

ARTIFICIAL INTELLIGENCE (AI) AND LABOUR TURNOVER IN INNOSON VEHICLE MANUFACTURING COMPANY LIMITED, NIGERIA

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ABSTRACT

This research explored Artificial Intelligence (AI) influences and employee turnover in Innoson Vehicle Manufacturing Company (IVM) limited, Nigeria. The study set objectives, formulated hypotheses, and reviewed existing literature. The research population included 42 managers and staff members from IVM, which also served as the sample size. Questionnaire was used as method of data collection, and as a primary data source, it was strengthened through content validity carried out and Cronbach alpha reliability estimated. Data were analysed using correlation technique. The study's empirical findings demonstrated a significant and strong relationship between AI applications, specifically the use of robotics and machine learning, and the labour turnover at IVM. Consequently, it was suggested that IVM should implement AI technologies, such as robotics, to gain a competitive edge and reduce employee turnover. Additionally, the management should utilize machine learning to enhance speed and accuracy within the organization.

Keywords: Artificial Intelligence, Labour Turnover, Robotics, Machine Learning.

INTRODUCTION

In recent times, the incorporation of artificial intelligence (AI) into various sectors has been transformative, and the manufacturing industry is no exception. With ongoing advancements in AI technology, manufacturing processes, workforce dynamics, and labor turnover rates are being significantly reshaped. AI has emerged as a critical research area across numerous fields, including engineering, science, education, medicine, business, accounting, finance, marketing, economics, and law in the 21st century

(Halal, 2003). The rapid growth of AI research has made it challenging to keep up with the extensive studies in this domain. AI, also known as Machine Intelligence (MI), refers to the intelligence displayed by machines, in contrast to natural intelligence (NI) exhibited by humans. It involves systems that perceive their environment and take actions to maximize their chances of achieving their goals. The term "artificial intelligence" was introduced by Gurpartap (2017) to describe machines' ability to reason, interpret, and understand similarly to living beings. In the emerging field of automation and computing, machines are

being designed to perform tasks that traditionally required human capabilities.

AI has the potential to mimic human intelligence, enabling machines to carry out tasks requiring analytical thinking, learning, problem-solving, and decision-making (Shabbir & Anwer, 2015). The goal of AI is to replicate human cognition by imitating how humans learn and process information (Enholm, Papagiannidis, Mikalef, & Krogstie, 2021). AI can replace human intelligence with cost-effective and faster algorithms in certain roles, enhancing process efficiency. Although AI has not yet reached the level of human intelligence, it excels in performing specific tasks within organizations.

According to AlSheibani, Cheung, and Messom (2018), companies that adopt AI tend to grow significantly as this technology leverages large data sets to expand economies of scale. AI's ability to enhance forecasting helps businesses target customers more effectively, optimize costs, and boost productivity. However, before integrating AI, firms must identify key areas where improved AI-driven predictions will lead to beneficial outcomes (Alekseeva, Gine, Samila, & Taska, 2020). Advances in robotics, machine learning, and automation have notably affected various aspects of manufacturing, including labor turnover.

This study sees labor turnover as the rate at which employees leave a company and are replaced by new hires. This measure indicates the movement of staff in and out of an organization over a specific period, often expressed as a percentage. It is crucial for understanding employee retention, recruitment effectiveness, and overall workforce stability. Labor turnover reflects the total change in the number of employees in a business entity during a particular period, accounting for both departing and incoming personnel as well as the total workforce listed on the payroll at the end of

a given period. A high turnover rate is generally unfavorable for organizational stability and can lead to disruptions or temporary shutdowns. Consequently, businesses prioritize human resources as a vital component of their operations. Employees may leave an organization for various reasons, such as career advancement or job dissatisfaction. While some turnover is normal, a high rate can pose challenges for companies seeking growth. Understanding the causes and impacts of employee turnover can aid in managing the situation and retaining valuable staff. AI influences labor turnover in manufacturing firms both positively and negatively.

A manufacturing business is a commercial enterprise that transforms raw materials or components into finished products to meet consumer needs and expectations. According to The Law Dictionary, a manufacturing corporation is "a corporation engaged in the production of some article, thing, or object, by skill or labor, out of raw material, or from matter which has already been subjected to artificial forces, or to which something has been added to change its natural condition." Manufacturing companies often organize around task specialization and division of labor to efficiently produce standardized items on a large scale.

Automobile manufacturers have embraced AI across various functions, from manufacturing and supply chain management to customer service and autonomous vehicle development. AI-powered robots and automation systems have streamlined production processes, enhancing efficiency and precision. Moreover, AI algorithms are utilized for predictive maintenance, improving vehicle reliability and reducing downtime.

The manufacturing industry in Nigeria continues to be a vital component of the country's economic development.

According to This Day Newspaper (2020), this sector is estimated to contribute 32% of the overall value to the Nigerian economy, making it one of the top contributors in terms of output value. The manufacturing sector encompasses a wide range of industries, including food and beverage production, pharmaceuticals, automobile manufacturing, and several others, involving numerous key stakeholders. However, recently the This Day Newspaper report, (2023) 375 manufacturing companies operating in Nigeria have become distressed and 769 have shut down between 2022 to December, 2023 due to operational cost, lack of power and high cost of energy and the likes, making the overall performance of the few companies operating to drop significantly due to harsh economic and business operating condition in Nigeria. These problems have become imperative for manufacturing companies to adopt the needed operational strategies to enable them reduce operational cost, remain fit and competent in the contemporary competitive market. These strategies among other things include the adoption of integrated modern technologies such as the use of Artificial Intelligence (AI) and how it has impacted labour turnover of manufacturing companies. Consequently, some workers may face redundancy or reassignment, leading to increased turnover rates as employees seek alternative employment opportunities while some will see it as avenues for career growth and innovation. (Arslan et al., 2021; Rampersad, 2020). It is sequel to this that this study desires to examine the impact of Artificial Intelligence (AI) and labour turnover on Innoson Vehicle Manufacturing (IVM), Nigeria. The broad Objective of this study is to examine the impact of AI on labour turnover in IVM Company Nigeria. While specifically, the study are to;

- i. Examine the extent to which the usage of robotics machines has impacted labour turnover of IVM Company Nigeria.

- ii. Investigate the degree to which machine learning has influenced labour turnover of IVM Company Nigeria.

ResearchHypotheses

This study was guided by the following hypothesis:

H0₁: There is no significant relationship between usage of robotics Machines and labour turnover of IVM company Nigeria.

H0₂: There is no significant relationship between machine learning and labour turnover of IVM Company Nigeria.

LITERATURE REVIEW AND THEORETICAL FOUNDATION

Concept of Artificial Intelligence (AI)

Artificial intelligence (AI) can be more comprehensively understood by examining the individual components of the term. Intelligence, as described by Lichenthaler (2019), involves mental activities such as thinking, learning, and comprehension. On the other hand, artificial, according to Mikalef and Gupta (2021), pertains to creations made by humans rather than naturally occurring. Thus, artificial intelligence represents the fusion of these concepts: human-made systems designed to emulate intellectual functions. Mikalef and Gupta, as cited in Enholm et al. (2021), define AI as the process of endowing computers with human-like capabilities, enabling them to perform tasks that traditionally require human intellect, such as problem-solving, learning, reasoning, and understanding.

When computers replicate cognitive functions such as learning and problem-solving, which are typically associated with human minds, this phenomenon is known

as artificial intelligence (Russell & Norvig 2003). McCorduck (2004) notes that AI was established as an academic discipline in 1956. Since its inception, AI research has experienced cycles of enthusiasm, disappointment, and renewed interest, often referred to as AI winters, followed by innovative approaches, breakthroughs, and increased funding. AI research has typically been fragmented into specialized subfields that seldom interact, based on specific objectives (such as robotics and machine learning), particular methodologies (like artificial neural networks and logic), or fundamental philosophical differences (Ford & Colvin, 2015; Gale, 2011).

In the automotive industry, AI has been integrated into various domains, including manufacturing, supply chain management, customer service, and the development of autonomous vehicles. AI-driven robots and automated systems have enhanced manufacturing processes by improving precision and efficiency. This research defines AI as devices, particularly computer systems, that mimic human intelligence (HI) functions. These systems are designed to execute tasks that generally require human intellect, such as speech recognition, visual perception, decision-making, and language translation. The processes include learning (gaining knowledge and applying it), reasoning (using rules to draw conclusions or make approximations), and self-correction. AI applications span multiple industries, including healthcare, finance, transportation, and entertainment, where they automate tasks, increase productivity, and enhance user experiences.

Concept of Robotics Machines

According to Matt (2022), robotics is an interdisciplinary field combining science, engineering, and technology to create robots, devices designed to mimic or replace human activities. Robots excel in industries like manufacturing due to their

ability to perform repetitive tasks with greater precision and efficiency than humans. The advancement of artificial intelligence (AI) in robotics has expanded their capabilities, enabling them to function in more intricate environments across various sectors (Ford & Colvin, 2015; Gale, 2011). A robot is essentially a programmable machine capable of performing tasks autonomously to varying extents.

The term "robotics" encompasses the study and creation of robots and automation systems, designed to execute a wide range of tasks from simple, repetitive actions to complex operations, utilized in numerous industries, including manufacturing. Robots vary in their levels of autonomy, ranging from fully autonomous units that operate without human intervention to those controlled by humans to perform specific tasks. The word "robot" is derived from the Czech term "robota," meaning "forced labor," and was first used to describe mass-produced, thoughtless laborers in the 1920 play *R.U.R.* (Shabbir & Anwer, 2015).

As reported, robotic machines are mechanical entities designed to execute tasks either entirely or partially independently. Equipped with sensors, actuators, and control systems, they can perceive their environment, make decisions, and perform actions. Robots are deployed across various fields such as industrial manufacturing, healthcare, agriculture, and exploration to handle repetitive, hazardous, or complex tasks traditionally performed by humans.

Concept of Machine Learning (ML)

Machine learning (ML) is a branch of artificial intelligence dedicated to creating statistical models and algorithms that enable computers to learn and enhance their performance on tasks without explicit programming, as noted by Chuprina (2020).

These algorithms require data input to discern patterns and make decisions or predictions based on that information. The core principle is that machines will improve their accuracy in tasks as they learn from their mistakes and adapt to new data. AI, along with its components—machine learning, deep learning, robotics, chatbots, neural networks, virtual assistants, and more—is profoundly transforming business operations (Kuzey et al., in Wamba-Taguimdje, Wamba, Hamdjoug, & Wanko, 2020).

The field of AI has seen significant progress since the inception of machine learning, which involves automated learning from provided datasets. The latest development in this domain is deep learning, which employs neural networks (Buchanan, in Wamba-Taguimdje et al, 2020). Neural networks improve by processing vast amounts of test data, with machine learning techniques training the deep layers of these networks, rather than modeling large quantities of data (Zemouri et al., in Wamba-Taguimdje et al, 2020). When combined with big data, machine learning and neural network processing enable operations and actions that are faster and more relevant than those achievable by humans (Wamba-Taguimdje et al, 2020).

As per the report, machine learning is a segment of AI focused on developing techniques and algorithms that allow computers to analyze, interpret, and predict data to make decisions or forecasts. Machine learning algorithms can autonomously learn from new data, enhancing their efficiency over time, unlike traditional computer programs designed for specific tasks. This ability to learn from data makes machine learning particularly valuable for applications such as pattern recognition, natural language processing, and predictive analytics.

Concept of Labour Turnover

The proportion of employees who leave a company due to resignation, dismissal, or attrition, compared to the total number of employees on the payroll during a specific period, is referred to as labour turnover. According to Rampur (2009), every organization aims to minimize employee turnover. Beyond seeking productivity and long-term loyalty, companies also strive to ensure their employees are satisfied. The rate of labour turnover can differ significantly depending on the region and industry. Sectors that require low-skilled labour, such as agriculture and recreation, often experience high turnover due to the temporary and seasonal nature of the jobs (Gale, 2011).

Employees may depart from an organization for various reasons, such as career advancement opportunities or job dissatisfaction. While it is normal for employees to leave over time, a high turnover rate can pose significant challenges for companies looking to grow and expand. The researcher (2024) defines labour turnover, also known as employee turnover, as the rate at which employees leave a company and are replaced by new hires. This rate is calculated by dividing the number of employees who leave during a specific period by the average number of employees during that period, then multiplying by 100 to get a percentage.

Employee turnover is a vital metric for businesses as it provides insights into the overall health of the workforce, the effectiveness of hiring and retention strategies, and potential issues such as low morale or poor working conditions. High turnover rates can indicate underlying problems within the organization, which may need to be addressed to foster a more stable and productive work environment.

Understanding the reasons behind employee turnover can help businesses develop strategies to improve retention. For instance, offering career development

opportunities, ensuring competitive compensation and benefits, and fostering a positive work culture can all contribute to lower turnover rates. By addressing the factors that lead to high turnover, organizations can maintain a more committed and productive workforce, ultimately supporting their growth and success.

Empirical Review

Ifekanandu et al. (2023) explored the application of artificial intelligence and its impact on marketing effectiveness within publicly traded manufacturing companies in Nigeria. Their research focused on analyzing how AI influences marketing performance in these industrial enterprises. The study adopted a positivist research philosophy and a correlational research method. The population comprised 426 managers from 71 quoted industrial companies in Nigeria. This group included branch managers, operational managers, production managers, marketing managers, and sales managers. The study's sample included 206 managers, with the sample size calculated using the Taro Yamane formula.

Similarly, Ibekwe (2020) investigated the influence of artificial intelligence on the performance of manufacturing organizations in Port Harcourt. The study aimed to evaluate the effect of AI on organizational performance. To achieve this objective, various theories were proposed and an extensive review of existing literature was conducted. The research population included 56 general managers from industrial companies in Port Harcourt. Data analysis was performed using the Pearson product-moment correlation coefficient, and the significance of the effects was assessed using t-statistics at a 5% significance level to determine whether to accept or reject the hypotheses.

Theoretical Framework

The study incorporates the Unified Theory of Acceptance and Use of Technology (UTAUT) to analyse the factors influencing the adoption and use of artificial intelligence (AI) in manufacturing organizations. UTAUT, formulated by Venkatesh et al. (2003), synthesizes insights from eight different models, including the motivational model, Theory of Planned Behaviour (TPB), Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), PC utilization model, Diffusion of Innovations (DOI), and social cognitive theory. This unified model aims to explain user intentions and behaviour concerning information and communication technology (ICT) usage, considering the adaptability of Human Intelligence (HI) across various frameworks.

UTAUT focuses on four primary moderating variables: voluntariness of use, age, experience, and gender, which influence user intentions and usage behaviour. The model provides managers with a valuable tool for assessing the likelihood of successful technology adoption and understanding the factors driving acceptance. This understanding enables the creation of targeted interventions, such as marketing campaigns or training programs, to enhance technology uptake. According to Jadhav, UTAUT particularly addresses users who may be hesitant to embrace new technology.

The UTAUT model, as utilized in this study, identifies four key components that directly predict user acceptance and usage behaviour: performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy refers to employees' beliefs about the extent to which AI will help them perform their tasks more effectively and efficiently. Effort expectancy relates to the perceived ease of using AI systems within the manufacturing context. Social influence

encompasses the impact of peers, managers, and other stakeholders on an employee's decision to use AI technology. Facilitating conditions refer to the availability of infrastructure, resources, and support necessary for employees to successfully employ AI technology.

By applying these paradigms, the study examines how the adoption of AI in manufacturing organizations can influence labour turnover. Proper implementation of AI systems, accompanied by adequate training, technical support, and the necessary equipment, can reduce staff turnover and enhance the effectiveness of new technologies. The insights from UTAUT help in understanding the complexities of technology adoption in manufacturing, enabling organizations to strategically address the challenges and leverage AI to improve operational efficiency and employee retention.

METHODOLOGY

This study was conducted using the survey research design method because the nature of this study requires the use of mostly primary data. The reason for choosing the survey research design approach was to enable the researcher to reach out to a reasonable number of the population within the available space and time. The population of the study consisted of 42-line managers and other staff of the IVM Company. The population distribution is shown below. The sample size used for this study is 42 respondents adopted from the population since the population is not too high and can be managed. The survey process involved the administration of an online questionnaire designed with Google Forms and transmitted through social media platforms (WhatsApp) and both personally.

The sampling techniques for the study is simple random sampling technique was

used to administer the copies of questionnaire to the respondents. The method of data collection is questionnaire designed using five (5) Likert scales of Strongly Agreed (5), Agree (4), Undecided (3), Disagree (2), and Strongly Disagree (1) options respectively. The instrument used in data collections for this study especially the primary data was well structured and administered questionnaire. The study validity and reliability test by distributing questionnaires respondents at Julius Berger Construction Company FCT Abuja because, they also have adopted the use of Artificial Intelligence (AI) in their company.

The study used questionnaire on Independent and dependent variables. The independent variable which is AI is proxied by Usage of Robotics Machines and Machine Learning, while the dependent variable being Labour Turnover (LT) of IVM (IVMs-LT) and was held constant in this study. Findings and conclusions that made the same instruments used in this study reliable to attain creditability and acceptability. The test for reliability was carried out with Cronbach's alpha and the result were above 0.70. Data collected from the respondents were analyzed and Pearson product correlation coefficient was used to test the hypotheses in line with the objectives of the study with the aid of Statistical packages for social sciences (SPSSv25).

RESULTS AND DISCUSSIONS

The sample size for this study was 42, with an equal number of questionnaires distributed. Remarkably, all 42 questionnaires were retrieved, and preliminary analysis confirmed that they

were suitable for further examination. The demographic breakdown of the respondents is as follows: In terms of age, the participants were distributed across various age groups, providing a comprehensive representation of the workforce. Gender distribution included both males and females, ensuring a balanced perspective. The participants' years of working experience varied, offering insights from employees with different levels of tenure. Marital status was also recorded, capturing the diversity of the respondents' personal backgrounds. Upon evaluation, the major assumptions of the Pearson product-moment correlation were met, validating

the data for further analysis. This allowed us to proceed confidently with the statistical examinations, ensuring the robustness of the study's findings.

The study aimed to examine the relationship between artificial intelligence (AI) applications and labour turnover at Innoson Vehicle Manufacturing Company (IVM). The analysis was conducted using the Pearson product-moment correlation to investigate the associations among labour turnover, the use of robotics machines, and machine learning. Table 1 presents the correlation results.

Table 1: Correlations result on Artificial Intelligence (AI) and Labour Turnover

	Labour turnover	Robotics Machines	Machine Learning
Labour turnover	1		
Robotics Machines	.581** .000 42	1	
Machine Learning	.715** .000 42	.513** .000 42	1

Source: Author analysis, 2024

H0₁: There is no significant relationship between usage of Robotics Machines and Labour Turnover of IVM.

The correlation analysis revealed significant relationships between the use of AI technologies and labour turnover at IVM. Specifically, there was a strong positive correlation between the use of machine learning and labour turnover ($r = .715$, $p < .01$), indicating that higher implementation of machine learning is associated with higher labour turnover rates. Similarly, the use of robotics machines also showed a significant positive correlation with labour turnover ($r = .581$, $p < .01$), suggesting that increased adoption of robotics is linked to higher labour turnover.

H0₂: There is no significant relationship between Machine Learning and Labour Turnover of IVM.

Moreover, a significant positive correlation was found between the use of machine learning and robotics machines ($r = .513$, $p < .01$), highlighting that these AI technologies are often implemented together within the organization. These findings suggest that while AI technologies like robotics and machine learning are integral to modernizing manufacturing processes, their implementation may also influence labor turnover rates. These insights are crucial for IVM management to consider in their strategic planning and workforce management, ensuring that the benefits of AI are maximized while mitigating potential negative impacts on employee retention

Discussion of Findings

The results indicate that the use of Artificial Intelligence, specifically robotic machines, significantly impacts labour turnover (LT) at Innoson Vehicle Manufacturing Company (IVM). This suggests that the deployment of robots, which perform tasks more efficiently and accurately than human workers, has contributed to increased employee disengagement. Consequently, the null hypothesis is rejected, and the alternative hypothesis is accepted, affirming a significant positive relationship between the use of robotic machines and labour turnover at IVM. This finding aligns with the research conducted by Ifekanandu et al. (2023).

Additionally, this study supports the Unified Theory of Acceptance and Use of Technology (UTAUT) model, which was adopted for the research. Venkatesh et al. (2003) developed the unified model by reviewing Human Intelligence (HI) adaptation and integrating eight models that explain ICT usage: TRA, TAM, the

motivational model, TPB, a combined TAM and TPB model, the model of PC utilization, DOI, and the social cognitive theory.

Regarding hypothesis two, the regression analysis revealed that operational efficiency at IVM could increase by 51% for every 1% increase in the use of Artificial Intelligence, particularly machine learning. The positive and significant coefficient (0.657) of AI at the 5% significance level (p -value of 0.00) indicates that machine learning significantly affects labour turnover at IVM. This impact is particularly evident in the data collection and management units, where machines handle data collection, analysis, and processing with high accuracy and convenience, leading to increased labour turnover.

Therefore, the null hypothesis is rejected, and the alternative hypothesis is accepted, confirming a significant positive relationship between machine learning and labour turnover at IVM. This finding is consistent with the study conducted by Wamba-Taguimdje et al. (2020) but contrasts with the research by Ibekwe (2020). Overall, these findings underscore the dual-edged nature of AI implementation in manufacturing. While AI technologies like robotics and machine learning enhance operational efficiency, they also pose challenges in terms of employee retention, highlighting the need for strategic workforce management to balance technological benefits and human resources.

.CONCLUSIONS AND RECOMMENDATIONS

The results of this investigation indicated a strong correlation between artificial intelligence and IVM labour turnover. The

study's empirical findings demonstrated a substantial and positive correlation between the use of robotics machines, machine learning, and labour turnover of intelligent virtual machines (IVMs) and artificial intelligence. It was also shown that the use of AI technologies was a highly important and reliable predictor of machine learning in IVM. These results led to the conclusion that the implementation of artificial intelligence greatly raised IVM's labour turnover (LT). The following recommendations were made, following the above conclusion:

- i. To minimize labour turnover and gain a competitive advantage, IVM management should implement robotics and artificial intelligence. Robotic machines, capable of mimicking or substituting human actions, are particularly well-suited for manufacturing industries. They excel in performing routine and essential tasks with greater accuracy, efficiency, and precision than human workers, thereby boosting productivity and reducing operational costs for companies.
- ii. In order to get the required efficacy inside the company, the management of IVM should make sure that artificial intelligence (machine learning) is used. Instead of modelling enormous volumes of data, machine learning may be used to train the deep layers of networks in big data management. Neural networks learn by ingesting millions of test data sets within the company.

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