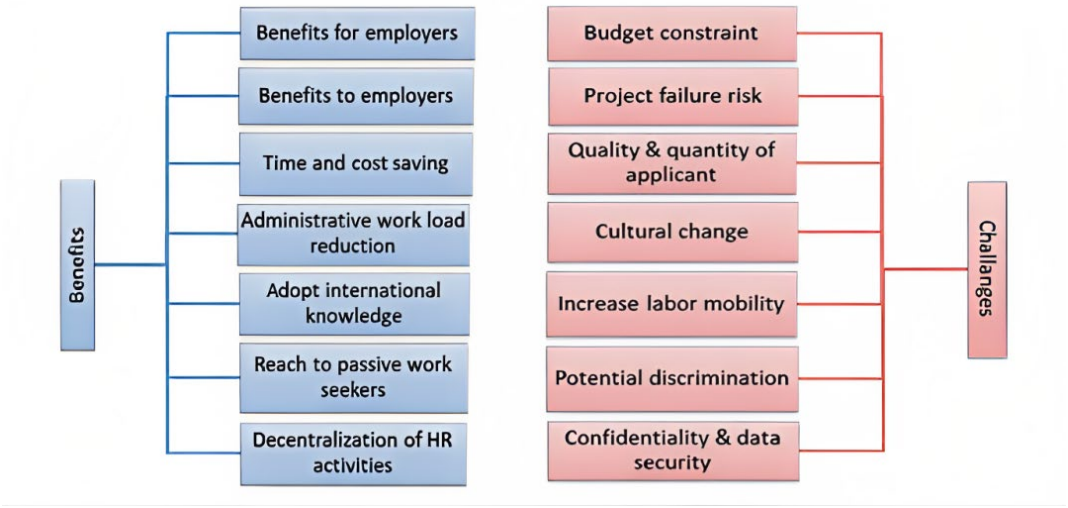

Figure 4. Benefits and challenges of HR automation

HR automation calls for not only the use of new technological tools but also the training of staff members and the restructuring of organizational culture. The onset of globalization, the rapid growth of business, and the ever-increasing demands of competition mean that organizations today cannot rely on conventional methods of task completion. Due to quicker processing times, information sharing, and access to data, HR automation makes it possible to reduce the amount of time spent on administrative tasks and boost productivity and profitability. Additionally, it lessens the administrative effort and offers immediate information availability. Document-driven processes for completing tasks without compromising their quality improve organizational productivity. Additionally, it shortens

hiring turnaround times by giving employers online access to a huge pool of qualified applicants. It also lowers hiring expenses. Additionally, it promotes employee retention by increasing organizational transparency by enabling access to historical data on businesses and employees.

The modern workplace is more disjointed than ever. Technologies that are disruptive have altered how people interact, collaborate, and work. Organizations will have to deal with a shortage of essential people, continuously changing skill requirements, and addressing the needs of various generations. On top of that, HR Today faces a significant difficulty in getting everyone on the same page and cooperating. The organization's biggest concern should be if the technology used can analyze organizational demands and business preparedness to ensure there is no gap between the services promised and those actually provided. Additionally, it is crucial that the firm choose whether to develop and manage technology internally or outside. The fear of losing their employment may prevent employees from adopting new working practices, making it difficult to persuade them to do so. As a result, encouraging employees to use new technologies is a major obstacle. The HR department of a commercial firm is more complex. There is a flood of information there. Finding the information, you need when you need it is a constant issue due to the variety of formats and media that employee information is available in. Organizations, particularly SMEs, should clearly state about the types of information that should be shared, who can access the data, and who will be authorized with the data; otherwise, security and privacy concerns might arise. Making sure that everyone in the organization abides by the company's policies, code of ethics, and confidentiality agreements is one of the major challenges in automating HR. Employees must understand that doing so could jeopardize organization security or lead to the disclosure of passwords.

3.Conclusion

In contrast to fluctuations or errors caused by humans, an automated system can provide consistent high accuracy results. Productivity will increase, and any time-consuming task will be completed with ease. Automation is viewed as a one of the bigger factors in the market success of robotic systems. Because certain tasks are intricate and require high precision, pure predefined automation will not always be feasible, necessitating the use of real-time sensors and operations. When working in different environments, the robots should automatically recognize parts of it that are relevant to the construction they were designed to perform.

When it comes to using automation to handle forensics, the majority of the criticism usually comes from relying too heavily on automated digital forensics which will result in some deterioration of expert level knowledge. When more complex tasks, such as analysis, are automated, the level of judgment rises, as investigators lose understanding of the nitty-gritty concepts of investigation. In the long run, this could lead to poor quality investigations.

Internet of Things has enabled organizations to be more agile and forceful in their pursuit of finding new revenue streams. It can potentially change the conventional method of spending money on building, maintaining foundations for various products. In industrial automation, any unplanned stops that are caused due to failure in certain components can then cause production losses. Industrial automation ranges over various kinds of control systems and can be found in a variety of domains.

The majority of cervical cancer causes and deaths in a single year occur in low-income countries. Machine learning has recently been used in research studies to aid in the initial screening phase of detection. These techniques necessitate the use of healthcare workers who are comfortable with technology, which is not always the case. The generalized data input practices need to be changed, which will take a lot of work. Data preparation is a time-consuming challenge that, if done incorrectly, might reduce the effectiveness of the model. Everyone involved in the process, including non-medical or non-technical stakeholders, should be able to understand it without any trouble.

Institutions who want to modernize their libraries should make sure they have enough funds and time to implement the necessary adjustments to successfully convert to an automated e library. In order to avoid wasting time, money, or energy, planning library automation will include a proper practicality analysis of the project. In the event that the automated system malfunctions or has any issues, there should also be professionals.

Automation can only supplement human labor and increase its effectiveness and productivity; it can never totally replace a human. This means that as automation progresses, the operator's skill must also be taken into account. When compared to outdated, unconventional methods, automated systems operate by humans 10 times more responsibly, which increases the risk of unanticipated incidents that are difficult to foresee and account for with fail safes.

The time needed to complete research and difficult mathematical operations has considerably decreased because of technological advancements. The main sciences have benefited much from automation, but social science has not yet fully embraced the technology and methodologies it offers. Lack of global standardization in data representation would be the biggest obstacle. It would be beneficial to have field-specific norms for file naming and metadata representation. If social sciences were to adopt automation, it would take a long time for individuals to adjust to the significant changes brought on by standardization and other cutting-edge technologies. To ensure that their study is acknowledged globally, people would need to learn new techniques, but the process would move much more quickly if it were well mechanized.

Devices that allow for sensor and networked device control have been around for a long time. However, use of home automation has not increased significantly since a few years ago. Because home automation is expensive and has few installation alternatives, the majority of people are unwilling to invest much time or money in it. Nowadays, remote access and secured access are necessities, which raises security problems. This has limitations on when and where it may be put because many installations need structural improvements. The majority of those surveyed claimed that everyone present in the home could utilize the automatic features, presenting security issues.

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