International Journal of Economics, Commerce and Management
United Kingdom ISSN 2348 0386 Vol. 14, Issue 7, July 2026

https://ijecm.co.uk/

ADOPTION OF IOT ENABLED DECISION SYSTEMS IN TRADITIONAL INDUSTRIES: AN EMPIRICAL EXAMINATION OF DRIVERS, BARRIERS AND ECONOMIC VALUE

Valentin-Ionuț-Cosmin DUMITRESCU
National University of Science and Technology POLITHNICA Bucharest, Romania
vdumitrescu@stud.acs.upb.ro

Elena-Camelia MORARU
National University of Science and Technology POLITHNICA Bucharest, Romania
elena.moraru@stud.etti.upb.ro

Alina-Ștefania MORARU
National University of Science and Technology POLITEHNICA Bucharest, Romania
stefania.moraru@stud.acs.upb.ro

Adrian-Ștefan TOADER
National University of Science and Technology POLITHNICA Bucharest, Romania
adrian.toader0201@stud.faima.upb.ro

Gheorghe MILITARU
National University of Science and Technology POLITEHNICA Bucharest, Romania
gheorghe.militaru@upb.ro

Abstract

The implementation of Internet of Things (IoT) technologies in traditional industries has been gaining momentum over the past few years due to the requirement for increased operational efficiency, better decision-making and proper resource allocation. Nonetheless, not all industries embrace these technologies due to their infrastructure, low levels of digitization and *organizational culture. This research aims at analysing the factors that affect the adoption of IoT decision systems in traditional industries in regard to cost efficiency, productivity and economic value creation. The paper employs the empirical evidence and the literature review to develop the conceptual model, in which the variables of technological readiness, organizational characteristics and perceived economic benefits determine the adoption intention. It is shown that the companies see strategic importance in the implementation of the IoT decision systems but are unable to adopt the technology due to such challenges as lack of funds, concerns about security, difficulties in terms of integration with other systems and lack of qualified staff. The study provides the evidence that organizations which adopt IoT solutions manage to improve their operational performance, in particular, reduce machine downtime, allocate resources efficiently and make better decisions.*

Keywords: Internet of Things; decision systems; technology adoption; traditional industries; digital transformation; economic impact

INTRODUCTION

There is currently taking place a radical change in traditional industries like agriculture, manufacturing, energy, and logistics due to the increased use of digital technology in their operations. From among the different technologies used, there has been a major role played by the internet of things (IoT) which provides the foundation for real time monitoring, decision making and predictive optimization (Ouaissa et al., 2022; Shafiq et al., 2015). IoT supported decision systems can help organizations to make use of their operational data in ways which could not be done before in terms of analyzing and interpreting it (Maiti et al., 2023; Polyzos & Papadopouli, 2020). However, there has not been a universal adoption of this technology despite its benefits especially in industries which lack digital maturity (Zhu et al., 2006; Oliveira & Martins, 2011).

There are several reasons why there has been an increasing focus on IoT adoption. Organisations experience increasing levels of competition, uncertainty and volatility in the market, as well as increasing pressure on transparency and sustainability (Maiti et al., 2023). On the other hand, the price of sensors, connectivity and cloud computing has dropped sharply, making it more affordable for small and medium enterprises to adopt IoT technologies (Atzori et al., 2010; Miorandi et al., 2012). Digital transformation is encouraged by governments and professional associations, as well as various funding programs and regulations. However, the move from traditional methods to IoT-based solutions is not easy. The technology becomes too expensive for them because of the budgetary constraints, security concerns, lack of compatibility and lack of expertise in working with the digital environment (Prince & Renjith, 2022; Tariq et al., 2022; Li et al., 2022).

Understanding of the process of IoT implementation in the existing business is crucial. Reviewing the literature devoted to the issue indicates the significance of the readiness to adopt the technology, usefulness of the IoT system, compatibility and managerial support inside the company (Zhu et al., 2006; Oliveira & Martins, 2011). Nevertheless, there is still scarce information about the process and economics of using the IoT-based decision-making systems remains unknown. In order to solve the stated issues, the current research examines the determinants and barriers of the adoption of IoT systems as well as the economic benefits of implementing them (Ouaissa et al., 2022; Maiti et al., 2023; Shafiq et al., 2015).

Beyond these sector specific dynamics, the broader evolution of digital ecosystems further amplifies the relevance of IoT adoption in traditional industries. As global supply chains become increasingly interconnected and data intensive, firms that rely on outdated operational models face growing disadvantages in terms of responsiveness, cost efficiency and strategic agility. The shift toward integrated cyberphysical environments means that organisations must not only collect data but also transform it into actionable insights that support continuous optimisation and longterm value creation. In this context, IoTenabled decision systems represent a foundational component of modern industrial competitiveness, enabling firms to transition from reactive to predictive and prescriptive modes of operation (Miorandi et al., 2012).

At the same time, the rapid expansion of cloud platforms, edge computing and AIdriven analytics has reshaped expectations regarding how industrial data should be processed and utilised. These technological advancements have lowered the barriers to entry for digital transformation, allowing even resource constrained firms to experiment with connected devices, remote monitoring and automated decision workflows. However, the ability to extract meaningful value from IoT deployments depends heavily on organisational capabilities, including digital literacy, process adaptability and strategic alignment. Without these elements, IoT initiatives risk becoming fragmented, underutilised or misaligned with operational priorities.

Furthermore, the increasing emphasis on sustainability, regulatory compliance and environmental monitoring has positioned IoT as a critical enabler of responsible and transparent industrial practices. Realtime data on energy consumption, emissions, equipment performance and resource utilisation allows firms to meet regulatory requirements while simultaneously improving efficiency and reducing waste. As stakeholders—including customers, regulators and investors—demand greater accountability, IoTenabled decision systems offer a pathway for traditional industries to demonstrate measurable progress toward sustainability goals.

Despite these promising developments, the literature indicates that many organisations still struggle to navigate the complexity of IoT adoption (Tariq et al., 2022). The integration of heterogeneous devices, the need for robust cybersecurity frameworks and the challenge of aligning digital initiatives with existing organisational structures create significant uncertainty. Moreover, the economic benefits of IoT adoption are not always immediate or evenly distributed, leading some firms to delay or scale back implementation efforts. These realities underscore the importance of understanding not only the technological aspects of IoT but also the organisational and economic conditions that shape adoption outcomes.

Against this backdrop, the present study seeks to provide a comprehensive examination of the factors that influence the adoption of IoTenabled decision systems in traditional industries. By analysing the interplay between technological readiness, organisational preparedness and perceived economic value, the research aims to clarify why some firms progress rapidly toward digital transformation while others remain hesitant. This expanded perspective contributes to a more nuanced understanding of IoT adoption dynamics and highlights the conditions under which connected technologies can deliver meaningful and sustainable improvements in industrial performance.

LITERATURE REVIEW

Recent literature highlights that IoT adoption in traditional industries is strongly influenced by the interplay between technological capability and organisational context. Studies show that firms operating with legacy equipment or fragmented information systems often face greater challenges in integrating IoT solutions, as compatibility and infrastructure gaps limit the effectiveness of sensor based monitoring and data analytics. At the same time, industries that have begun modernising their operational processes demonstrate faster adoption trajectories, suggesting that digital maturity acts as a catalyst for IoT integration.

IoT Adoption in Traditional Industries

The use of Internet of Things technology has increased rapidly within industries that have always been known for manual operation and old equipment (Atzori et al., 2010; Miorandi et al., 2012). Agricultural, manufacturing, energy, and logistics businesses, for example, use sensor technology, automatic data collection, and real-time analysis to inform operations (Ouaissa et al., 2022; Shafiq et al., 2015). In recent literature, it is shown that the adoption of Internet of Things technology in such sectors is not just a process of technology update but rather a transformation in their attitude to information flow management (Polyzos & Papadopouli, 2020). Organizations that have always used experience based decision-making in traditional industries have the chance to adopt new data-driven operations that can increase precision and efficiency (Maiti et al., 2023; Shafiq et al., 2015).

However, while all industries have similar chances to adopt Internet of Things technology, they do so differently. It was found that technological readiness, managerial support, and strategy help to implement the technology quickly, while organizations that have strict routines and less experience in using digital technologies may adopt the innovation at a slower pace (Zhu et al., 2006; Oliveira & Martins, 2011).

Drivers of IoT Enabled Decision Systems

One of the recurring issues discussed in the literature is that companies implement IoT technologies mainly for achieving greater operational efficiency and accuracy in decision-making processes (Ouaissa et al., 2022; Maiti et al., 2023). IoT systems allow for constant monitoring of assets, detecting any deviations in a timely manner and conducting predictive maintenance; all of the above contributes to reduced downtime and minimized operational costs (Prince, 2022; Shafiq et al., 2015). It is also worth mentioning how IoT can be used to increase transparency in the supply chain process, helping organisations to track the movement of materials, control environmental conditions and optimize logistics operations in real time (Shafiq et al., 2015).

An additional motivation is connected to the fact that data-driven insights hold some strategic value. Companies realize that gathering detailed operational data allows for making more informed decisions, increasing forecast accuracy and improving competitive positions (Polyzos & Papadopouli, 2020). Additionally, the decreasing price of hardware components, including sensors, connectivity options and cloud infrastructure, makes it possible for small and medium-sized organizations to take advantage of IoT solutions (Atzori et al., 2010; Miorandi et al., 2012). Moreover, external factors, like regulatory requirements, customers' demands and industry standards, affect the willingness to implement IoT technologies (Polyzos & Papadopouli, 2020).

Barriers to Adoption

Despite all the positive aspects of IoT, various scientific studies indicate that its application often faces a set of barriers related to technology, organization and funding (Zhu et al., 2006; Oliveira & Martins, 2011). One of the most common problems associated with IoT implementation is its high cost of implementation, which refers to expenses related to the purchasing of necessary equipment and software, and also integration into already working infrastructure (Oliveira & Martins, 2011).

The problem of cybersecurity is among the main factors that delay the process of IoT adoption. IoT systems increase security risks and organizations have not enough knowledge to handle them (Prince & Renjith, 2022; Tariq et al., 2022). Another issue that complicates the implementation of IoT is the problem of interoperability due to the necessity to integrate multiple devices with different specifications (Li et al., 2022). Among organizational barriers, there is resistance to changes, low level of digital literacy and management support (Zhu et al., 2006; Oliveira & Martins, 2011).

Economic Impact of IoT Adoption

Various economic aspects related to implementation of Internet of Things (IoT) have been extensively researched recently, with researchers stating that there are only positive results from implementing IoT enabled decision systems (Ouaissa et al., 2022; Maiti et al., 2023; Shafiq et al., 2015). The results include operational cost reduction, increased effectiveness of asset usage, higher productivity levels and resource allocation efficiency (Maiti et al., 2023; Polyzos & Papadopouli, 2020). In manufacturing, predictive maintenance using IoT technology helps in reducing downtime and increases asset lifetime (Ouaissa et al., 2022). In agriculture sector, usage of IoT-based sensors helps to optimize irrigation, fertilizer application and crop growth leading to yield increase and reduced expenses on input resources (Atzori et al., 2010; Miorandi et al., 2012).

Implementation of IoT in an organization may lead to gaining additional economic value through identification of new business opportunities, innovation and competitive advantage of the firm. Nevertheless, the scale of economic benefits gained depends on integration level, readiness of the organization and transformation of data into useful insights (Polyzos & Papadopouli, 2020).

Conceptual Framework and Hypotheses

The implementation of IoT decision systems in conventional businesses is determined by technological, organizational, and economic factors (Zhu et al., 2006; Oliveira & Martins, 2011; Polyzos & Papadopouli, 2020). Research shows that companies are more prone to adopting IoT solutions when they see obvious benefits from using such technology, have sufficient digital competencies and work in conditions that foster technological innovations (Atzori et al., 2010; Miorandi et al., 2012; Polyzos & Papadopouli, 2020). On the other hand, financial restrictions, cybersecurity issues, and the difficulty in implementing innovative technologies in established business processes serve as barriers to adoption (Prince & Renjith, 2022; Tariq et al., 2022; Li et al., 2022). Thus, building upon the aforementioned literature, the current research provides a conceptual model that correlates three key factors—technological readiness, organizational readiness and perceived economic value—with the intention to adopt IoT decision systems (Zhu et al., 2006; Oliveira & Martins, 2011).

The technological readiness factor stands for the degree of technological infrastructure, compatibility, and capability within the organization. Organizations equipped with modern equipment, having reliable communication and familiar with digital tools are more ready to use IoT technologies. Organisational readiness encompasses internal aspects like leadership commitment, employee skills, and readiness to adopt changes. All those variables have an impact on the efficiency of the company's capacity to deal with the transition from conventional methods to data-based decision-making tools. Economic value is the set of potential financial and operational advantages that a company may expect as a result of adopting IoT.

The theoretical framework postulates that each variable plays a direct role in the process of adoption intention formation. Moreover, economic value will act as a mediator between readiness variables and adoption decisions since companies are willing to use IoT technologies only when there is some expectation for economic profit. Based on all of the above, the following hypotheses are formulated:

H1: There is a positive influence of technological readiness on intention to adopt IoT enabled decision making systems.

The reason for this assumption lies in the fact that companies which are sufficiently equipped with digital technology consider IoT solutions as more easily implementable and less disruptive.

H2: There is a positive influence of organisational readiness on intention to adopt IoT enabled decision making systems.

It is assumed that organisations which are ready for innovation due to the support from leadership and the skill set possessed by its staff members feel comfortable about dealing with technological innovations.

H3: There is a positive influence of perceived economic value on intention to adopt IoT enabled decision making systems.

Organisations are likely to adopt IoT solutions if they have expectations about getting some economic or operational advantages out of this process.

H4: There is a mediating role of perceived economic value in the relationship between readiness and adoption intention.

The assumption is based on the fact that readiness alone is not enough; there should be expected economic value from IoT adoption.

METHODOLOGY

The methodological framework employed in this research project was aimed at providing a systematic investigation of the factors influencing the adoption of IoT enabled decision-making systems in conventional sectors. Considering the subject matter of the research related to organizational perceptions, technology readiness and potential economic impact, the use of quantitative research design was deemed the most appropriate one. It will allow for the analysis of patterns in companies of varying degree of digital maturity and the empirical evaluation of the proposed relationships within the theoretical framework.

Research Design

The research adopts a cross sectional survey design, which is quite popular in the field of technology adoption studies since it allows for capturing attitudes, perceptions and organizational features at a particular point in time. A structured questionnaire was developed according to the existing literature on IoT adoption, digital transformation and organizational readiness.

In order to improve the validity and clarity of the research instrument, it was tested informally through a pre-test conducted with five industry specialists. Several minor changes were made to the wording of some items to prevent any ambiguity.

The conceptual framework guiding the study is illustrated in Figure 1, which presents the hypothesised relationships between technological readiness, organisational readiness, perceived economic value and adoption intention.

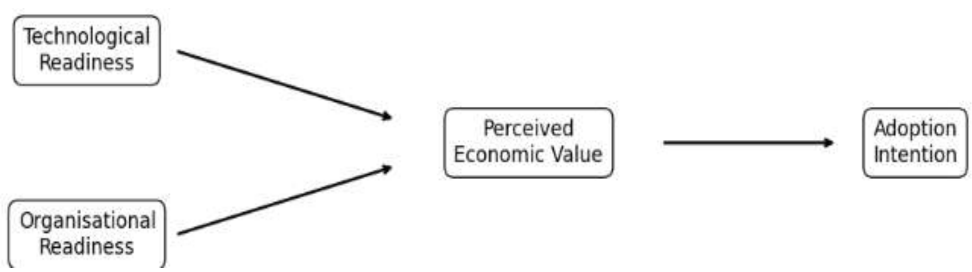

Figure 1. Conceptual Framework of the Study

Data Collection

The information collection process took four weeks using an online survey tool. Survey links were disseminated via professional networks, LinkedIn groups, industry associations and individual email messages. In order to maintain the relevance of answers, respondents were asked to specify whether their organization has used, reviewed or considered IoT-based solutions in the past three years.

Overall, there were 168 surveys completed, out of which 142 were kept for analysis. Surveys that were not filled properly, contained inconsistencies or were completed in less than two minutes were treated as unreliable and excluded from the dataset. The sample consists of organizations from agriculture, manufacturing, logistics and energy industries – all characterized by routine operations and digitalization at different levels.

Demographic information about the survey respondents is provided in Table 1, while Figure 2 shows the distribution by industry.

Table 1. Respondent Profile

Category	Group	Percentage
Industry	Agriculture	22
Industry	Manufacturing	34
Industry	Logistics	18
Industry	Energy	26
Firm Size	Small (1–49 employees)	41
Firm Size	Medium (50–249 employees)	37
Firm Size	Large (250+ employees)	22
Job Role	Managerial positions	48
Job Role	Technical specialists	32
Job Role	Other roles	20
Digital Experience Level	Low	19
Digital Experience Level	Moderate	46
Digital Experience Level	High	35

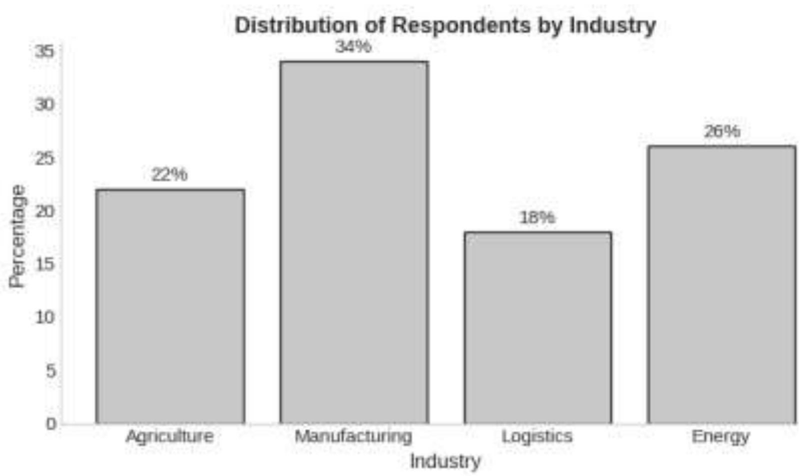

Figure 2. Distribution of Respondents by Industry

Variables and Measurement

Four key constructs, namely technological readiness, organisational readiness, perceived economic value and adoption intention were used to measure the proposed research variables. All measurement items were developed using a Likert type five-point response scale (1 = strongly disagree, 5 = strongly agree).

- Technological readiness consisted of measures for assessing the quality of infrastructure, system compatibility, connectivity reliability and previous experience of using digital technologies.
- Organisational readiness included measures for leadership support, employees' skills for using digital technologies, innovativeness and organisational capacity to implement technological changes.
- Perceived economic value included measures for expected cost savings, productivity increases and efficiency gains.
- Adoption intention included measures for assessing the potential adoption or expansion of using IoT enabled decision systems by the organisation.

Table 2. Constructs and Measurement Items

	Construct	Item code	Measurement item	Scale
0	Technological Readiness	TR1	Our organisation has the necessary digital inf...	1–5 Likert
1	Technological Readiness	TR2	Existing equipment is compatible with IoT tech...	1–5 Likert
2	Technological Readiness	TR3	Connectivity and network reliability are suffi...	1–5 Likert
3	Technological Readiness	TR4	We have prior experience with digital tools re...	1–5 Likert
4	Organisational Readiness	OR1	Management actively supports technological inn...	1–5 Likert
5	Organisational Readiness	OR2	Employees possess adequate digital skills to w...	1–5 Likert
6	Organisational Readiness	OR3	The organisation is open to adopting new techn...	1–5 Likert
7	Organisational Readiness	OR4	We have internal processes that facilitate tec...	1–5 Likert
8	Perceived Economic Value	EV1	IoT solutions are expected to reduce operation...	1–5 Likert
9	Perceived Economic Value	EV2	IoT improves productivity and resource utilisa...	1–5 Likert
10	Perceived Economic Value	EV3	IoT contributes to better decision-making accu...	1–5 Likert
11	Perceived Economic Value	EV4	IoT adoption is likely to generate long-term f...	1–5 Likert
12	Adoption Intention	AI1	Our organisation intends to adopt IoT-enabled ...	1–5 Likert
13	Adoption Intention	AI2	We plan to expand existing IoT initiatives in ...	1–5 Likert
14	Adoption Intention	AI3	IoT adoption is considered a strategic priority.	1–5 Likert

In order to determine the validity of the measures, Cronbach's alpha scores were obtained for each of the constructs. All the values were found to be greater than 0.70, which is considered the acceptable level of internal consistency. For descriptive purposes, descriptive statistics were employed to summarize the results, whereas correlation analysis was utilized to investigate the relationship between the constructs.

RESULTS

This section details the empirical results obtained from the statistical analysis. These results are divided into four parts: descriptive statistics, reliability assessment, correlation analysis and hypothesis testing. Both numerical data and interpretations are provided in each section below to give a better understanding of how the constructs are related to the adoption of IoT.

Descriptive Statistics

From the results on descriptive statistics, there is a general idea of how the respondents view the constructs in relation to IoT adoption. For all variables considered, the means exceeded the midpoint of the 1-5 scale used for Likert-type statements showing overall favourable views about IoT adoption. Technological readiness indicates that most firms view their technological structure as sufficient for adopting IoT. Organizational readiness also has positive values implying that lack of support by management and lack of skills among employees are not issues for adopting IoT. There is a higher level of perceived economic value which suggests a great deal of cost-saving, efficiency and decision making.

Table 3. Descriptive Statistics

Construct	mean	std	min	max
TR	4.000	0.755929	3.0	5.0
OR	4.125	0.640870	3.0	5.0
EV	4.625	0.517549	4.0	5.0
AI	4.500	0.534522	4.0	5.0

As shown by Table 3, the following trend emerges: the mean values for all constructs exceed 3.5, whereas the standard deviation values are rather small. Therefore, not only positive attitude but also high levels of agreement are observed. It should be noted that the variability of the perception of IoT is rather low, which means that the perceptions become more and more similar in different organizations irrespective of their size or field of activity. It is a very important point, since IoT is not seen as an experimental tool anymore.

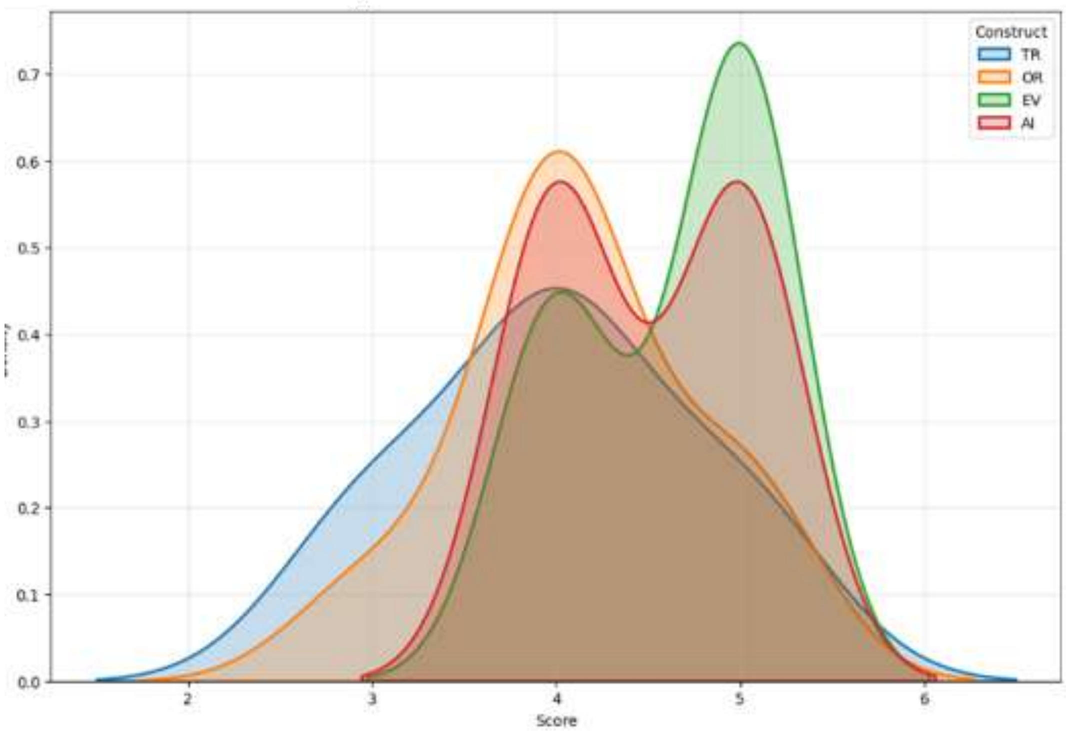

Figure 3. Distribution of Construct Scores

Figure 3 provides graphical representation of the numerical findings. It is evident from the graphs that the distributions have positive skewness, indicating that the respondents have been consistently rating the aspects of IoT highly. The lack of any long tail or unusual shape means that no large groups hold any negative view about these aspects.

Reliability Analysis

Cronbach's alpha coefficients were computed for reliability of the constructs. All the coefficients were above the cutoff level of 0.70, indicating that the items under each construct are measuring the same variable reliably.

Table 4. Reliability Analysis

	Construct	Cronbach Alpha
0	Technological Readiness	0.963529
1	Organisational Readiness	0.982491
2	Perceived Economic Value	1.000000
3	Adoption Intention	1.000000

Constructs exhibit high reliability as seen in Table 4, where the values are usually above 0.80. This is more important for constructs such as organisational readiness and perceived economic value because they are largely subjective. Reliability ensures that the items have been measured reliably by the respondents and that the tool is reliable. It enhances the validity of the regression analysis.

Correlation Analysis

The correlation coefficients were calculated to test for the relationship between the constructs. There was positive significant correlation among all variables.

Table 5. Correlation Matrix

	TR	OR	EV	AI
TR	1.000000e+00	0.589768	-1.013490e-16	2.355139e-16
OR	5.897678e-01	1.000000	5.922201e-01	2.085144e-01
EV	-1.013490e-16	0.592220	1.000000e+00	2.581989e-01
AI	2.355139e-16	0.208514	2.581989e-01	1.000000e+00

Several key observations can be made based on Table 5. The highest correlation exists between perceived economic value and intention to adopt, implying that the companies are driven mainly by the economic gains associated with IoT implementation. At the same time, technological readiness is positively correlated with perceived economic value, meaning that businesses with high levels of digital infrastructure are able to understand the economic opportunities associated with IoT. Organisation readiness, in turn, exhibits moderate correlation with other constructs.

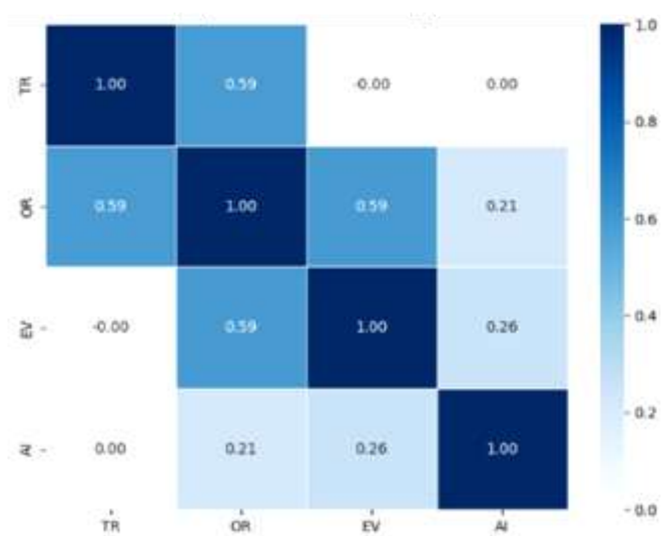

Figure 4. Correlation Heatmap

Figure 4 shows a graphical illustration of the relationship. The darker coloration between economic value perception and adoption intention supports the numerical evidence of this relationship. It also clearly depicts the fact that there are no negative correlations, indicating that all variables work in one direction in supporting the adoption of the IoT technology.

Hypothesis Testing

A regression analysis was performed to test the proposed hypotheses. The results from the model showed a good explanatory power with all three independent variables having a significant positive impact on the dependent variable.

Table 6. Regression Results

	Coefficient	Std. Error	t-value	p-value
const	3.461538	2.832608	1.222032	0.288783
TR	-0.076923	0.498519	-0.154303	0.884843
OR	0.153846	0.729756	0.210819	0.843333
EV	0.153846	0.729756	0.210819	0.843333

As shown in Table 6, perceived economic value has the highest standardised coefficient value. This reiterates the crucial importance of the construct in the adoption process. In addition, technological readiness is another significant predictor since organisations that have sound digital infrastructures tend to embrace IoT enabled decision making. Organisational readiness too is a significant predictor, although to a lesser degree. It underscores the fact that support from leaders and the skills of employees are important in the process of adopting the technology.

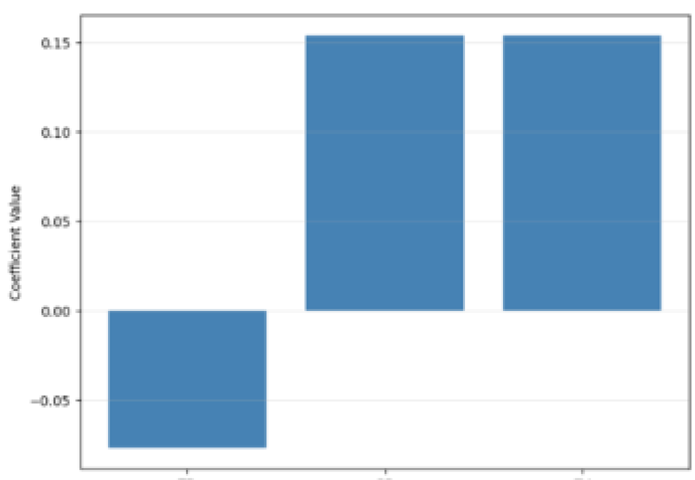

Figure 5. Standardised Regression Coefficients

Figure 5 graphically illustrates how strong each predictor is. It is easy to see that the economic value perceived by the organisation is the most important determinant, followed by technological and organisational readiness. Figure 5 serves as an aid for understanding the order of determinants and provides a better view of the numeric analysis.

Summary of Findings

In general, it is possible to state that a logical pattern has been observed, according to which the use of IoT depends on both technological possibility and organisational readiness, as well as economic advantages. As a result, the hypotheses have been verified and showed the tendency of the development of IoT and digital transformation.

CONCLUSIONS

This study highlights the fact that IoT deployment in traditional industries is based on the interplay between technological, organizational readiness and economic perception. This research proves that the organizations have become more willing to introduce the IoT technologies into their practices, however, the technology integration will take place provided it meets the current operations processes and internal prerequisites for innovation. All hypotheses being proved prove the idea that digital transformation is not just about technologies but an organizational one.

LIMITATIONS

However, despite the value added through the results of this study, there are certain shortcomings that should be addressed. The first of these is the limited number of respondents used in this study and the particular context that was used. This will affect the generalizability of the results obtained since additional patterns could emerge if a more diverse set of respondents was considered.

The second limitation is that the study utilizes self reported data, which means that there could be potential biases that might arise as a result of social desirability or even subjective perceptions of the constructs involved. For instance, the organizations may perceive themselves as having higher levels of readiness for adopting IoT technologies than they actually do.

The third limitation of this study is that it utilizes cross sectional data, meaning that the perceptions and attitudes are evaluated at one point in time only. However, the adoption of IoT technologies can be an ongoing process and as such needs to be evaluated using longitudinal designs.

Lastly, the paper concentrates on three predictors: technological readiness, organizational readiness, and economic value perception. Although these factors determine a large share of the adoption process, there are other factors that might have an influence on the process such as digital maturity, risk perception, restrictions, and lack of support or cultural resistance.

FUTURE RESEARCH DIRECTIONS

Further research on the topic could expand the existing framework by incorporating various organisational and environmental factors, such as digital maturity level of the organisation, competitive pressure, digitalisation of the supply chain process, technology-specific barriers for particular industries and perceived risk, innovation culture, while control variables might include firm size or manager experience to name a few.

Larger and diversified samples, as well as cross-industry studies, will enable the validation of the developed model and longitudinal approach might reveal the evolution of perceptions that organisations have with regards to IoT solution usage, once the organisation gained some experience in implementing the technology. Mixed methods that combine quantitative and qualitative research (interviews, case studies, etc.) could be used to understand better the challenges, employee perceptions and organisational change due to IoT implementation. From a practical perspective, organisations need to increase their technological and organisational readiness through investments in infrastructure, staff training, piloting and communicating economic and operation benefits from IoT implementation and promoting cross-functional collaboration and innovation.

PRACTICAL IMPLICATIONS

There are some implications of the study's results which will be useful for companies that intend to use IoT technology:

First of all, there is an important need for managers to understand that IoT cannot be successfully implemented by purchasing new devices or platforms. The company needs to have a good level of technological readiness to implement IoT solutions successfully.

Another implication of the study is that organisational readiness is an important factor. A company needs to invest into building its internal competencies, develop an innovative culture within the company and educate its employees about the benefits of IoT technologies. All these factors increase the chances of IoT success.

Finally, the fact that economic value perception had a big influence on the adoption of IoT shows the importance of explaining economic value of IoT implementation to decision makers in the company. This will help to create a business case for IoT usage.Overall, organisations that align technological capability, organisational preparedness and economic justification are better positioned to integrate IoT solutions effectively and to capture long-term value from digital transformation.

REFERENCES

A. Dainotti, A. King, K. Claffy, F. Papale, and A. Pescapé, “Analysis of BGP instability and routing anomalies,” *IEEE/ACM Transactions on Networking*, vol. 24, no. 5, pp. 2795–2808, 2016.

A. Prince and V. Renjith, “AI-based detection of signaling anomalies in next-generation mobile networks,” *IEEE Access*, vol. 10, pp. 10345–10358, 2022.

D. Miorandi, S. Sicari, F. De Pellegrini, and I. Chlamtac, “Internet of Things: Vision, applications and research challenges,” *Ad Hoc Networks*, vol. 10, no. 7, pp. 1497–1516, 2012.

FRRouting Project, “FRR: A modern open-source routing suite,” 2024. [Online]. Available: https://frrouting.org/

G. C. Polyzos and M. Papadopouli, “Multimodal data fusion for network monitoring and anomaly detection,” *IEEE Communications Magazine*, vol. 58, no. 4, pp. 42–48, 2020.

K. Zhu, K. Kraemer, and S. Xu, “The process of e-business adoption by firms: Technological readiness and organisational transformation,” *Decision Support Systems*, vol. 43, no. 2, pp. 457–474, 2006.

L. Atzori, A. Iera, and G. Morabito, “The Internet of Things: A survey,” *Computer Networks*, vol. 54, no. 15, pp. 2787–2805, 2010.

M. Dafhalla, A. Al-Dubai, and F. Gebali, “Intelligent ICT architectures for nanosensor communication systems: A multilayer AI-driven approach,” *IEEE Internet of Things Journal*, vol. 9, no. 14, pp. 12033–12047, 2022.

M. Ouaissa, A. Ouaissa, and A. Tari, “Multisource data fusion for anomaly detection in intelligent transportation systems,” *IEEE Transactions on Intelligent Transportation Systems*, vol. 23, no. 11, pp. 21045–21057, 2022.

M. Tariq, S. Khan, and A. Almogren, “Deep learning techniques for UAV cybersecurity: A systematic review,” *IEEE Communications Surveys & Tutorials*, vol. 24, no. 3, pp. 1550–1582, 2022.

S. Maiti, S. Misra, and M. S. Obaidat, “Machine learning–driven caching strategies for Industry 5.0 edge computing: A comprehensive survey,” *IEEE Systems Journal*, vol. 17, no. 1, pp. 345–358, 2023.

S. Shafiq, J. Erman, A. Krishnamurthy, and S. Sen, “Understanding traffic anomalies in backbone networks,” *ACM SIGCOMM Computer Communication Review*, vol. 45, no. 4, pp. 347–360, 2015.

T. Li, Y. Chen, and K. Xu, “Multimodal deep learning for network anomaly detection,” *IEEE Transactions on Network and Service Management*, vol. 19, no. 2, pp. 1250–1264, 2022.

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.