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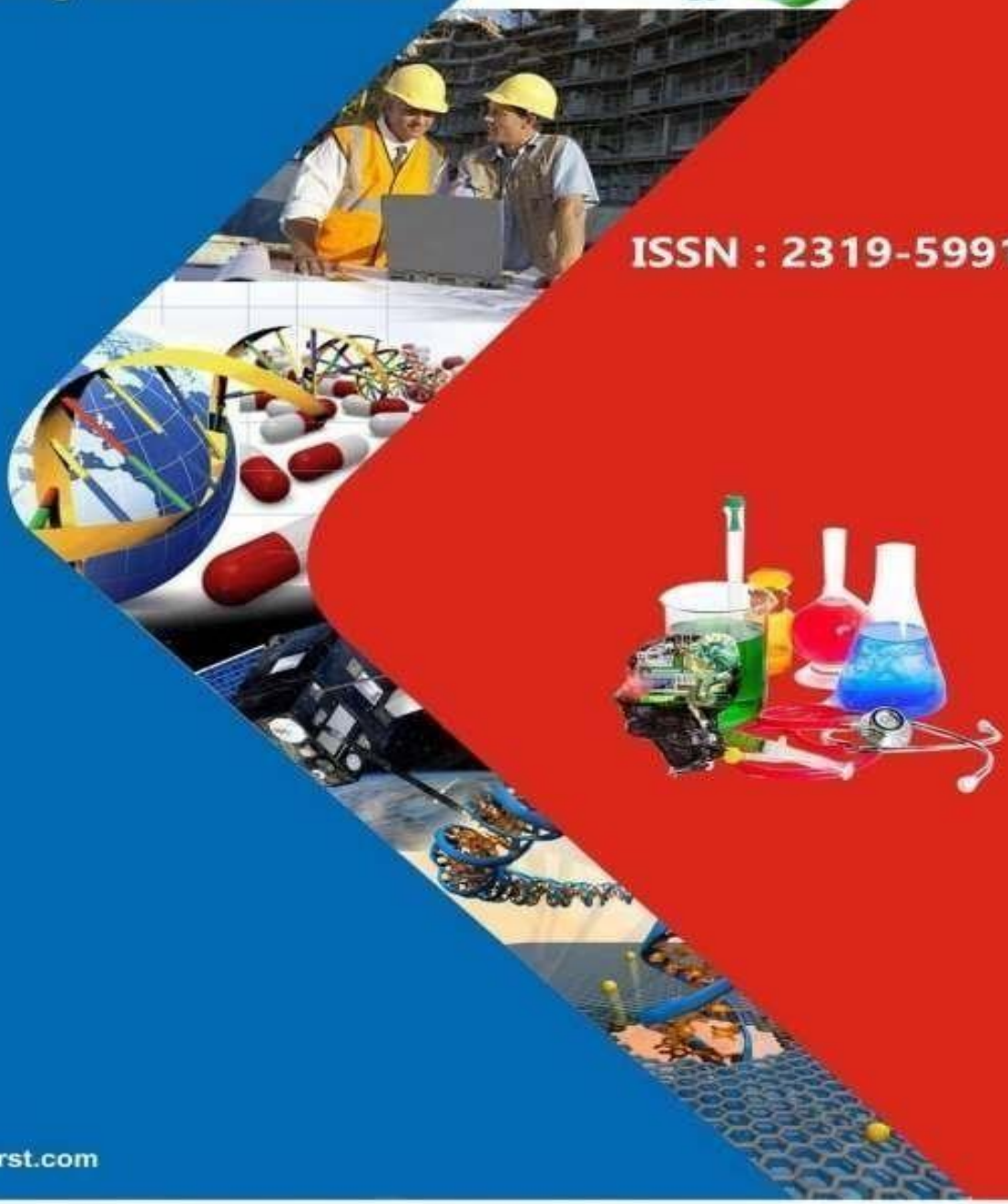

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EXPLORING THE SECURITY CHALLENGES AND SOLUTIONS FOR INTEGRATING IT WITH PHYSICAL SYSTEMS IN CRITICAL INFRASTRUCTURE

Archana Todupunuri

Sr. Software Engineer

Fidelity Information Services

archana.todupunuri@gmail.com

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ABSTRACT

Context: Information Technology (IT) in organisations is beneficial in improving collaboration, communication as well as elevates productivity of organisations.

Objective: The paper aims to analyse security challenges along with solutions for inclusion of IT with physical systems in critical infrastructure.

Method: In this research a secondary qualitative research method has been used and information is collected from Google Scholar along with authentic online websites.

Results: The "Attrition of Network Architecture" along with poor visibility is reflected as major challenges. Solutions incorporate maintaining networks and regular updates can help in integrating IT.

Conclusion: Employee training programs along with maintaining networks are crucial in integration of IT in critical infrastructure.

Keywords: Information Technology (IT), Security,

I. INTRODUCTION

The integration of Information Technology (IT) reflects streamlined processes as well as workflows with the help of unifying data that is helpful in improving operational efficiency. The critical infrastructures were not vulnerable to cyber attacks and isolated that negatively impacts operations of business [1]. The focus oncomprehensive insights in business plays a vital role in identification of loopholes in firms. The paper focuses on multiple challenges faced by organisations in inclusion of IT along with solutions that assists in improving infrastructure of firms and improving productivity of organisations. Considering positive attributes, inclusion of IT assists in improving critical infrastructure of an organisation. Challenges such as technological skill gap among employees, networkconnectivity along with poor visibility are the challenges highlighted in this research paper.

A) Aim and objectives

Aim

The aim of this paper is to explore security challenges associated with solutions for inclusion of IT with physical systems in critical infrastructure.

Objectives

- To analyse significance of integrating IT with physical systems in critical infrastructure
- To identify security challenges for integration of IT with physical systems in critical infrastructure
- To evaluate impact of challenges on physical systems management in critical infrastructure by interaction of IT
- To access solutions for integration of IT with physical

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The inclusion of IT in critical structure is beneficial as it assists in improving communications as well as better accessibility of data. The use of IT is beneficial as it assists in using information; sharing as well as communicating that is helpful in improving operations of business [2]. Keeping this into considerations it is significant to implement IT in critical infrastructure to improve operations of business. One of major issues inIT is lack of skills among employees that negativelyimpacts effective usage of IT with physical systems. In 2022, 27% of respondents revealed a major skill gap lies in IT technician followed by cloud computing [3]. The statistical data justifies that one of major issues is usage of IT technologies effectively in critical infrastructure that impacts operational efficiency. Lack of training programs for employees in organisations for usage of IT creates challenges in usage of technologies in critical infrastructure. Thus, presence of skill gap among employees in tech field negatively impact in integration of IT effectively.

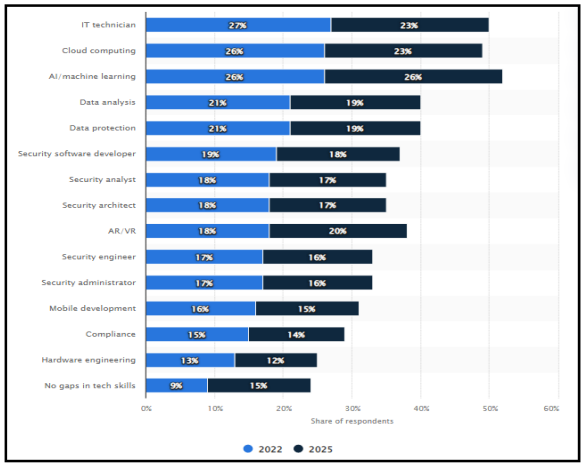

Figure 1: Gaps in tech skills

(Source: [3])

Another major challenge that is faced in integration of IT is security risks as sharing user data with third party applications reflects difficulties to protect information. From the above graph it can be analysed that the lack of knowledge among employees of organisations regarding the usage of IT also mirrors a major challenge in protecting information [3]. Issues in protecting information in organisations negatively impacts business operations as information is not secured effectively. On the contrary, organisations introducing advanced IT more rapidly in comparison with competitors are expected to optimise logistics and supply chain decisionsmore easily in a changing environment [4]. Therefore, it can be stated that in present situation implementation of IT in critical infrastructure is challenging due to lack of knowledge among employees along with prevailing security risks.

II. LITERATURE REVIEW

Identifying challenges in integrating IT in critical infrastructure

Integration of IT in critical infrastructure is beneficial in improving efficiency of organisations by automating tasks. The integration of IT assists to flow dataseamlessly in between different systems that helps in improving communication and keeping records of information [5]. Protecting records is beneficial in securing crucial information that can help in gaining competitive advantage in market. In recent years in field of information technology cloud computing is considered as one of best computing paradigms [6]. Challenge in using cloud computing limit in providing flexibility and security that impact in dealing with data storage issue and improvising IT infrastructure.Therefore, integration of IT is crucial in protecting information and also improvises critical infrastructure.

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Security challenges and solutions for the integration of IT with physical systems in critical infrastructure

The improvement in the integration of IT is effective as it enables organisations to become more productive as well as efficient by improving operations of business. One of major challenges in the integration of Information Technology IT includes "attrition of network architecture" as network needs continuous maintenance along with installation upgrades [7]. The solution for this challenge can be assessing network security for schedule updates and it is significant to replace obsolete components. Poor visibility in IT is the other challenge that adversely affects security factors in protecting information [8]. In this regard, hiring of skilled employees in IT department is beneficial in improving visibility and also helps in reduction of human errors. Thus, issues in network connectivity along with poor visibility are major challenges in better integration of IT.

Application of Technology Acceptance Model (TAM) for adoption of technologies

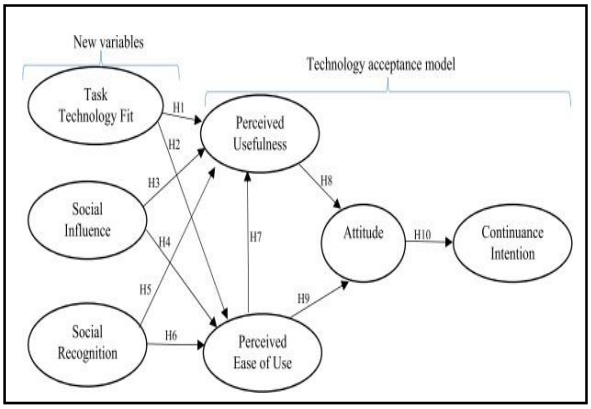

Figure 2: Technology Acceptance Model (TAM)

(Source: [9])

The implication of Technology Acceptance Model (TAM) is crucial in organisations as it helps in adaptation of advanced technologies that helps ingaining competitive advantage. The integration of TAM assists in analysing external variables that helps in identifying perceived usefulness of technologies [10]. In this regard, implementation of "Technology Acceptance Model TAM" assists in identification of ease of use along with attitude towards use of IT in criticalinfrastructure. Thus, inclusion of advanced IT with the help of Technology Acceptance Model (TAM) inorganisations by effectively assists in improving operations of business.

Literature review gap

In some of the articles there was lack of information regarding the different challenges in the integration of IT. Specific challenges faced by the organisations in the usage of IT also were not present that reflected a major gap in the paper in highlighting the challenges and solutions related to IT inclusion effectively.

III. METHODOLOGY

The implication of multiple research methods is beneficial in collection as well as interpretation of information. In this paper interpretivism research philosophy has been used to interpret information related to challenges in IT integration along with solutions for effective usage. Interpretivism research philosophy assists in apprehending wide context by interpreting regarding role of IT integration in critical infrastructure. The paper has followed a deductive research approach that played a crucial role in analysing variables along with concepts appropriately. Secondary data are collected from multiple technical publications such as journals, handbooks, official publications and others [11]. Apart from this "secondary data collection method"

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has been applied that helps in gathering of information from different journals and articles.

In this paper information was collected from Google Scholar and authentication online websites. Grasping information from secondary journals and articles is beneficial for analysing multiple challenges in implementation of IT along with solutions for better implementation in critical infrastructure. In this study, a thematic data analysis method has been used that aids in interpretation of huge set of collected information for the integration of IT. Therefore, use of a secondary research method sheds a positive impact in analysing the challenges and solutions regarding integration of IT effectively.

V. RESULTS AND DISCUSSION

Theme 1: Information technology helps in improving communication and collaboration in business

The usage of appropriate strategies in integration of IT in business is beneficial as it helps in improving collaboration as well as communication. Optimising existing systems along with introduction of new technologies assists in enhancing collaboration as well as communication [12]. The introduction of advanced technologies helps in improving real time communication that assists in development of effective strategies with help of effective communication and aids in increasing productivity by IT integration. Better collaboration with employees with help of advanced technologies aids in reduction of conflicts and helps in retention of skilled employees [13]. The improvisation in collaboration among employees with the use of IT assists in completing provided tasks effectively. This strategy helps in improving efficiency of employees and elevates productivity. Therefore, introduction of IT in critical infrastructure is beneficial in improving productivity by enhancing collaboration and communication.

Theme 2: Attrition of Network Architecture negatively impacts in protecting information's

The improvement in network connectivity is crucial as it assists in automating operations and helps in identification of problem areas. The lack of continuous maintenance along with installation upgrades negatively impacts in maintaining security [14]. Gradual attrition is also effective in maintaining security as well as effective transfer of data and eliminates the misuse ofinformation. The introduction of change management is effective as it helps in better adaptation of advanced technologies. Appropriate training to employees regarding usage of information technologies assists to foster better usage [15]. Considering this, foster changes in organisations with help of providing better training to eliminate skill gaps assists in better implementation ofIT in critical infrastructure that assists in improving efficiency and productivity. Thus, better employeetraining and change management assists in the better integration of IT in critical infrastructure.

V. CONCLUSION

In conclusion, implication of IT in business is beneficial in improving the productivity of the organisation along with communication and collaboration factors. It is noted that the presence of a skill gap among the employees reflects negatively in the effective usage of technologies and impacts in protecting crucial information. Updating the technologies in business is crucial as it helps in acknowledging the regular updates that sheds a positive impact in maintaining the security factors. Improvisation in the security factors in the

organisation is effective; it helps in the protection of crucial information that improvises business operations and also aids in gaining competitive advantage. Therefore, training programs along with change management attributes mirror positively in the inclusion of IT in critical infrastructure.

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