TOWARDS AN INTEGRATED ELECTRONIC WORKFORCE INTEGRATION TRACKING SYSTEM

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Abstract: The use and application of digital tools to improve the process of delivering and operating the built environment is known as digital construction. The construction industry in Malaysia has been slow to adopt technology, but it is poised to see the integration of several digital technologies. The advantages of digitalization in the construction industry include increased productivity, profitability, and firm innovation capabilities. This study aims to develop E-Workforce Tracking System (E-WITS) for project monitoring in the construction industry. Quantitative data were statistically examined using descriptive analysis (mean, standard deviation) and internal consistency using the Cronbach alpha value. The value of Cronbach's Alpha is 0.75 for the 20 numbers of questions which means that the questionnaire has excellent consistency. The result shows that respondent preferred using E-WITS (Mean = 4.929, SD = 0.196) compare with existing method (Mean=1.161, SD = 0.211). This means that E-WITS was more effective compared with the existing method. E-WITS was highly recommended to be used by personnel in the industry since the users are highly satisfied with this user-friendly website tracking system.

Keywords: *E-Workforce Tracking System; Digitalization; Quantitative; Monitoring*

1. Introduction

The construction sector is experiencing a wave of innovation due to the introduction of new materials and energy sources, design concepts, digital technological advancements, and big data. Creating technology is not an easy undertaking that requires careful attention to detail. By doing this, the project will be carried out efficiently and to the best of its capacity. To find the best methods for executing a new project or technology and addressing its limitations, researchers and investors must work efficiently together. Technology is one of the sustainable techniques that might help the building sector. Technology development is necessary for the construction sector to grow sustainably. Therefore, scientific, and progressive theories should be established, and new technologies, processes, materials, operational concepts, and management modes should be implemented (Tung et al., 2021).

While assessing the causes and effects of delays in the Malaysian construction industry, a study discovered ten most problematic factors. These issues include the contractor's poor site management, poor contractor experience, insufficient client finance and payments for

completed work, problems with subcontractors, material shortages, labour supply, equipment availability and failure, a lack of communication between parties, and mistakes during the construction stage (Olanipekun & Sutrisna, 2021; Wang et al., 2022).

Therefore, after looking at the failures and problems that occur in our country and abroad, the idea arose to create a website-based platform named Electronic Workforce Integration Tracking System (E- WITS) that is expected to help and address related problems. E- WITS are created to resolve such issues and weaknesses by way of monitor and track work progress and storing documents digitally. It can become an integration platform between the person in charge and workers involve in every single project. It also acts as an alert to the individuals involved to complete the work according to the planned time and ensure that the project journey is always on track. While at the same time, it also can solve sustainable issues as it can bring savings in the use of paper, which causes waste and danger to the environment. The aim of this study is to investigate the effectiveness of the E-WITS.

2. IR 4.0 and It Future in the Construction Industry

Smart construction is an inevitable trend for the future development of the construction industry. In Malaysia, smart construction has already been applied to projects. According to Lyu (2021), the smart site system uses internet technology and collects real-time information data on construction site personnel, machinery, and equipment as well as other key elements. The system uses big data, cloud computing and other technologies for rapid analysis and processing. An increase in the implementation of smart construction could potentially improve the quality of workers, equipment, safety and quality in comprehensive and timely manner, which could improve the digitalization, refinement and intelligent management of construction (Papadonikolaki et al., 2022; Sepasgozar & Davis, 2019).

During the digital transformation process, digital tools such as materials procurement digital platforms, industrial robots and drones, digital marketing, service digital tools, and BIM infrastructure are used (Gamage, 2021). Furthermore, organizations can maximize the benefits of digital transformation by combining a variety of digital tools. Technical aspects of digital transformation include cloud computing, the Internet of Things (IoT), mobile technology, big data, and data analysis (Ikuabe et al., 2020).

The ability to connect data quickly and efficiently is a relatively new phenomenon in the industry. Considering the available tools and resources to support digital transformation, it is critical to select the best tools and technologies to implement digital transformation in construction projects. Therefore, the design and implementation of a web-based system are critical to ensuring that the process runs smoothly and according to plan. This system has used the website as a tool for the project. Website is a developing technology that turns the information and networking industry into a wireless networking infrastructure that supports mobile devices (Kudryavtseva & Vasileva, 2021). As reported, the growth in the number of new technology devices was spurred by the advancement of mobile networks, such as the capacity to access the network using desktops, laptops and notebooks.

3. Methodology

The study was conducted in the form of a survey, with data being gathered via questionnaire. Pre-test and post-test surveys were adopted to identify the effectiveness of the Workforce Integration Tracking System (E-WITS). It consists of two sections: section 1 for demographic characteristics of respondents and section 2 contains 20 items, measured on a five-point likert scales (ranging from 1 = Strongly Disagree to 5 = Strongly Agree). Statistical analyses were performed using the Statistical Package for the Social Sciences (IBM SPSS Statistics, Version 20.0). The participants of this study were 30 from the construction stakeholder industry. This research was analyzed using descriptive study which aims to compile information about the effectiveness of E-WITS compare to existing method.

3.1 Prototyping

This project is expected to assist in each project's launch by tracking and recording the work done for each project. E- WITS using web-based application that perform tracking, recording, and alerts via a web browser. The planning design of E-WITS is implemented through a visual basic coding template and using a Hypertext Preprocessor-PHP as a programming scripting language. In this system development, login page containing id and password was design due to cyber security programming. Its personal id was created by admin to make sure the user is identified by company. In the first step, the users need to register the account. The requirement must be filled for register such as username, password, confirm password, full name (Figure 1). Next, home page displays the main board of daily task and submission and the department due to their position. Task was separate in different department to easier for the searching and task submission. This is a home page containing the mainboard that makes it easy for the personnel to track their task. Also have three departments: administration, road department, and civil/structural department.

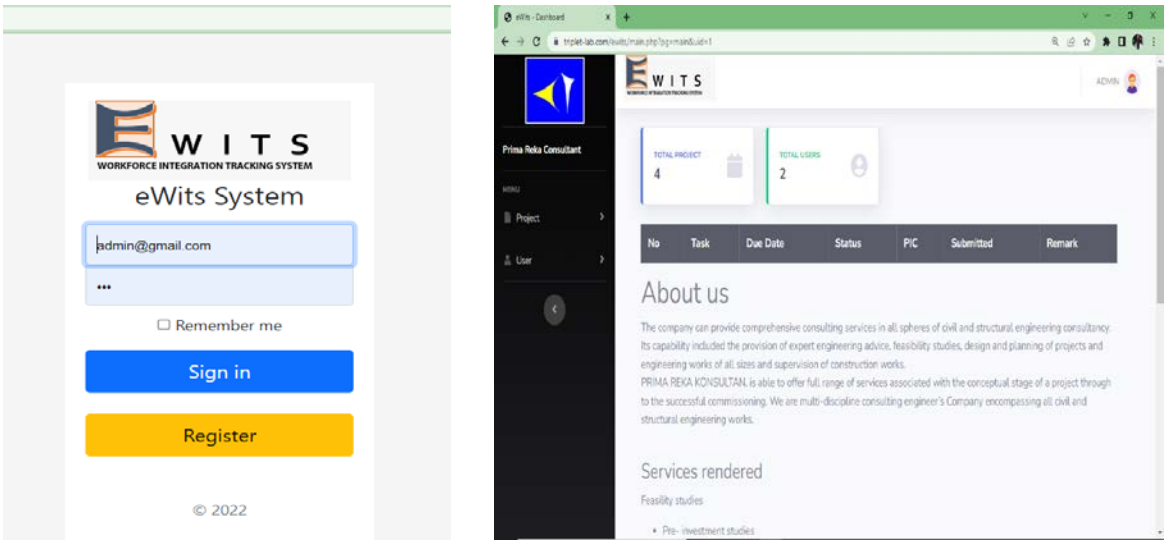

Figure 1. The Main Page Interface

The contents of E-WITS containing a list of ongoing and completed projects used to track the progress of tasks in a project. For a civil engineering consulting firm, project tracker is a tool that lets managers measure the progress of their team as they execute tasks and use resources. As a result, this website is more relevant for operations and planning departments to keeping projects on schedule and within their budgets. As shown in Figure 2, user can access the percentage of progress of the project. This percent value moves automatically where it will increase through the file to be sent. This percentage is believed to help users be more aware of the progress of the project. Project progress will be reviewed in this section where the breakdown of work will be divided with the person in charge. Monitoring through small work is believed to be easier and more transparent.

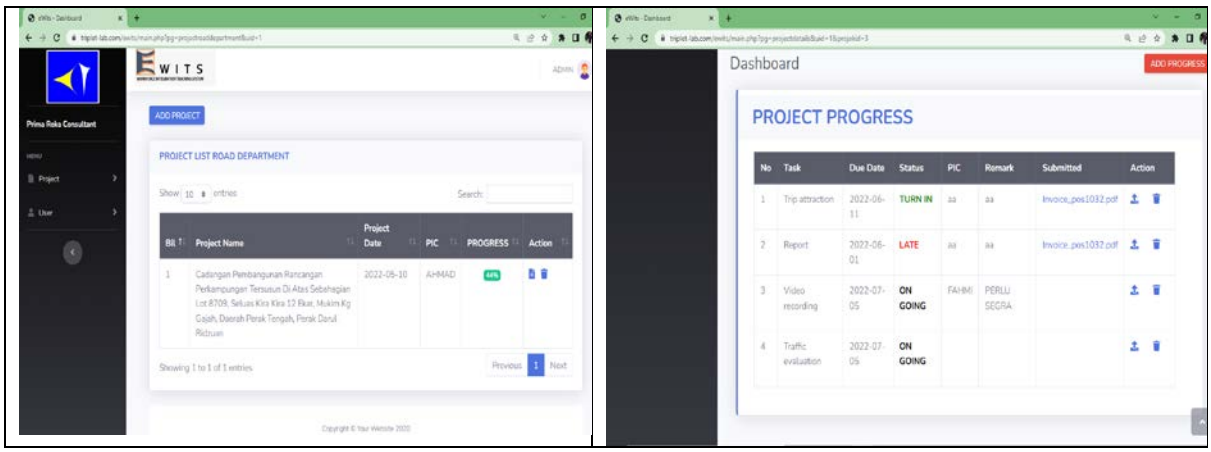

Figure 2. The Main Page Interface

3.2 Data Analysis

To ensure the validity of this survey reliability test had be done also. The purpose of the reliability analysis is to know the internal consistency of the questionnaire that distributed to the respondent. The Cronbach's Alpha have the range between 0-1. But many experts saying that the result of reliability analysis must more than 0.7 to get conformity of consistency for the questionnaire. Based on Nunnaly (1980), the score below 0.6 is poor, between 0.60 and 0.70 is acceptable, between 0.8 and 0.9 is good and above 0.9 is excellent. The value obtained for the coefficients Cronbach's Alpha is greater than 0.7. Therefore, from the Table 1 below showed the value of Cronbach's Alpha is 0.78 for then 20 numbers of questions which mean that the questionnaire has excellent consistency.

Table 1: Reliability Test show the Cronbach's value

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
.75	.78	20

Table 2 below show the result of respondent about the issues related to tracking system on existing method. There are ten attributes of effectiveness. Overall, the result showed that majority of respondents do not agree with the current system (desktop applications) effectively for construction companies to make it easy to access data. It was proved due of lower average mean value. Considering the need to improve construction processes and delivery, as well as the importance of the industry to any nation's economy, there is an urgent need to redirect the methods and ways of carrying out digitalization in the industry. One of these steps is the incorporation of digital technology into construction processes.

Table 2: Effectiveness of tracking system on existing method

	Variables	Mean	Std. Deviation
1	Do you feel comfortable using of your current system?	1.27	0.449
2	Do you feel current system help in communication with your team?	1.07	0.442
3	Do you think current system practical for project planning?	1.60	0.000
4	Do you think current system effective in project monitoring & tracking?	1.00	0.183
5	Do you feel current system user- friendly?	1.07	0.305
6	Do you think current system solve/ minimize delay issue?	1.00	0.254
7	Do you think current system help in time saving/ planning?	1.27	0.000
8	Does the current system help you for timely submission?	1.00	0.000
9	Does current system make it easier for you to recover old files?	1.00	0.000
10	Do you agree that current system offer sustainable practice?	1.33	0.479

Table 3 shows the means and standard deviations for effectiveness of E-WITS tools in construction industry. The survey instrument intended to explore the effectiveness of using the E-WITS. Majority respondents indicate on scale 4 and above. The sample results show that most of the respondents feel that E-WITS is an effective platform for project planning in sustainable construction practice (mean = 5.00). Standard deviation results showed that data points are close to the mean, which is showed a good fit of the data. This finding corroborates the ideas of Sepasgozar & Davis (2019), who suggested that the use of digitalization in a construction company may be able to digitally transfer its project processes to achieve more benefits including increased productivity and collaboration.

Table 3: Effectiveness of E-WITS tracking system

	Variables	Mean	Std. Deviation
1	Do you feel comfortable using E-WITS?	4.93	0.254
2	Do you think E-WITS help in communication with your team?	4.72	0.442
3	Do you think E-WITS practical in project planning?	5.00	0.000
4	Do you think E-WITS effective in project monitoring and tracking?	4.97	0.183
5	Along with the manual guide is included do you think E-WITS easier to grasp than existing system?	4.90	0.305
6	Do you think E-WITS solve/ minimize delay issue?	4.93	0.254
7	Do you think E-WITS help in time saving/ planning?	5.00	0.000
8	Does E-WITS help you for timely submission?	4.97	0.183
9	Does E-WITS make it easier for you to recover old files?	4.87	0.339
10	Do you agree that E-WITS offer sustainable construction practice?	5.00	0.000

4. Conclusion

Construction companies have relied on closed systems, in-house developments, desktop applications, and on-premises servers to manage their operations. The transfer of accurate data was tedious and manual, relying on spreadsheets, manual data entry, and re-entry. For companies taking their first steps into digital efficiency, E-WITS is effective for personnel tracking system compared to existing method. E-WITS was developed by using website which is easier for user to complete the small task and overall project. E-WITS can improve processes and efficiency, streamline operations, and improve productivity. This finding gives the idea that the role data plays in making smarter and faster decisions. Therefore, further research is required to establish cloud-based platforms combined with Application Programming Interface (APIs). APIs enable data from different systems to be exchanged automatically.

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