

The Automation of Business Processes and its Effect on Overall Business Structure and the Hiring Process

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On my honor as a University Student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments

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STS Research Paper

Automation's Impact on Business Processes

In the dynamic landscape of contemporary business, the relentless pursuit of efficiency is a linchpin for companies trying to stay competitive. Among the myriad of strategies available, automation has emerged as a pivotal force, fundamentally reshaping process optimization within businesses. Defined as “the step-by-step work activities that are focused and coordinated to provide an output useful for stakeholders,” business processes are one of the targeted regions when businesses strive to improve their efficiency (Mohapatra et al., 2023, p. 91). From the streamlining of routine tasks to the empowerment of data-driven decision-making, automation not only allows heightened productivity but also allows opportunities for businesses to reallocate resources and nurture innovation. The rise of automation and Artificial Intelligence (AI) in manufacturing, often referred to as "intelligent manufacturing," has witnessed exponential growth. Predictions indicate that the AI market, valued at \$200 billion in 2021, is poised to exceed \$320 billion by 2022, boasting an annual growth rate of 12.5% (Dubey et al., 2020). The technological wave is not merely confined to industry giants but also affects the operations of smaller enterprises, where the impact is often felt acutely. Reflecting on internship experience at a small manufacturing company this past summer, it became apparent that even smaller-scale companies deal with the challenges and opportunities that come with automation.

In this research paper, I attempt to explore the complex relationship between automation and the manufacturing industry, analyzing its effects on business processes. The overarching research question driving my inquiry is: How does the integration of automation technologies of business processes transform overall business structure and the hiring process? To explore the relationship between the technical aspect and the human aspect of technologies, I have elected to use Hughes (1987) theory of technological momentum because the use of automation is an

example of a technology that is becoming entrenched in society. Hughes' theory explores the expansion of large technical systems over time and how they become integrated into broader social systems and the environment. Hughes' theory seeks to address the persistence and influence of existing technologies when more advanced alternatives exist

Exploring the Impact of Automation on Business Structure

The research question my paper explores is how the automation of business processes has affected overall business structure and the hiring process. To address this question, research was done on existing literature on the effect of automation on business structures and the hiring process. Sources of automation in the hiring process include researching the rise of resume keyword scanners and the use of performance prediction using machine learning. In addition to the hiring process, research was conducted on how automation has affected the overall business structure of companies. Changes in overall structure include the change in the percentage of employees hired that are dedicated to technology-based roles as well as different training adopted by companies that are more focused on preparing employees to use technology. The research also includes case studies of companies that have integrated automation in their operations to understand the practical implications, benefits, and challenges that they faced with this new structure. The framework of technological momentum guides the analysis, offering a wide lens on the process of moving towards automation, the challenges faced in implementing automation, and how automation has become and continues to be so deeply in businesses.

Keywords for guiding research: Resume scanners, automation, technological momentum, artificial intelligence, robotic process automation.

The paper begins with a discussion on how automation has been adopted by many businesses for a variety of uses and the impacts that it has had on efficiency profits for the

companies. Subsequently, the study delves into how the adoption of these technologies has impacted the workers and their role in increasingly more tech-reliant companies. Finally, the study explores automation in the context of the hiring process, including its history and the benefits and downsides experienced.

Evolution of Automation Technology

The origins of automation technology trace back to the early days of mechanization during the Industrial Revolution, where manual labor was replaced with mechanical power. During this time, manual labor manual labor was gradually replaced by mechanized systems, increasing the productivity and efficiency of various industries (Groover, 2024). Early forms of automation include the use of steam engines, mills, and internal combustion engines (Bong, 2022).

Through time, advancements in engineering and computing have increased the capabilities of automation. With the introduction of the digital computer, improvements in data-storage technology, and software to write computer programs, automation has become much more sophisticated (Groover, 2024). Machines used in automation are capable of performing calculations at great speeds due to due integrated circuits. Automation can be seen in a variety of industries from finance with computers capable of performing calculations to manufacturing with the use of robotics.

Approaching this paper through the lens of Hughes' theory of technological momentum, it is important to understand how it is used and some critiques of the theory. The theory of technological momentum is used by scholars as a framework for understanding the persistence and influence of existing technologies in socio-technical systems. This concept is applied to analyze how technologies become embedded in society and how they interact with other

technologies and institutions over time. Some critiques of Hughes' theory of technological momentum include that once a technology gains momentum, it become difficult to change course or reverse its effects. Some scholars argue that this perspective the agency that individuals and institutions hold in shaping technological trajectories (Jasanoff, 2008).

Technological Momentum and Automation

In exploring the relationship between technological advancements and their societal implications, Hughes' (1987) theory of *technological momentum* serves as a framework for understanding the nuances of automation within businesses. Hughes' theory explores the nature of technical systems over time, focusing on how they integrate into broader social systems and the environment. The main focus of Hughes' framework is the persistence and influence of existing technologies, even when there are more advanced alternatives.

An important facet of *technological momentum* is the concept of consolidation. As exemplified by Mailchimp (n.d.) and Unreleased Software (n.d.), automation consolidates diverse operational data into coherent reports, streamlining performance, marketing, inventory, and other essential facets of businesses. The theory also introduces the idea of a “reverse salient” which is a deficiency in the system that lags behind other components. The deficiency is seen in organizations that still rely on manual processes (GrapeCity, n.d.). The importance of consolidation and eliminating reverse salients is further reinforced by the need for manufacturers to leverage data optimally through emerging technologies (McKinsey & Company, 2017).

In the broader context of STS, Hughes' theory provides a lens through which to understand the relationship between technological development and societal impact. Hughes' framework contributes unique insights into the inertia, consolidation, reverse salients, and innovation within technological evolution. The juxtaposition of consolidation, reverse salients,

and innovation in the *technological momentum* framework offers a comprehensive perspective for analyzing the implications of automation technologies on businesses.

Results and Discussion

The research question at hand delves into the impact of automation on business processes and the hiring process, particularly through the lens of Thomas Hughes' concept of technological momentum. This section aims to provide a comprehensive overview of the findings, detailing the implications of automation adoption within organizational contexts. The main findings of this section include that the integration of automation technologies is a quickly growing model that provide value to companies. Additionally, this study shows that the adoption of automation has changed many business formats and leads to the necessity of new training for employees and a greater emphasis on technology in higher education.

Adoption and Integration of Automation Technologies

The adoption of automation in businesses is designed to optimize the performance of tasks while reducing the effort required to complete them. Using technology, businesses seek to increase the effectiveness of their operations and reduce errors. The use of Robotic Process Automation technology (RPA) has become widely used in a variety of sectors to bring a greater degree of efficiency to business tasks. RPAs are described as a technology consisting of software agents imitating humans through a series of applications which perform specific activities (Syed et al., 2020). Tasks using RPAs are selected specifically based on the degree of benefit yielded from the automation of a process. Often the tasks selected are performed in a high volume and use various applications and systems (Pramod, 2022). In addition to these factors, tasks that have a higher probability of being affected by human error are good candidates for RPAs. Automation

has been adopted across several domains including banking and financial services and manufacturing.

Automation and data drive business agility in the banking and financial services market. Companies focusing on these innovations are utilizing technology known as fintech. These innovations can be used in a variety of ways; one proposed method is combining RPA and artificial intelligence (AI) for application in pension and inventory audits (Zhang, 2019). In the manufacturing industry, RPA is picking up and there are many opportunities for automation (Sonmez & Borekci, 2020). RPAs in manufacturing are used for master data management and are assembly tasks. Data management includes retrieving information that is then processed, the results of which are stored in specific databases or systems.

The market for RPAs is increasing steadily and is expected to continue to grow for the foreseeable future due to the value it provides to companies. According to a report from Fortune Business Insights (2023) the global robotic process automation market is projected to grow from \$13.86 billion in 2023 to \$50.50 billion in 2030. This substantial growth in the market clearly demonstrates Hughes' notion of technological momentum by showing that once an innovation has been accepted, it can create a "lock-in" effect where alternatives become increasingly difficult to adopt. The projected growth can also be seen as a form of inertia as described in Hughes' theory. Inertia, as described by Hughes', claims that once a technology gains momentum, there is often inertia against change. The use of RPA is widespread in areas of Finance, Accounting, Manufacturing, and Human Resource Management due to the repeatability of the processes and low number of exceptions. Because robotization is becoming more popular and common, organizations have begun using more sophisticated methods that utilize knowledge-based systems (Szmajser et al., 2022). Due to this and constantly expanding

databases, of cases and exceptions allows the use of automation with much more exceptions (Szmajser et al., 2022).

Changes in Organizational Structures and Practices

As the digital era is changing the structures of businesses, many professionals are forced to adapt their work and develop new skills. As RPAs and other forms of automation are used in business practice, they are replacing employees with software dedicated to their tasks. While they may take the place of primarily repeated and uncomplicated tasks, they allow employees to focus on more complex tasks which bring value to the company.

While the use of RPA may bring value to the company and reduce the time spent performing menial tasks, not everyone is in support of the increasing automation in the workplace. In July 2017, IMA (Institute of Management Accountants) conducted a survey of 161 senior finance professionals to see how technology is affecting management accountants and what skills and knowledge they will need to prosper in an ever-changing technology environment. In the survey, 42% of those who responded said that they are at least somewhat worried that new technologies such as AI and automation will replace their job (Krumwiede, 2017). Those surveyed were also asked about their level of familiarity with a variety of different areas related to data governance. Areas with higher levels of familiarity and skill included data analysis, security, operations, and business analytics. All of which are areas commonly needed in their field. The areas with the lower levels of skill and familiarity included metadata, AI, and blockchain technology (Krumwiede, 2017). These areas are not traditionally common in finance; however, newer innovations in the field often employ these skills and technologies. This divide between the traditional skills with which the professionals are most comfortable and the newer skills with which they lack familiarity can explain why some fear that these new technologies

may replace their jobs. Enhanced familiarity with emerging technologies could significantly bolster the value of accountants in their respective companies. Consequently, such proficiency mitigates their susceptibility to displacement by automation and AI.

Despite fears of automation and AI displacing professionals and making many jobs obsolete, technology has its risks, and completely replacing skilled workers with specialized software to cut costs may not yet be a valid business model. According to Boylan et al. (2018) in their research regarding the use of technology in accounting, while costs can be reduced by using software, there is a higher risk of error if the staff using the software has less understanding of accounting concepts and procedure. They also conclude that software cannot replace the advice given by professionals.

With these changes in the professional world, many higher education institutions feel pressure to adapt their degrees to better prepare students and provide them with the technical skills required to be competitive in the job market. Many higher education institutions attempt to adapt their curriculums to provide their students with the skills and experience necessary fulfill the requirements of the labor market. As concluded by Manuela Epure (2017), the cooperation of higher education with the industry should be encouraged and supported as the partnership between student, teacher, and employer has an important impact on all stakeholders. In a study by Brown-Martin (2017), he concludes that the jobs that would be most affected by advancements in technology in the coming years are middle skill jobs. Middle-skill jobs are defined as careers that require technical education and training beyond the high school level, but not a four-year college degree. Most undergraduate accounting students will be employed into middle skill jobs which raises the concern of whether or not these students will be able to find employment following graduation. Therefore, to ensure that these students are employable

following graduation, the curriculum of accounting students needs to be tailored to fulfill the expectations of employers. The changing job market due to the effects of automation influencing the curriculum of higher education institutions to better prepare students with the technical skills to understand and use said technology can be seen as a feedback loop. Feedback loops are discussed in Hughes' theory of technological momentum in the context of a technology gaining momentum and creating feedback loops to reinforce its adoption and use.

Impact on the Hiring Process

The automation of the hiring process can be traced back to the rise of the internet and the use of internet recruiting. Online postings of jobs allowed for companies to easily view applicant response by maintaining a database of the applicants and their resumes. The online postings were also useful in allowing the company to provide potential applicants with information regarding the organization and position, which let applicants evaluate their fit in the company (Breugh and Starke, 2000). With the introduction online applications, many jobs received an increase in the number of applicants to each position. This is due to a large increase in the number of applications that jobless workers submit. According to the Federal Reserve Bank of St. Louis (2023), Between 1979 and 1980, the majority of jobless workers submitted three or fewer applications a month. Between 2013 and 2019, about 40% filed at least nine applications per month. With the rise in number of applications received, many organizations searched for ways to reduce the time and effort needed by the HR departments to review resumes. One of the solutions brought forth to limit the number of applications that were manually reviewed is resume scanners.

Companies are able to scan resumes using keywords to select only those who meet certain requirements. The resumes not containing those specific keywords are discarded and only

those selected will actually be viewed by employers (Frazee, 1996). Criteria for differentiating between strong candidates using keyword searches can include the date of resume submission, or the existence of words or strings of words (Amin Mohamed et al., 2001). In addition to resume scanners, some companies have started to implement AI as a tool to help them determine whether a candidate would be a strong hire.

There are two main types of AI that are used in algorithmic hiring, AI-enabled sourcing software and AI-enabled assessment software. As the name indicates, AI-enabled sourcing software is used in the candidate sourcing domain, supplying matches between job openings and candidates. On the other hand, AI-enabled assessment software evaluates the fit of a candidate in a certain position and scores their predicted performance (Li et al., 2021). One of the first that tried to implement AI into the hiring process was one of the leaders in machine learning at the time, Amazon. Amazon had been building computer programs to review applicants resumes and search for top talent since 2014. The AI would review candidates resumes and compare them to the data supplied by the company to rate them. The training data included all resumes submitted to the company over the previous decade to spot the best candidates; however, given the low proportion of women working at the company, the AI was trained to believe that being male was a factor in success, and rated them higher (Lavanchy, 2018). The system taught itself to discriminate against women creating a sexist model for hiring. The program was shut down following the discovery because the technology wasn't ready to be continued. The failure of this system at the time can be seen through the lens of technological momentum as a reverse salient, lagging behind the other components of the hiring process. With the applications being online and the use of resume keyword scanners already using technology available, the need to

manually read through applicants was holding back the complete automation of the hiring process.

The use of automation in hiring doesn't end once the applicant is selected; the idea of employee self-service is that data is maintained by whomever it belongs to. This concept means that the employees are responsible for updating their personal information which is maintained in the companies' databases. Updating their personal information includes having them fill out their forms online and updating them personally, empowering them to perform simple administrative tasks themselves. This concept of employee self-service reinforces the notion of social embeddedness, explored in Hughes' theory of technological momentum, in which technologies become intertwined with social, economic and political structures, making them deeply embedded in society.

Limitations and Future Research

While my study delves into the effect so automation on business structures and the hiring process, it potentially overlooks the broader societal implications. The scope of my research is somewhat limited to the effects on the businesses themselves and does focus on the impact that automation may have in a wholistic view. Additionally, there may be biases or gaps in the sources that I consulted which would affect the comprehensiveness of my findings. My study briefly touches on ethical concerns regarding automation, particularly in the context of AI-driven hiring practices and the bias and discrimination involved in using existing data. More consideration of ethical concerns with automation and AI including exploration of issues of equity, privacy, and transparency could be the subject of future research.

As the researcher, continuing this line of inquiry would involve a deeper exploration of the broader societal impacts of automation including the integration of technology education into

formal curricula and policy frameworks that promote responsible automation adoption, address workforce transitions, and mitigate the potential negative consequences of automation. These areas would provide a more robust understanding of the impact of automation on broader societal dynamics.

Embracing Automation: Transforming Business Structures and Workforce Dynamics

In conclusion, my research sheds light on the profound impact of automation on business structures and the hiring process, explored through the lens of Thomas Hughes' concept of technological momentum. As businesses continue to integrate automation technologies like RPA and AI, they experience significant changes in organizational practices and employee roles. The transformation not only alters business models, but also influences the adaptation of workforce training and educational curricula to fulfill the demands of a technology-driven landscape. Additionally, my study explores the ethical consideration surrounding automation, particularly in AI-driven hiring practices, and emphasizes the importance of thoughtful implementation to navigate these challenges. Overall, my research highlights the need for organizations, institutions, and policymakers to embrace technological advancements while addressing their societal implications to ensure a sustainable and equitable future workforce.

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