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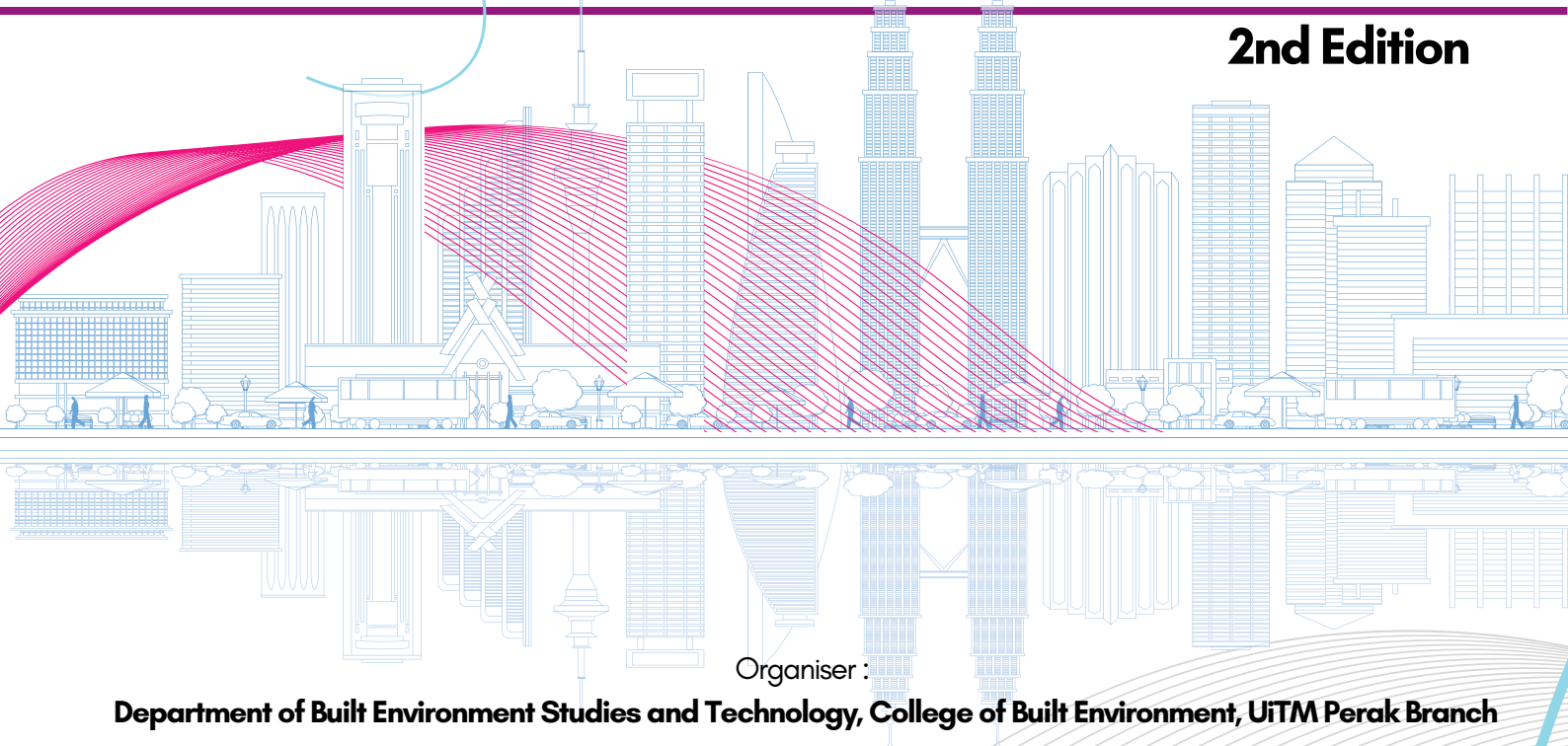
Cawangan Perak

e - Proceedings



**Proceeding for International Undergraduates Get Together 2024 (IUGeT 2024)**  
"Undergraduates' Digital Engagement Towards Global Ingenuity"

**2nd Edition**



Organiser :

**Department of Built Environment Studies and Technology, College of Built Environment, UiTM Perak Branch**

Co-organiser :

**INSPIRED 2024. Office of Research, Industrial Linkages, Community & Alumni (PJIMA), UiTM Perak Branch**

**Bauchemic (Malaysia) Sdn Bhd**

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## **STREAMLINING OPERATIONS: TRANSITIONING MAINTENANCE CHECKLISTS FUNCTIONALITY TO A PAPERLESS SYSTEM AT PUSAT SAINS NEGARA**

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### **Abstract**

This paper describes a case study undertaken at Pusat Sains Negara and it aims to explore the application of the digital transformation strategy to enhance the operational performance. The study concentrated on the utilisation of digital tools and methodologies to simplify the operations and enhance the communication process in the organisation. This study incorporated methodologies which include PDCA Cycle, 5 Whys Analysis, 5S Concept as well as Fishbone Diagram in order to pinpoint problems in operations and provide effective solutions for them. Digital tools provide a modern organisation with an agile and responsive operational framework that can satisfy the contemporary market demands. By following a proper methodology, data from exhibition departments and operation units of Pusat Sains Negara provide insights into the efficiency of digital transformation initiatives. In the beginning of the study, it was seen that making use of digital means and methods can greatly benefit productivity. This is because time taken is reduced to 75%, coordination increases among teams and savings are made in terms of costs by 94.18%. Overall, this paper contributes to existing knowledge about digital transformation by showing its effectiveness on organisational operational performance improvement. Specifically, findings from this study offer Pusat Sains Negara some tips for getting started with digital transformation among other similar establishments.

**Keywords:** *digital tools, PDCA Cycle, 5 Whys Analysis, 5S Concept, Fishbone Diagram*

### **1. INTRODUCTION**

It has, therefore, dawned on Pusat Sains Negara that the adoption of IT and AI innovation has to be facilitated so that administrative processes could also be optimised and environmental footprints could be reduced. On the other hand, with growing global awareness for environmental issues, AI and ML have a span of issues to be sorted out from waste control to resource optimisation [1]. Many companies advocate for green products, less harmful and energy efficient [2]. This digitally smoothes maintenance checklists with real-time updates and integrity of data. Ambitious training programs will make staff users to be fully conversant with the new system, while robust data security protocols protect the information.

#### **1.1 Literature Review**

The application of Google Sheets and Google AppSheet has made the supply order management process of a Malaysian automotive SME warehouse to be more effective. The digital system enhances multi-user collaboration, safe data storage and accessibility, real-time updates of data, and reduces the lead time for processing orders by eliminating unnecessary manual recording processes. In addition, this deployment has enhanced the ability of the organisation to adapt to the Fourth Industrial Revolution by introducing staff members to IoT expertise and technology and making them comply with its values and guidelines.

The benefits from the use of the Order Processing System for the automobile firm powered by Google Sheets and Google AppSheet include real-time update of data, multi-user collaboration, safety in data storage, effective analysis of data, and reduction of manual errors [1]. The goal of the web-based management system which the Advanced Technological Institute (ATI) in Galle, Sri Lanka, has put into place is to increase productivity and communication within school settings. The overall purpose of the system is to eliminate paper-based activities and make routine work easier by having effective communication, automating procedures, and providing easy access to academic information. The information will be updated with greater ease and on greater demand when it is centrally located, enhancing abilities in administration, oversight, and quality of the educational system [2].

## 1.2 Problem Statement

The problem addressed by the project at Pusat Sains Negara was on the inefficiencies and limitations of the existing manual maintenance checklist system [5], [6]. The manual procedure takes a longer processing time, about 80 minutes to finish which suggests a major operational bottleneck.

## 2. METHODOLOGY

The researcher used free, open-source tools like Google Forms and Google Spreadsheets. In the Check phase of the project, the performance of the new paperless system was benchmarked against that of the paper-based system to identify its areas of improvement. The Act stage is for developing a standardised operating system for maintenance checklists, so that efficiency will keep on improving. The project is oriented to enhance the efficiency of checklist maintenance at Pusat Sains Negara using the PDCA methodology as illustrated in **Figure 1**.

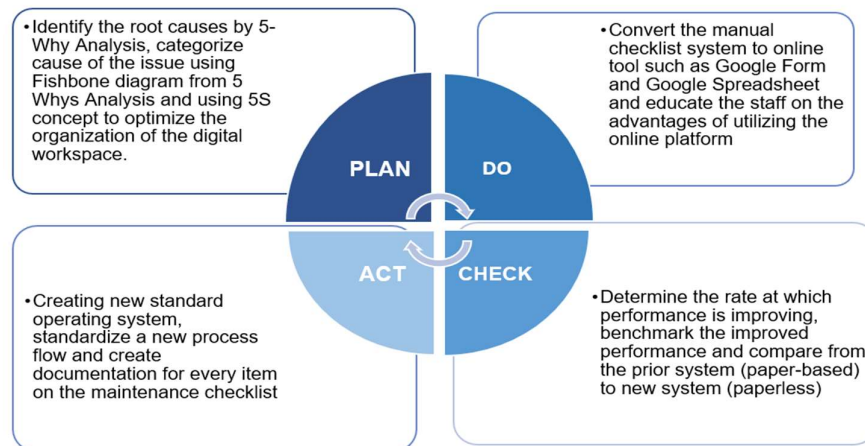


Figure 1: PDCA Method

*Why* questions in the Pusat Sains Negara paper-based maintenance checklist system point out a series of problems in regard to inefficiency and the waste of several resources. This method goes deeper into the root causes that may not be easily distinguished at the surface level of symptoms. No single cause has been identified; several root causes are found through analysis: over-reliance on paper caused delay due to the lack of an integrated, centralised digital platform, and the adoption of digital tools was prevented by resistance to change and a lack of awareness. There has to be a paperless system implemented with plans to address resistance, improvement of digital literacy, and building robust digital infrastructure.

Substantial enhancement of efficiency, organisation, and productivity can be witnessed in an organisation after it has integrated the 5S concept into its digital workplace optimisation process. The Japanese management technique of 5S holds Sorting, Setting In Order, Shining, Standardising, and Sustaining. It cleans up the digital environment and organises it but at the same time provides a culture of continuous improvement.

During the planning phase, the Fishbone Diagram helps to organise all the identified root causes resulting from the 5-Why Analysis, thereby giving an overview of what the issues are to be tackled by the researcher. At Pusat Sains Negara, the concept of transitioning to a paperless maintenance checklist system faces challenges like the lack of a digital platform, inadequate technological integration, poor communication and training programs, and resistance from staff and stakeholders. Solutions include enhancing technology, communication, training strategies, and change management.

Data collected on the current manual service sheet system revealed that it takes an inefficient 80 minutes to complete the processes. The present manual process is liable to problems such as tearing, water damage, unclean surfaces, careless handling, and misplacement of exhibits, for example, during servicing. Data obtained indicates that improvements are needed both in efficiency and in the actual physical handling of service sheets.

### 3. RESULTS AND DISCUSSION

The online system reduced the time taken in the process from using manual maintenance sheets by a huge 75% in percentage terms as depicted in **Figure 2**. This drastic fall in time consumption is indicative of manifold efficiency after the implementation of the digital solution. Because of its introduction, time taken has been greatly reduced due to process streamlining and easier access to information. This has increased productivity and operational efficiency in turn. The large decrease in time taken is, by right, a sign of effectiveness when adopting digital technologies to streamline flows and optimise the use of resources. The online maintenance sheet system has saved much time on its adoption with respect to maintenance operations.

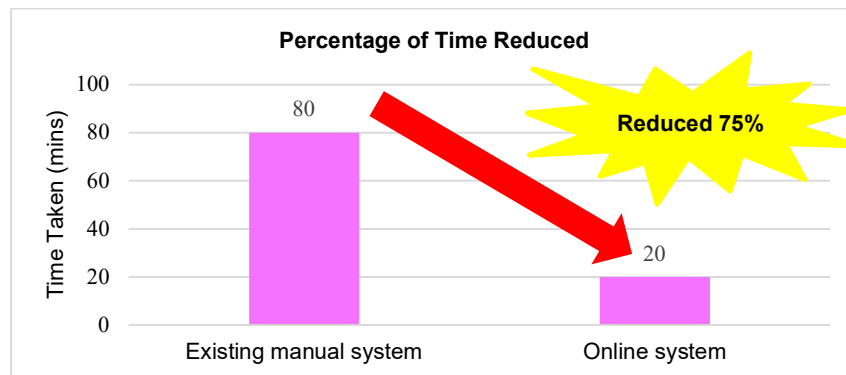


Figure 2: Graph of Time Reduced Percentage

By replacing the paper-based service sheet system with a paperless system utilising Google Drive, the cost decrease reaches a massive 94.18% as stated in **Figure 3** compared to the previous position. This shows that there are enormous financial benefits associated with going digital. These savings have been accrued from the elimination of expenditure related to paper, printing, stationery, and administration overheads. At the very same time, considering the sustainability aspect, it is possible that this paradigm shift will help save the environment by saving paper use and wastage. In this regard, the huge cost reduction itself explains the effectiveness and economy that digital technologies project in embracing their commitment for



the betterment of resources and operational efficiency [3], [4], [5].

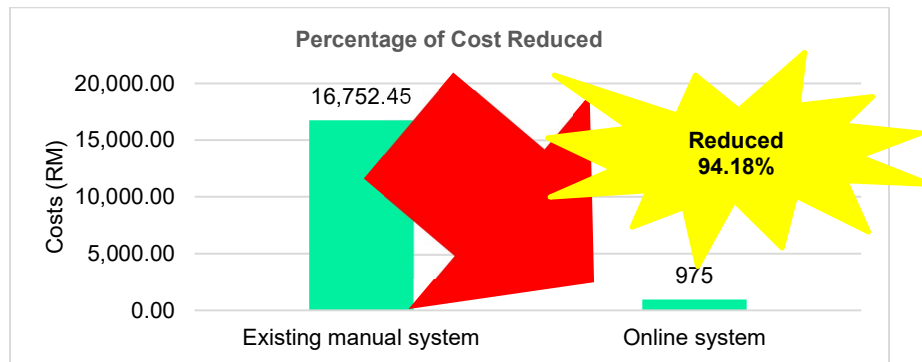


Figure 3: Graph of Cost Reduced Percentage

To operate as intended, the SOPs should be reviewed and updated with time, probably yearly or following major changes. Documentation of each review and update is key to maintaining a revision record and compliance. The creation and maintenance of good SOPs must involve participation of experts that includes the maintenance managers, engineering teams, health and safety officers, and, most importantly, the front-line maintenance technicians. Organisations can take a structured approach toward the writing and implementation of SOPs that take them through the journey of realisation of the benefits of compliance, quality, safety, efficiency, and accountability [6], [7], [8]. Figure 4 depicts the process of producing a digital signature.

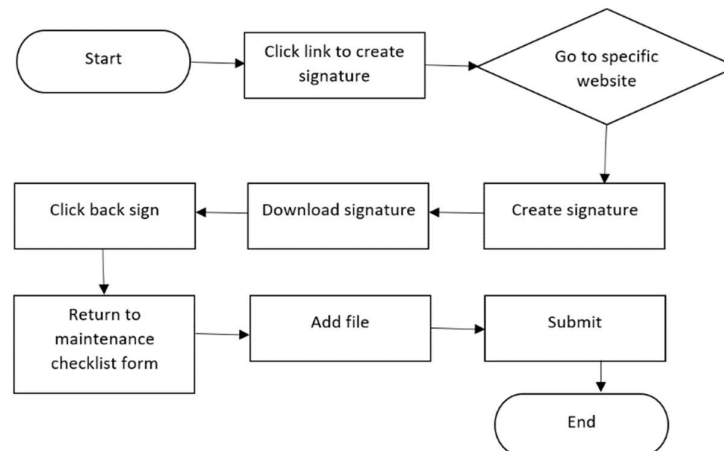


Figure 4: The Interface of Digital Confirmation Flowchart

#### 4. CONCLUSION

The objectives of the research were therefore successfully met at Pusat Sains Negara by way of attention to the issues that had been causing inefficiencies in operations and resource wastage. The work is aligned with SDG 9 in using technological innovation for industrial upgrading and processes, infrastructure, taking a step closer to Industry 4.0 with such innovative tools and applications as Google Forms and Google Drive, IoT technology for real-time monitoring and data management. This study also covers SDG 12 by ensuring responsible consumption and production practices are in place. It helps in reducing the rate of exploitation of resources and the environment that paper use has, thereby reducing the carbon footprint from paper production and disposal. Improved training of personnel and technological literacy for staff promote the responsible use of digital resources, minimising wastage.



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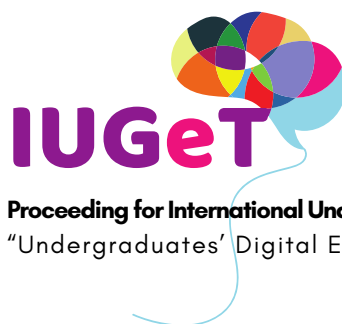
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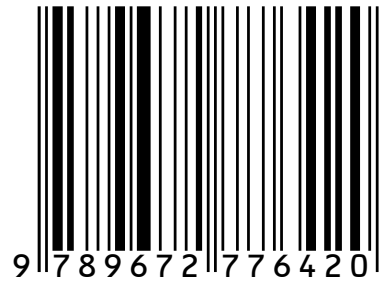
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