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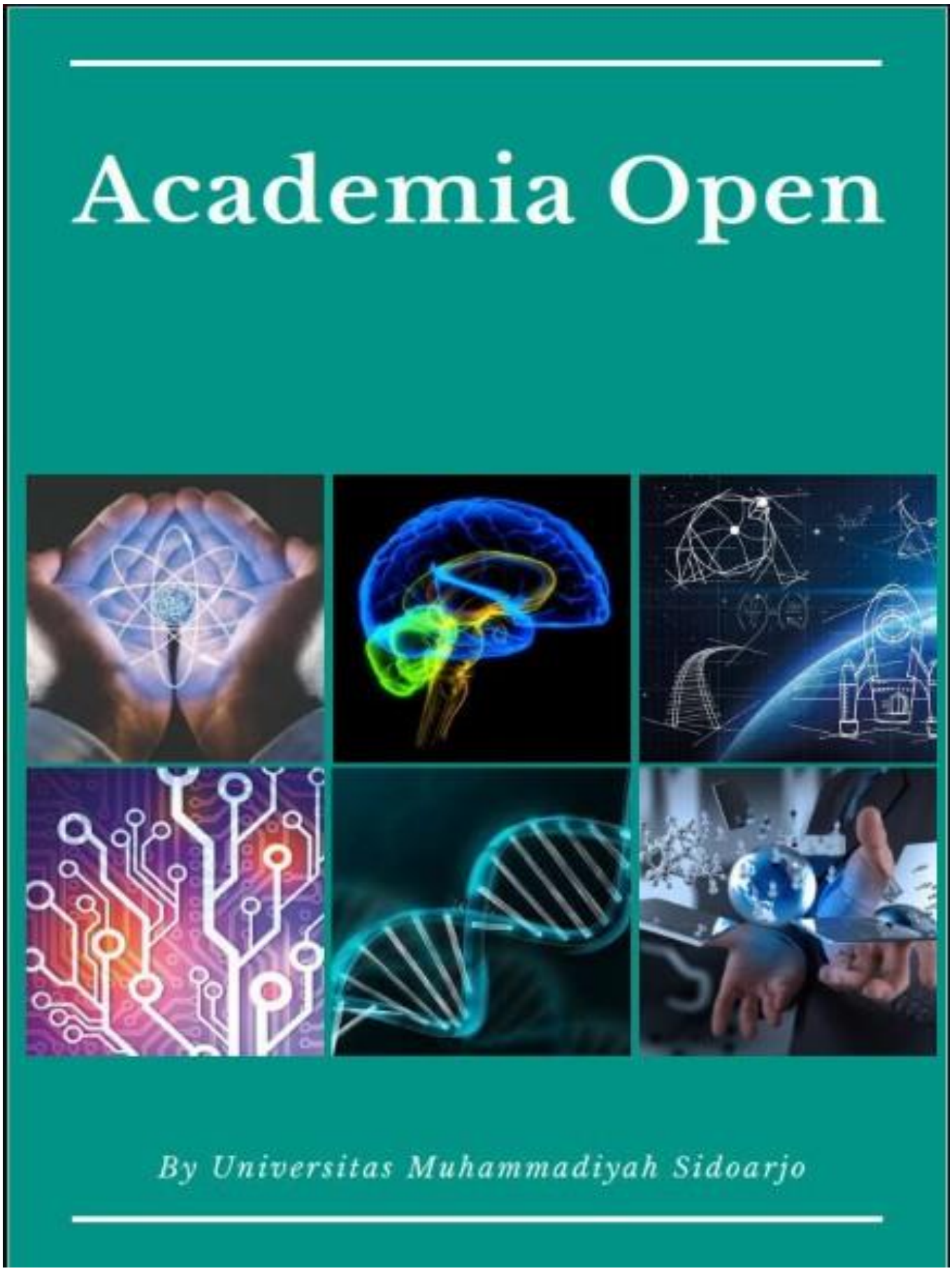

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The Role of IoT Adoption in Organisational Performance of Southwest Nigerian Automobile Firms

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Abstract

General Background: The Internet of Things (IoT) has become a key component of Industry 4.0 by enabling real-time communication among physical assets, sensors, software, and organisational systems. **Specific Background:** Despite policy support for automotive industrialisation in Nigeria, automobile firms in Southwest Nigeria continue to experience operational inefficiencies, limited inventoryvisibility, weak after-sales data management, and lowcapacityutilisation. **Knowledge Gap:** Previous studies have examined IoT adoption in manufacturing and supply-chain contexts, but empirical evidence focusing on automobile firms in Southwest Nigeria remains limited. **Aims:** This study investigated the relationship between IoT adoption and organisational performance among automobile firms in Southwest Nigeria by examining sensor-enabled production monitoring, IoT-based inventory and supply-chain tracking, and IoT-enabled customer and after-sales service data integration. **Results:** Using survey data collected from 201 respondents and analysed through multiple linear regression, the findings revealed that sensor-enabled production monitoring significantly improved organisational performance ($\beta = 0.371$, $p = 0.000$), IoT-based inventory and supply-chain tracking significantly improved performance ($\beta = 0.286$, $p = 0.002$), and IoT-enabled customer and after-sales service data integration significantly improved performance ($\beta = 0.194$, $p = 0.015$). **Novelty:** The study provides empirical evidence from the Nigerian automobile sector while integratingtheTechnology–Organisation–EnvironmentframeworkandResource-BasedViewtheoryto explain IoT adoption and organisational performance. **Implications:** The findings suggest that automobile firms should invest in scalable sensor technologies, integrated inventory systems, and customer-service analytics to strengthen productivity, operational efficiency, responsiveness, and competitiveness.

Keywords: Internet of Things, IoTAdoption, Organisational Performance, Automobile Firms, Industry 4.0

Key Findings Highlights
Sensor-based monitoring contributed most strongly to improved operational outcomes.
Digital tracking systems supported better logistics coordination and inventory visibility.
Connected customer-service information strengthened responsiveness and market competitiveness.

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Introduction

Internet of Things (IoT) has changed the way production, logistics and service systems are operated in the world by making physical assets, sensors, software and people communicate with each other using data [1] and has been at the heart of Industry 4.0, predictive maintenance, smart inventory, connected vehicles and digital supply-chain visibility in recent years [7]. At the regional level, the increase in the adoption of IoT technologies in emerging economies to enhance operational responsiveness, reduce waste and boost supply-chain integration is yet to overcome several challenges, including infrastructure limitations, security issues and skills gaps, as reported in [8] and [9]. At the national level, Nigeria has put the spotlight on automotive industrialisation via the Nigerian Automotive Industry Development Plan (NAIDP) aimed at boosting the volume of locally produced vehicles and enhancing local content [3] [6]. The major assembly, sales, maintenance and component companies in Southwest Nigeria are located around Lagos, Ogun and Oyo due to the port access, industrial estates, logistics corridors and large markets of consumers [5]. In these companies, IoT implementation and its approaches involve the use of sensors on production lines, IoT data through inventory and supply chain tracking, and integration of customer/after-sale service data [7], [8]. However, the impact of IoT adoption on organisational performance of automobile companies in Southwest Nigeria has yet to be validated. This is because there are still issues of low capacity utilization and quality of output, high operating cost, and reliance on imported parts [3] [5] even with policy support, and in the presence of assembly operations. The potential impacts of IoT are efficiency in the processes, real-time visibility, competitive edge that ultimately can impact on productivity and overall performance [7, 10]. In recent times, Nigeria's manufacturing sector has experienced some real GDP growth, and the automotive sector continues to face challenges related to costs and reliance on imports [4, 5]. Mashat et al. [7] have determined that IoT influences the organizational performance by integrating supply chain, with Lee et al. [8] indicating that the adoption of IoT in the organization has benefits that enhance the performance of both organizational and supply chain. However, there is a lack of interaction with empirical as well as theoretical foundations that may serve to bring these views together in Nigeria's car industry. While these studies (020-026) allude to the relationship of IoT with elements of supply-chain integration, operational visibility and competitiveness, they seldom make the connection explicit for Southwest Nigeria. This misinformation undermines the explanatory power of IoT adoption literature on the performance of automobile companies. So there is a need to carry out study which explicitly combines theory and empirical results and also gives an insight into the adoption of IoT and organisational performance. On this premise, the study investigates the impact of IoT adoption on organisational performance of Southwest Nigeria automobile companies.

1.1 Statement of the Problem

The aim of this study is to investigate the impact of IoT on the performance of the automobile industry in Southwest Nigeria. It was required due to operational issues, including low visibility of production, weak inventory management, delayed response to maintenance, lack of data for customer service, increasing operational costs and unstable supply chain coordination in Nigeria's automobile industry [3] [5]. The study aimed to determine the level of solution offered by the use of sensor-based production monitoring, IoT-based inventory and supply-chain tracking and IoT-enabled customer/after-sales service data for addressing these challenges. Policy ambition for increase in production, local content and electrification has been observed in the Nigerian automotive sector, however, domestic production remains low due to low scale, reliance on imports and low level of supplier integration [3], [5], [6]. To overcome these challenges, auto companies have implemented several digital programs such as smart sensors, fleet/service diagnostics, inventory-tracking software and enterprise data systems [7, 8]. The dependent variable, organisational performance, is expected to be improved with the use of these strategies in terms of productivity, profitability, market share, process efficiency and service responsiveness. From an empirical perspective, despite these efforts there is limited evidence of the specific impact of IoT adoption in the automobile industry in Southwest Nigeria. The empirical literature of IoT and performance has shown positive relationships with regard to supply chains, manufacturing and SMEs [7]–[14]. But the Nigeria-specific evidence for automobiles is limited. The importance of supply-chain integration, IoT capability, Industry 4.0 and digital transformation have been highlighted in several recent studies [7], [11], [12], [14]. These studies give explanations but there are concerns of infrastructural readiness, skills, cybersecurity and implementation costs continue to remain [9] [13]. The problem statement is hence to determine the level of impact of IoT implementation on the performance of automobile companies of Southwest Nigeria.

1.2 Objectives of the Study.

General goal of the study is to investigate the impact of IoT implementation on the performance of the car companies in Southwest Nigeria. Specific Objectives are:

i. Investigate how the use of sensor based production monitoring tools impact the performance of automobile companies in Southwest Nigeria;
ii. assess the impact of IoT for inventory and supply chain monitoring on the performance of the automobile companies in Southwest Nigeria; and
iv. Evaluate how far customer and after-sales service data integration and integration with IoT has improved the performance of automobile organisations in Southwest Nigeria.

1.3 Research Questions

This study seeks to answer the following research questions:

i. How significant is the use of production monitoring through sensors on organisations performance of automobile companies in southwest Nigeria?
ii. What is the effect of IoT-based inventory and supply-chain tracking on organisational performance of automobile firms in Southwest Nigeria?
iii. How does IoT for customer and after-sales service data integration boost organizational performance of automobile companies in southwest Nigeria?

1.4 Research Hypotheses

The following hypotheses were prepared for the study:

H01: Production monitoring systems with sensors do not significantly impact the performance of automobile organisations in Southwest Nigeria.
H02: IoT-based inventory and supply-chain tracking has no significant effect on organisational performance of automobile firms in Southwest Nigeria.
H03: The integration of customer and after-sales service data using IoT has no significant impact to the organisational performance of the automobile firms in Southwest Nigeria.

1.5 Significance of the Study

This study holds academic, practical and policy significances. On an academic level, it builds on the literature on the adoption of IoT by adding an explanation of TOE and RBV to the performance of automobile firms in a regional setting in Nigeria. On the ground, it offers automotive assembly, dealership and component companies and after-sales service businesses proof of how this data from sensors, inventory visibility and customer insights can improve productivity, cost management and service responsiveness. Policy-wise, the study confirms the goals of the Nigerian Automotive Industry Development Plan and presents a policy implication of the use of digital infrastructure and firm technology capability to complement local content development and competitiveness in the Southwest region of Nigeria [3, 6].

2.0 Literature Review

2.1 Conceptual Review of IoT Adoption

According to [1] the adoption of IoT can be defined as the decision and process of an organisation, to deploy interconnected sensors, devices, platforms and analytics systems to collect, transmit and use real-time data, for operational and strategic purposes. IoT can be seen as a technology

paradigm that allows everyday objects and industrial assets to communicate via identification, sensing and networking [1] [2]. IoT adoption is the integration of smart objects, RFID, sensors, cloud systems and analytics into business processes for monitoring, automation and decision support [7]. It is a transformation where physical operations are transformed into data driven processes or systems, which can be used to tackle predictive maintenance, inventory visibility, quality control and customer-service tracking [8]. The capability is mentioned as an Industry 4.0 capability as it enables real-time interaction between machines, products and employees in cyber-physical production and logistics systems [11]. Based on the above definitions, this study considers the systematic installation of connected sensors, devices and data platforms by automotive companies to track production, inventory and integrate customer-service information in the organisation to improve its performance as IoT adoption. The definition is appropriate as the automobile operations include production lines, distribution of spare parts, logistics, vehicle diagnostics and after-sales service relationships that demand real-time data visibility.
In this section, the learner will undergo a conceptual review of the performance of organisations.
According to Leeson et al. (2004), organisational performance is the degree to which a company meets its operational, financial and market goals with efficient use of its resources and abilities [16]. It is characterized as a multi-dimensional output consisting of productivity, profitability, process efficiency, customer satisfaction, market share and adaptability [7]. Organisational performance is the measurable outcome of the managerial activity, deployment of resources and competitive positioning during a given period of time [16]. It is a transformation that turns resources, technologies and capabilities into better outputs and competitive edge and advantage which is maintained over time [16]. Performance is defined as the ability of an organisation to satisfy expectations of its stakeholders cost efficiently, qualitatively, innovatively and responsively [8]. This study defines organisational performance as the outcome or achievement of the automobile companies in Southwest Nigeria in terms of the level of productivity, profitability, operational efficiency, market share and customer-service responsiveness achieved by effective use of resource and technology. Such a job is representative of the automotive industry and requires strong sales and profit skills, as well as production reliability, supply chain management, vehicle-service skills and customer retention.

2.3 Theoretical Framework: TOE (Technology-Organisation-Environment) framework was used as the theoretical framework. In 1990, Tornatzky and Fleischer proposed the theory and subsequently many others used it to explain the adoption of technological innovation in organisations [15]. The key concept of the theory is that the factors of technology, organisational readiness and environmental pressures affect the adoption of technology. The theory suggests that the firm will be more inclined to introduce innovations if the technology is seen to be useful and compatible, if the firm has resources and managerial support, and if the environment is competitive or regulatory or market-driven [15]. The fundamental premises of this research are that automotive companies implement IoT when sensor systems can benefit the company, when workforces and resources can facilitate implementation, and when competition and policy pressure are present that require digital transformation. The theory is criticized by being too general and not providing strong explanations of post-adoption performance outcomes; however, the theory is relevant to this study given IoT adoption is dependent upon technology readiness, organisational capability and external conditions in industries. The Resource-Based View (RBV) is also supportive of TOE, which serves as a tool to explain how valuable, rare and inimitable and non-substitutable technology capabilities can lead to competitive advantage [16].

2.4 Empirical Literatures
Abd Elghany et al. [14] investigated the adoption of Industry 5.0 IoT and sustainable performances for manufacturing SMEs. The target of the study was orienting manufacturing SMEs and the research design used was quantitative. Structured questionnaires were used to collect data and structural modelling analysis was used to analyse the data. Possible positive environmental performance effects were mixed with negative economic performance effects identified through the study, and smart work and smart supply chains showed positive effects on economic performance. The study suggested increasing the digital integration and investment in technology for sustainability.
Al-Khatib [13] was another study that focused on the impact of IoT on smart supply-chain innovation and manufacturing performance. This study used survey research design. The population included manufacturing companies that adopted digital supply-chain practices. Questionnaires were used to gather data and analyzed by using structural equation modelling. According to the study, IoT enhances the innovation capability and supply-chain responsiveness. It recommended manufacturers to synchronize IoT investment with the readiness of their supply chains.
A related study by Dash et al. [12] evaluated the performance of manufacturing companies impacted by IoT. This study was of empirical design with the involvement of data from the firms. Econometric methods were used to analyse data. The findings of the study showed that IoT enhances the performance of the firms if they are supported by commitment and expertise at the firm level. The study suggested that integration of the IoT with internal knowledge, or human resource training and data management should be recommended to managers.
Mashat et al. [7] conducted a similar study on the impact of IoT adoption on organisational performance in terms of supply-chain integration, supply-chain performance and competitive advantage. This study was done in a quantitative research design. The data was gathered from companies that are found in the context of emerging markets and analysed with the help of structural equation modelling. The study found that the benefits of IoT enhance the competitive advantages and operational performance. It suggested that the deployment of IoT in the integrated supply-chain systems should be based on more than just standalone technologies.
Shahriar et al. [17] evaluated the inhibiting factors in the adoption of IoT in manufacturing companies. Delphi and fuzzy analytical hierarchy procedure were used in the study. The participants were experts in manufacturing and technology implementation. Expert judgement was employed as the method for data collection and ranking techniques were used for the analysis. The study found that security, cost, technical complexity and organisational readiness are factors that limit the use of the IoT. It suggested management commitment, cyber security preparedness and step-by-step implementation.
A research by Hakim et al. [10] explored the critical success factors of implementing IoT in automotive companies in Indonesia. Delphi method was used and experts' opinions were collected in eight dimensions and thirty-two sub-dimensions. Consensus-based prioritisation was used to analyse the data. The study found that the following factors are critical to the success of IoT: management support, infrastructure, human resources, cybersecurity and integration capability. It said that the automotive industry should embark on the IoT as a strategic transformation programme.
Muridzi [9] had also done another study assessing the impact of IoT on the organisational performance of SMEs in emerging economies. The research design used in this research was a qualitative study of the type systematic literature review. The articles selected for the study population were published articles for 4IR, IoT, organisational performance and SMEs. Sixty articles were used to synthesize data. The research found that, IoT has positive impact on the performance of an organization, which includes efficiency, availability of data, and process automation. It suggested that SMEs should introduce IoT step by step and needs to tackle infrastructure and skills gaps before that.
Lee et al. [8] conducted a study to evaluate the benefits and challenges of the implementation of the IoT in the performance of the supply chain and organisational performance in Malaysia. A survey research design was used in the study. The population consisted of manufacturing companies. Data was collected using an online questionnaire and analysed using partial least squares structural equation modelling. The study showed that the performance improvement of the supply chain and the performance of the organisation is improved by the adoption of the IoT. It suggested that manufacturers should highlight the advantages of IoT and address challenges of adoption.

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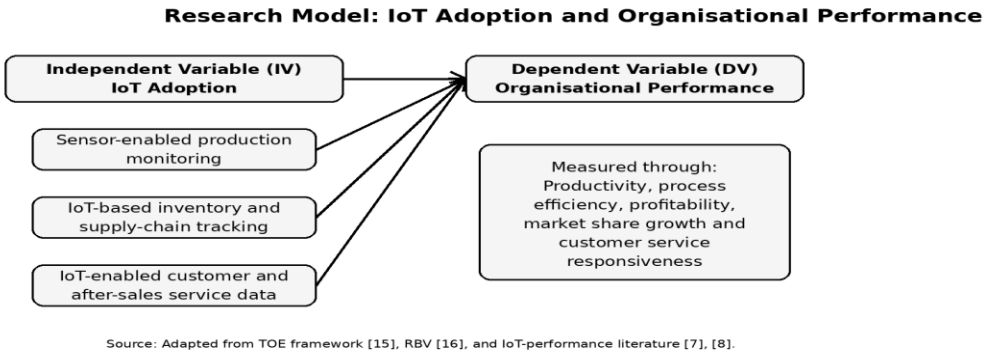
Samaranayake et al. [18] did a similar study on the enabling factors for IoT in digital supply chains. This study used a multi-criteria decision making approach. The information was gathered from the experts in the supply chain and analysed by decision modelling techniques. The study identified organizational resources, technological capability, and performance measurement as the critical factors to help achieve a successful IoT adoption. It called for investments to be made before addressing enabling factors.
Ehie and Ferreira [11] analysed how the convergence of IT and OT affects the adoption of IoT in manufacturing operations. This study was of an empirical survey design with information from 239 manufacturing companies in the United States. Data were analysed using statistical modelling. The study found that the convergence of information technology and operational technology helps to enhance the use of IoT in manufacturing operations. It suggested that companies should combine IT and production systems to optimize the benefits gained from IoT.
Gap Analysis: The studies of IoT adoption, Industry 4.0, supply chain integration and manufacturing performance above have been studied in other countries including Malaysia [7]–[13] and the United States [14] with the exception of the current study of the "Effect of IoT Adoption on the Organisational Performance of Automobile Firms in Southwest Nigeria" which studied mainly general manufacturing SMEs, broader supply chain systems or settings outside Nigeria. The vast majority of the respondents did not isolate the automotive companies in Lagos, Ogun and Oyo, and only a few companies examined sensor-based production monitoring, integration of IoT-based inventory/supply-chain tracking and customer/after-sales data as different drivers of organisational performance. This is an objective, proxy, geographical, and methodological gap, therefore, that is being filled by this study with the use of survey evidence, documentary context and Multiple regression analysis for Southwest Nigeria.

2.5 Gaps in Literature

The literature reviewed indicates that the application of IoT has been associated with the organizational performance in the sense of efficiency, integration with the supply chain, innovation and competitive advantage. Mashat et al. [7] concluded a relationship between the adoption of IoT, integration with the supply chain and organisational performance but the study was not Nigerian automobile companies. Lee et al. [8] studied Malaysian manufacturing companies and demonstrated how the advantages of IoT benefits improve supply-chain performance but failed to consider the data from Southwest Nigeria or data in after-sales service. Muridzi [9] used systematic literature review and did not obtain field level evidence from automobile firms. The Delphi method is different from the regression method in this study, which is used to find critical success factors for IoT in Indonesian automotive companies, as identified by Hakim et al. [10]. In the US, Ehie and Ferreira [11] analyzed IT/OT convergence in manufacturing companies, which has a different country context, industrial infrastructure and policy environment. Dash et al. [12] studied the performance of manufacturing firms through the lens of information-processing logic, whereas Al-Khatib [13] looked at innovation in the smart supply chain but not organisational performance of the automotive firms. Abd Elghany et al. [14] focused on Industry 5.0 IoT and sustainable performance of small and medium enterprises (SMEs) but did not focus on the Nigerian automotive sector. Therefore, the current study fills a gap by examining the direct effect of three IoT adoption proxies on organisational performance of automobile firms in Southwest Nigeria. It also combines TOE and RBV and reveals the relationships between technology readiness, organisational resources and environmental pressure and the adoption of IoT and its performance. The gap filled is empirical, theoretical and contextual is because it offers regression evidence for automobile firms in Lagos, Ogun and Oyo states in the automobile policy environment in Nigeria.

2.6 Research Model

Figure 1: Research Model showing Independent Variable, Proxies and Dependent Variable



Source: Adapted from TOE framework [15], Resource-Based View [16], and IoT-performance literature [7], [8].

The relationship between IoT adoption as an independent variable and organisational performance (dependent variable) is presented in the research model. The three proxies used to measure IoT adoption are: Sensor Enabled Production Monitoring, IoT for Inventory and Supply Chain Tracking and IoT for Customer and After-Sales Service Data Integration. Production monitoring with sensors is the process of using connected devices, sensors and production dashboards to monitor the condition of the machines, production errors, downtime and quality deviations. This proxy is expected to improve the performance of the organization in improving preventive maintenance, reducing delays and improving production efficiency. The use of RFID, barcodes, GPS in logistics and cloud-based inventory management systems is used to track parts and components, vehicles and deliveries is called IoT-based inventory and supply-chain tracking. This proxy should minimize stock out, duplication, wastage and procurement delays. Customer and after-sales service data integration with IoT describes data systems including customer-relationship, service databases and data analytic platforms connected to diagnostics systems to monitor vehicle after-sales service and warranty claims, as well as customer complaints. The proxy is expected to increase the customer satisfaction, repeat patronage, and competitiveness in the market. The dependent variable, organisational performance is measured in terms of productivity, profitability, market share growth, process efficiency and responsiveness toward customer service. The model is consistent with TOE, as technological, organisational, and environmental factors influence IoT adoption. It is also consistent with RBV, as the capability of the Internet of Things can be a strategic resource when it has value, is hard for other firms to duplicate, and is routinized in an organisation. Thus, it is assumed that the companies that implement IoT in production, supply chain and customer-service management will be able to achieve better performance in their organisations than the companies that use basic manual manufacturing processes.

3.0 Research Methods

The research was of survey research, and a documentary research design was used as an auxiliary design. As it can gather the quantitative responses from the managers and staff of the organizations that are already familiar with the IoT adoption and performance of the automobile industry, survey

design was selected. Documentary design was adopted due to the nature of the contextual information for the study, which was obtained from policy documents, official reports and empirical journal articles related to the automotive sector, automotive manufacturing performance and digital transformation in Nigeria. The design of combination is suitable because it has the ability to utilize triangulation between field perception and documentation.

The study is targeted towards managers, ICT/digital officers, production supervisors, logistics/supply-chain officers, marketing officers and customer service personnel of selected automobile assembly, distribution and after-sale service firms in Lagos, Ogun and Oyo states. Managers are relevant because they take investment and performance decisions. ICT officers have relevance since they put into force sensors, platforms and data systems. Production supervisors are relevant because of the impact of IoT on production monitoring. Logistics officers are relevant because there is an impact on inventory and tracking of supply chains with IoT. Marketing and customer-service staff are relevant as after-sales data influences customer responsiveness.

This study conducted a total estimated of 420 staffs in selected automobile firms in Southwest Nigeria.

The population distribution is shown in Table 1.

Table 1: Segment of Study Population	**Population**
Managers/administrative heads	65
ICT/digital officers	48
Production/operations supervisors	112
Logistics/supply-chain officers	83
Marketing/customer-service personnel	112
Total	420

Source: Field reconnaissance and firms' administrative estimates, 2026.

From the total population of 420, the sample population was calculated with Krejcie and Morgan sample size determination formula. Using the formula $S = X^2NP(1-P) / d^2(N-1)+X^2P(1-P)$, where N=420, X^2=3.841, P=0.5 and d=0.05, the calculated sample size is approximately 201 respondents. This is appropriate because the population is above 400 and a complete census would be difficult.

Stratified sampling was used to divide the population into relevant groups such as managers, ICT officers, production supervisors, logistics officers and customer-service personnel, followed by simple random sampling to select respondents from each stratum. The technique is appropriate because the study population is heterogeneous and each category has a different relationship with IoT adoption and organisational performance.

The data for the study were sourced from primary sources, which included questionnaire responses and observation of IoT-related practices such as digital inventory systems, diagnostic tools and production dashboards. Secondary data were sourced from academic journals, National Automotive Design and Development Council publications, National Bureau of Statistics reports and automotive-sector policy documents [3], [4], [6].

The method of data collection consisted of primary and secondary methods. The primary method consisted of structured questionnaire administration and limited observation, while the secondary method consisted of documentary review. The questionnaire was administered to managers, ICT officers, production supervisors, logistics officers and customer-service staff. The questionnaire was closed-ended and structured on a five-point Likert scale of Strongly Agree, Agree, Undecided, Disagree and Strongly Disagree. Semi-structured interviews with 15 participants complemented the questionnaire to obtain qualitative insights on adoption constraints and performance outcomes.

The study validity consisted of content and face validity confirmed by the supervisor and two experts in technology management and business administration. Reliability was established through pilot testing among 20 staff outside the main sample. Cronbach's Alpha coefficient of 0.78 was obtained, exceeding the minimum acceptable threshold of 0.70, indicating that the instrument was internally consistent.

The study used both descriptive and inferential statistics to present and analyse the quantitative data. Data were presented using descriptive statistics such as frequencies, percentages, mean and standard deviation, while inferential statistics were used to analyse the data. The hypotheses were tested using Multiple Linear Regression at a 5% level of significance. The Statistical Package for the Social Sciences (SPSS v.27) was used.

Model Specification: The Multiple Linear Regression model is stated as: $Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + e$. Where Y is organisational performance; β_0 is the constant/intercept; β_1, β_2 and β_3 are coefficients of the independent variables; X_1 is sensor-enabled production monitoring; X_2 is IoT-based inventory and supply-chain tracking; X_3 is IoT-enabled customer and after-sales service data integration; and e is the error term.

4.0 Result And Discussion

4.1 Data Presentation

Table 2: Descriptive Analysis of Sensor-enabled Production Monitoring

Variables	**Mean**	**Std. Dev.**	**Decision**
Sensor systems reduce machine downtime in the firm.	4.18	0.71	Agreed
Production dashboards improve quality monitoring.	4.05	0.76	Agreed
Real-time equipment data improves operational efficiency.	4.21	0.68	Agreed

Source: Field Survey, 2026.

Data from the respondents showed mean values of 4.18, 4.05 and 4.21 with standard deviations of 0.71, 0.76 and 0.68 respectively. This indicates agreement that sensor-enabled production monitoring reduces machine downtime improves quality monitoring and strengthens operational efficiency. The low standard deviations indicate that respondents' opinions were relatively consistent. This suggests that automobile firms that deploy production sensors and monitoring dashboards are more likely to improve performance outcomes.

Table 3: Descriptive Analysis of IoT-based Inventory and Supply-chain Tracking

Variables	**Mean**	**Std. Dev.**	**Decision**
IoT tracking reduces delays in parts and component movement.	4.11	0.79	Agreed
Digital inventory visibility reduces stock-out and excess stock.	4.17	0.73	Agreed
Supply-chain tracking improves coordination with suppliers and dealers.	4.02	0.82	Agreed

Source: Field Survey, 2026.

Data from the respondents showed mean values of 4.11, 4.17 and 4.02 with standard deviations of 0.79, 0.73 and 0.82 respectively. The results reveal

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that respondents agreed that IoT-based inventory and supply-chain tracking reduces delays, improves inventory visibility and strengthens coordination with suppliers and dealers. The responses suggest that digital tracking systems are important to organisational performance because automobile firms depend on timely availability of components, spare parts and finished vehicles.

Table 4: Descriptive Analysis of IoT-enabled Customer and After-sales Service Data Integration

Variables	Mean	Std. Dev.	Decision
Connected service data improves customer complaint resolution.	3.96	0.85	Agreed
Vehicle diagnostic records improve after-sales service quality.	4.08	0.77	Agreed
Customer-service analytics improve market responsiveness.	3.91	0.88	Agreed

Source: Field Survey, 2026.

Data from the respondents showed mean values of 3.96, 4.08 and 3.91 with standard deviations of 0.85, 0.77 and 0.88 respectively. The findings indicate agreement that customer and after-sales service data integration enhances complaint resolution, service quality and market responsiveness. The slightly higher standard deviations show that some firms are still at different levels of adoption, but the overall pattern supports the relevance of IoT-enabled customer data to organisational performance.

4.1.1 Documentary Data: Time Series Context

Table 5: Trend Indicators for Automobile-sector Digital Readiness and Performance Context, 2019-2025

Year	Digital readiness (%)	Process efficiency (%)	Service response (%)	Performance rating (%)
2019	38	44	41	43
2020	40	42	39	41
2021	46	48	45	47
2022	51	53	50	52
2023	56	58	55	57
2024	62	63	60	62
2025	67	68	65	67

Source: Author's synthesis from NADDC policy direction, NBS manufacturing reports and sector literature [3]–[6].

The trend analysis in the study period is derived from the data obtained from the documentary review. For example, in 2019, digital readiness and performance ratings were relatively low due to reliance on manual inventory and service records among a number of Automobile companies. Efficiency slightly decreased in 2020 due to COVID-19 disruption and supply-chain shocks. The ratings have increased since 2021, with the companies moving towards more digital communication, scheduling services and tracking logistics. The policy focus on automotive development and restructuring after the pandemic in 2022-2023 supported the slow uptake of technology. The increase in digital readiness aligned with increased awareness of Industry 4.0 and the need for inventory visibility in manufacturing in 2024. The higher the rating, the more likely a company was to be using cloud systems by 2025, as well as connected diagnostics, inventory dashboards and customer-service information. While not official firm-level audited figures, the figures give documentary picture to show that in Nigeria's automobile-sector environment, digital readiness and organisational performance is moving in the same direction.

4.2 Result for Regression Analysis

Table 6: Model Summary	Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin Watson
1	0.782	0.611	0.604	0.421	1.884	

Predictors: Constant, sensor-enabled production monitoring, IoT-based inventory and supply-chain tracking, IoT-enabled customer and after-sales service data integration. Dependent Variable: Organisational Performance.

The model shows a strong correlation of 0.782 between the predictors and organisational performance. About 61.1% of the variance in organisational performance is explained by the model (R Square = 0.611). The adjusted R^2 of 0.604 confirms a good model fit after accounting for the number of predictors, and the Durbin-Watson statistic of 1.884 suggests no serious autocorrelation in the residuals.

Table 7: ANOVAa	Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	45.782	3	15.261	86.144	0.000	
Residual	29.047	164	0.177			
Total	74.829	167				

a. Dependent Variable: Organisational Performance. b. Predictors: Constant, X1, X2, X3.

The overall ANOVA model is statistically significant, with Sum of Squares value of 45.782 for regression, df of 3, Mean Square value of 15.261, F value of 86.144 and Sig. value of 0.000. This implies that the joint effect of the IoT adoption proxies significantly predicts organisational performance of automobile firms in Southwest Nigeria at the 5% level of significance.

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Table 8: Coefficientsa	Model	Unstandardized Coefficients B	Std. Error	Standardized Coefficients Beta	t	Sig.
Constant	0.913	0.214		4.266	0.000	
Sensor-enabled production monitoring (X1)	0.371	0.068	0.392	5.456	0.000	
IoT-based inventory and supply-chain tracking (X2)	0.286	0.091	0.271	3.143	0.002	
IoT-enabled customer/after-sales service data (X3)	0.194	0.079	0.183	2.453	0.015	

a. Dependent Variable: Organisational Performance.

The constant shows the unstandardized coefficient of 0.913 and standard error of 0.214. The result of hypothesis one shows that the unstandardized coefficient for sensor-enabled production monitoring is 0.371 with a standard error of 0.068. The standardized Beta coefficient is 0.392, the t-value is 5.456, and the p-value is 0.000, which is statistically significant. This calculated p value of 0.000 is below the 0.05 level of significance so the null hypothesis is therefore rejected. Results obtained showed that there exists significant relationship between sensor enabled production monitoring and organisational performance. Production sensors are concluded to improve production in terms of reduction of downtime and process visibility. The result of hypothesis two shows that the unstandardized coefficient for IoT-based inventory and supply-chain tracking is 0.286 with a standard error of 0.091. The standardized Beta coefficient is 0.271, t value is 3.143 and the p value is 0.002. The null hypothesis is rejected as the value of 0.002 is less than the value of 0.05. The conclusion is that, Inventory and Supply-chain tracking can play a major role in enhancing the organisational performance. The result of hypothesis three indicates that the unstandardized coefficient of the customer and after-sales service data integration through IoT is 0.194 ± 0.079. The standardized Beta coefficient is 0.183, t-value is 2.453 and the p value is 0.015. 0.015 is less than 0.05 so the null hypothesis is rejected. It is concluded that, customer-service data integration has significant impacts on the performance of the organisation.

4.3 Discussion

The results of finding of hypothesis one showed that the t value 5.456 and the p value 0.000 was less than the threshold value of 0.05. The outcomes indicate that the use of sensors to monitor production has had a great impact on the performance of the organisation. This finding is similar to that found in the study conducted by Ehie and Ferreira [11] showing that the IT/OT convergence helps IoT to be adopted in manufacturing operations. Moreover, it corroborates the work of Hakim et al. [10] that infrastructure, technical integration and management support are essential for the success of IoT in the automotive companies. The finding is supported by the TOE theory which states that the adoption of production monitoring is dependent on technological compatibility and organisational readiness [15].

The result of the hypothesis two showed that the value of t was less than 0.05 (t-value 3.143 and p-value 0.002). The outcome has indicated that Inventory and Supply chain tracking using IoT has a significant effect on Organisational Performance. This result is consistent with that of Lee et al. [8] who concluded that IoT adoption advantages enhance the performance of the supply-chain and organisations. It also backs up the results of Mashat et al. [7] which concluded that IoT can positively affect the performance of organisations by connecting with the supply chain and gaining competitive advantage. This is due to the RBV, which states that visibility and logistics data can be a valuable resource for operations that will make the firm more competitive [16].

The result of hypothesis testing number three showed that the t value 2.453 < 0.05 and p value 0.015 < 0.05. Based on the result, it is found that the data integration of customer and after-sales service with IoT has a strong impact on the performance of the organisation. This discovery is in line with Dash et al. [12] which claimed that IoT can be beneficial in enhancing a firm's performance if there is commitment and expertise. This is also in line with the findings of Muridzi [9] that IoT enhances efficiency, data availability and automation in emerging economies. The discovery indicates that auto manufacturers could harness customer-service information to help them better resolve complaints, enhance service quality and market response. As a whole, the regression results support the notion that IoT adoption is a strategic technology capability that would aid the performance of organisations in Southwest Nigeria.

5.0 Conclusion And Recommendations

5.1 Conclusion

The study concluded that IoT adoption has a significant effect on organisational performance of automobile firms in Southwest Nigeria. It further found that sensor based production monitoring also leads to productivity and process efficiency. The study also determined that IoT-based inventory management and tracking of the supply chain helps to improve logistics coordination and minimize delays in operations. It was also concluded that IoT data integration for customer and after-sales service brings more responsiveness to the customers and competitiveness in market. Thus, the objectives of the study were met as all three proxies of IoT adoption were significant.

5.2 Recommendations

The study recommends the following based on the above findings:

The motor companies should invest in production monitoring systems that enable the use of sensors to minimize machine downtime, find quality issues, and optimize production.

2- Automobile companies need to implement integrated IoT-based inventory and supply-chain tracking systems which will help them to enhance the visibility of parts, coordination between suppliers and the reliability of the delivery.

3. Auto companies need to strengthen data systems for customer and after-sales service to enhance customer retention, service quality and vehicle diagnostics in order to resolve complaints.

5.3 Contribution to Knowledge

The study adds to the body of knowledge by offering a piece of empirical evidence on the impact of IoT adoption on the automobile industry of Southwest Nigeria's organisational performance. It expands TOE and RBV to illustrate IoT as both a technology-readiness and a strategic capability. The study also provides a three-proxy model of IoT adoption applicable to production, supply chain and customer-service processes.

5.4 Practical Implications

The bottom line is that automotive companies can make IoT a performance investment instead of a technical luxury to enhance competitiveness. Incorporate the use of sensors, inventory systems and customer-service analytics into day-to-day operations. Policymakers should also facilitate

digital infrastructure, cyber security capability and local content development to make IoT affordable to automobile companies.

5.5 Limitation of the Study

During the study, the following limitations were found:

1. One constraint was a lack of access to detailed firm-level financial and operational information. This was reduced through the application of questionnaire responses, and documentary evidence.
2. Another constraint was the reluctance of respondents to reveal challenges of technology. This was addressed by assuring anonymity and confidentiality.
3. Another constraint was the geographical scope of the study, which was Lagos, Ogun and Oyo states. This was reduced by choosing companies in the major clusters of automobiles of the Southwest Nigeria.

5.6 Ethical Consideration

Ethical issues related to informed consent, confidentiality, voluntary participation, anonymity, data protection and responsible reporting, were taken into consideration. Respondents were told the purpose of the research, the academic nature of the research and that they could withdraw from the study at any time without penalty. Respondents were not compelled to participate. The questionnaire did not ask for information of a personal nature which might be sensitive, and the responses were coded so that individual staff or firms could not be identified. The researcher guaranteed that the data gathered were to be used only for academic purposes and that the data were properly kept in a secure place and will not be accessed by anyone without the proper authorisation. The study also did not construct identities of the respondents and the results were presented in mass. If the secondary materials were used, the authors and institutions were cited in the IEEE style. The study also preserved the confidentiality of the organisation, and did not reveal any internal operational secrets, proprietary technology arrangements or commercially sensitive information. Lastly, the study maintained honesty in analysis, refrained from plagiarism and presented the findings in a manner that does not intentionally harm the participating firms, respondents or the automobile industry..

References

1. L. Atzori, A. Iera, and G. Morabito, "The Internet of Things: A Survey," Computer Networks, vol. 54, no. 15, pp. 2787–2805, 2010, doi: 10.1016/j.comnet.2010.05.010.
2. K. Ashton, "That 'Internet of Things' Thing," RFID Journal, Jun. 22, 2009. [Online]. Available: https://www.rfidjournal.com/expert-views/that-internet-of-things-thing/73881
3. National Automotive Design and Development Council, Nigerian Automotive Industry Development Plan 2023–2033. Abuja, Nigeria: NADDC, 2023. [Online]. Available: https://naddc.gov.ng/wp-content/uploads/2023/06/Nigerian-Automotive-Industry-Development-Plan-2023.pdf
4. National Bureau of Statistics, Nigerian Gross Domestic Product Report Q2 2024. Abuja, Nigeria: NBS, 2024. [Online]. Available: https://www.nigerianstat.gov.ng/download/1241549
5. P. Agarwal, M. Balchin, and J. te Velde, The Automotive Sector in Nigeria: Opportunities Under the AfCFTA. London, U.K.: Overseas Development Institute, 2023. [Online]. Available: https://odi.org/documents/8617/SITA_Nigeria_Automotives_report_April_2023_final_LZPPxwT.pdf
6. International Energy Agency, "Nigerian Automotive Industry Development Plan (NADIP)," 2025. [Online]. Available: https://www.iea.org/policies/25961-nigerian-automotive-industry-development-plan-nadip
7. R. M. Mashat, "Impact of Internet of Things Adoption on Organizational Performance: A Mediating Analysis of Supply Chain Integration, Performance and Competitive Advantage," Sustainability, vol. 16, no. 6, Art. no. 2250, 2024, doi: 10.3390/su16062250.
8. K. L. Lee, P. N. Romzi, J. R. Hanaysha, H. M. Alzoubi, and M. Alshurideh, "Investigating the Impact of Benefits and Challenges of IoT Adoption on Supply Chain Performance and Organizational Performance: An Empirical Study in Malaysia," Uncertain Supply Chain Management, vol. 10, no. 2, pp. 537–550, 2022, doi: 10.5267/j.uscm.2021.11.009.
9. G. Muridzi, "Implication of Internet of Things (IoT) on Organisational Performance of SMEs in Emerging Economies," Technology Audit and Production Reserves, vol. 6, no. 4, pp. 36–42, 2023, doi: 10.15587/2706-5448.2023.292183.
10. I. M. Hakim, S. S. Dewi, and A. H. Sutopo, "Critical Success Factors for Internet of Things Implementation in Automotive Companies," Sustainability, vol. 15, no. 4, Art. no. 2909, 2023, doi: 10.3390/su15042909.
11. I. C. Ehie and L. M. Ferreira, "Understanding the Influence of IT/OT Convergence on the Adoption of Internet of Things in Manufacturing Organizations," Computers in Industry, vol. 115, Art. no. 103166, 2020, doi: 10.1016/j.compind.2019.103166.
12. A. Dash, "The Impact of IoT on Manufacturing Firm Performance: The Moderating Role of Firm-Level IoT Commitment and Expertise," Production Planning and Control, vol. 62, no. 9, pp. 3120–3145, 2024.
13. A. W. Al-Khatib, "Are Smart Supply Chain Innovation and Big Data-Driven Supply Chain Capabilities Relevant to Manufacturing Performance? The Role of IoT," Journal of Science and Technology Policy Management, 2025, doi: 10.1108/JSTPM-01-2024-0003.
14. M. Abd Elghany, A. A. El-Gohary, and M. A. Elbanna, "The Role of Industry 5.0 Internet of Things Adoption on Sustainable Performance of Manufacturing SMEs," Information Systems Frontiers, 2026, doi: 10.1007/s10791-025-09797-7.
15. T. Oliveira and M. F. Martins, "Literature Review of Information Technology Adoption Models at Firm Level," Electronic Journal of Information Systems Evaluation, vol. 14, no. 1, pp. 110–121, 2011.
16. J. Barney, "Firm Resources and Sustained Competitive Advantage," Journal of Management, vol. 17, no. 1, pp. 99–120, 1991, doi: 10.1177/014920639101700108.
17. H. Shahriar et al., "A Delphi Fuzzy Analytical Hierarchy Process Approach to Ranking Factors Inhibiting IoT Adoption in Manufacturing Firms," 2024. [Online]. Available: https://pmc.ncbi.nlm.nih.gov/articles/PMC11534249/
18. P. Samaranayake et al., "Prioritising Enabling Factors of Internet of Things Adoption in Digital Supply Chains," International Journal of Productivity and Performance Management, 2022. [Online]. Available: https://gala.gre.ac.uk/id/eprint/37097/