# Design and Development of the Sistem i-Burst@PKB: A User Requirement-Driven Approach for Digital Quantity Surveying

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*Abstract* - **Digital transformation in the construction industry has accelerated the use of web-based technologies, automation and Artificial Intelligence (AI) to improve operational efficiency and information management. In the field of Quantity Surveying (QS), construction cost management and calculation of built-up rates are important processes in the preparation of cost estimates, budget control and project financial decision-making. However, current practices still rely heavily on manual approaches and spreadsheet platforms that have constraints in terms of data integration, accessibility, scalability and information security. This study discusses the design and development of the Sistem i-Burst@PKB (Interactive Built-Up Rate System) System using a user requirement-driven approach to support Digital Quantity Surveying practices. The study uses a Design and Development Research (DDR) approach which involves the user requirements analysis phase, system design, development and system integration. The developed system integrates various functions including user dashboard, project management, 13 construction work modules, build-up rate analysis module, Interactive Cost Calculator, QS Technical Reference Module as well as the "Ask i-Burst" smart assistance function based on Artificial Intelligence (AI). The migration from a spreadsheet platform to a web-based environment improves system accessibility, centralized data management, flexibility of use and digital functionality. The development of Sistem i-Burst@PKB demonstrates the potential for developing a local digital construction cost management platform to support QS practices in Malaysia. In addition to supporting Digital Quantity Surveying, the system also emphasizes industrial usability, real-world application readiness and commercialization potential. This study contributes to the development of digital construction cost management through the development of an integrated, user-oriented and AI-powered platform.**

***Keywords— Digital Quantity Surveying, Construction Cost Management, Built-Up Rate, Web-Based System, Artificial Intelligence (AI).***

## I. INTRODUCTION

Digital transformation has changed the landscape of the global construction industry through the application of technologies such as Building Information Modelling (BIM), Cloud Computing, Artificial Intelligence (AI), Internet of Things (IoT) and web-based information systems. In line with the Construction 4.0 agenda, digital technology is increasingly being used to improve productivity, data integration, information accuracy and decision-making efficiency in construction project management [1], [2].

In the field of Quantity Surveying (QS), construction cost management is a critical component that involves the preparation of cost estimates, calculation of built-up rates, budget control, tender management and contract administration [3]. The accuracy of construction rate calculations plays an important role because it affects the accuracy of cost estimates and the effectiveness of financial management of construction projects.

However, construction rate management practices in the construction industry still rely heavily on manual approaches, spreadsheet applications and separate databases. This approach is often associated with several constraints

such as difficulties in data integration, limited user access, information security issues, low system scalability and inefficiency in project information management [4], [8]. Although spreadsheets offer flexibility of use, they are not well suited to support more complex, large-scale, and industry-oriented construction cost management.

In addition, most commercial construction cost management systems available in the market are developed based on international contexts and do not necessarily meet the construction rate structure, professional practices, and needs of the Malaysian construction industry. The Malaysian construction industry digitalization agenda through the Construction 4.0 Strategic Plan (2021–2025) and National Construction Policy 2030 also emphasizes the need for local digital technology development to support industry innovation and competitiveness [5], [10]. However, the lack of local digital platforms that integrate construction rate calculation, project management, technical references, and AI-based intelligent assistance still creates a gap in the development of Digital Quantity Surveying systems.

To address these issues, this study develops the Sistem i-Burst@PKB (Interactive Built-Up Rate System) system using a user requirement-driven approach. This system is developed as a web-based construction cost management platform that integrates project dashboard, user management, construction rate analysis module, Interactive Cost Calculator, QS Technical Reference Module and the "Ask i-Burst" smart assistance function based on Artificial Intelligence (AI) [9].

In addition to supporting Digital Quantity Surveying practices, the development of Sistem i-Burst@PKB also emphasizes industrial usability and real-world application readiness. This system is developed with the potential for use by material surveyors, contractors, construction companies, training institutions and industry stakeholders, in addition to having potential for commercialization purposes.

Specifically, this study aims to: (i) identify user needs for the development of the Sistem i-Burst@PKB System; and (ii) design and develop the Sistem i-Burst@PKB System using a user-based approach. The development of this system is expected to contribute to strengthening the practice of Digital Quantity Surveying through the provision of a more systematic, responsive and in-line construction cost management platform for the Malaysian construction industry.

## II. LITERATURE REVIEW

### *A. Digital Transformation in the Construction Industry*

Digital transformation has become a major agenda in the development of the construction industry in line with the development of the Industrial Revolution 4.0. The concept of Construction 4.0 refers to the application of digital technologies such as Building Information Modelling (BIM), Artificial Intelligence (AI), Cloud Computing, Internet of Things (IoT) and digital information systems to increase productivity, operational automation, data integration and efficiency in construction project management [1], [2].

In the Malaysian context, the construction industry digitalization agenda is strengthened through the implementation of the Construction 4.0 Strategic Plan (2021–2025) and the National Construction Policy (NCP) 2030 which emphasizes technological development, industrial innovation and increasing digital competencies [5], [10]. This development shows the need for the development of digital systems that can support the construction industry operations in a more systematic and responsive manner.

### *B. Digital Quantity Surveying and Construction Cost Management*

The field of material surveying (Quantity Surveying) plays an important role in the financial management of construction projects through functions such as preparing cost estimates, calculating construction rates, tender management, cost control and contract administration [3].

The development of digital technology has led to the emergence of the concept of Digital Quantity Surveying, which is the use of digital technology to support quantity calculation, cost analysis, construction information management and the delivery of professional QS services [6].

In construction cost management, built-up rate calculation is an important component because it forms the basis for the preparation of job prices, tender analysis and project cost estimates [3]. Although various cost management software has been introduced, most existing systems are developed based on international contexts and do not necessarily meet the cost structures, professional practices and needs of the Malaysian construction industry.

### *C. Web-Based Information Systems in Construction Cost Management*

Web-based information systems are increasingly gaining attention in the construction industry because of their ability to provide flexible access, centralized data management and real-time information integration [7].

Compared to traditional spreadsheet platforms or desktop applications, web-based systems allow users to access data and system functions via the internet without relying on local software installations. In addition, web platforms offer advantages such as user access control, information security, system scalability and multi-user operation support [7], [8].

In the context of construction cost management, the development of web-based systems has the potential to improve calculation accuracy, operational efficiency, project record management and user experience. The design aspects of the user interface (UI) and user experience (UX) also play an important role in determining the level of user acceptance of a digital system [8].

### *D. Artificial Intelligence in Quantity Surveying and Construction Cost Management*

The use of Artificial Intelligence (AI) is growing in the construction industry, especially in the fields of cost forecasting, data analysis automation, information management and decision support systems [9].

In the context of Quantity Surveying, AI has the potential to assist the process of construction rate analysis, cost data interpretation, technical information retrieval and the provision of intelligent support to users. The integration of AI in digital systems allows users to obtain information more quickly, responsively and interactively [9].

The AI-based user assistance approach through the concept of conversational assistant is gaining increasing attention due to its ability to support human-system interaction, information retrieval and user learning in a digital environment.

### *E. Research Gaps*

The literature highlights show that many studies have discussed the digital transformation of the construction industry, Digital Quantity Surveying, cost management systems and AI applications in the construction industry [1], [2], [6], [9]. However, there is still a lack of research focusing on the development of a web-based local construction rate management system that integrates project management, interactive cost calculator, QS technical reference and AI-based user assistance in one integrated platform.

In addition, the use of spreadsheets is still widespread in construction rate management although this approach has limitations in terms of data security, user management, information integration and system scalability [4], [8].

In this regard, this study develops the Sistem i-Burst@PKB using a user-needs-based approach to support the development of a Digital Quantity Surveying platform that integrates construction rate calculation, project management, technical reference module and smart assistance function “Ask i-Burst” in the context of the Malaysian construction industry.

## III. RESEARCH METHODOLOGY

This study uses the Design and Development Research (DDR) approach to support the development process of the Sistem i-Burst@PKB. This approach was chosen because of its suitability in digital system development involving user requirements analysis, system design, application development and integration of technical functions to meet the operational needs of users and the industry [11].

The system development was implemented using a user requirement-driven approach to ensure that the system design, module structure and application functions were developed in line with the actual needs of users in the field of construction cost management and Quantity Surveying [11].

*A. User Requirements Analysis Phase*

The first phase of the study involved the process of identifying user requirements for the development of the Sistem i-Burst@PKB. This analysis was carried out to understand the current challenges, operational requirements and user expectations related to construction rate management, project cost calculation and construction data management.

The requirements analysis focused on aspects of calculation accuracy, system accessibility, information security, user experience and the need for digital functions that support Quantity Surveying operations [3], [6].

*B. System Design Phase*

The second phase involved the development of the system design based on the identified user requirements. The Sistem i-Burst@PKB is designed using the concept of a web-based information system to enable online access to the system [7], [8].

The system design includes the development of a user dashboard, project management module, construction rate management module, interactive cost calculator, QS technical reference module and AI-based "Ask i-Burst" smart assistance function [9].

In addition, the system also uses a centralized database approach to support the management of project information, user data, calculation records and system operations more systematically [7], [8].

*C. System Development and Integration Phase*

The third phase involves the development of the Sistem i-Burst@PKB through migration from a spreadsheet-based platform to a web-based platform.

This approach aims to increase the flexibility of use, information security, data management and system scalability as commonly discussed in the development of modern software systems [7], [8].

## IV. DESIGN AND DEVELOPMENT OF THE SISTEM I-BURST@PKB

## V.

*A. System Architecture*

The Sistem i-Burst@PKB was developed using a web-based information system approach to support construction rate management and construction cost management digitally [7].

The system uses an architecture that integrates a user interface (see figure 1), a centralized database, a cost calculation module, a project management dashboard, technical references, and AI-based smart assistance functions [8], [9].

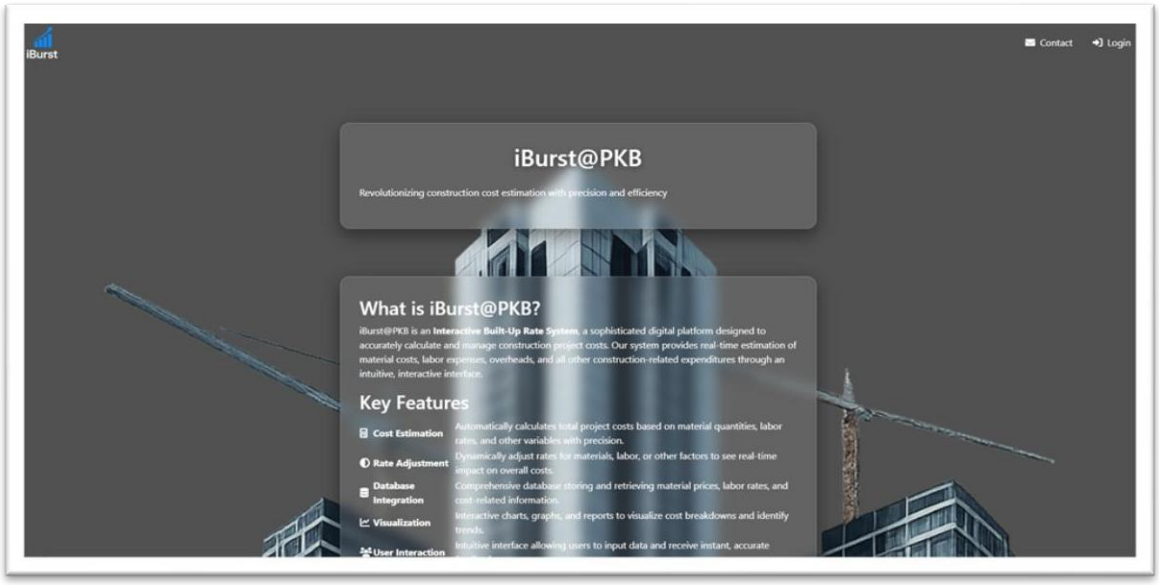



Fig. 1: Sistem i-Burst interface

*B. User Dashboard and Project Management*

The integration of the user dashboard as shown in figure 2 allows the management of user profiles, project information, and system operations to be implemented in a more centralized and systematic digital environment.

This approach is in line with the development of modern information systems that emphasize centralized data management, user experience, and digital function integration [7], [8].

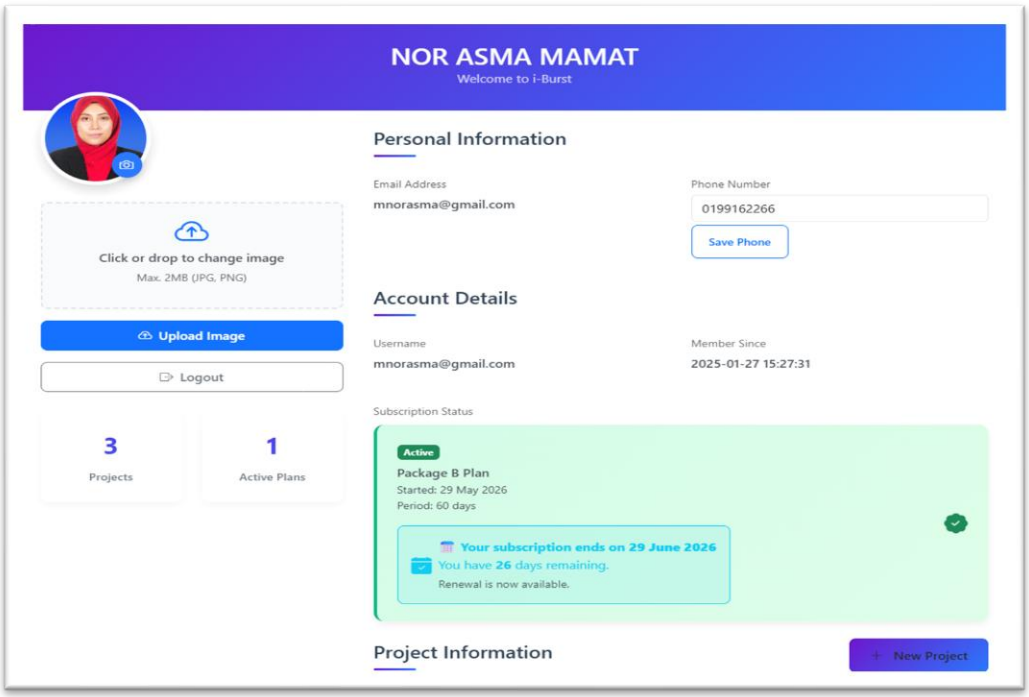



Fig. 2: User Dashboard

*C. Quantity Surveying Dashboard and Construction Work Modules*

The Sistem i-Burst@PKB integrates 13 construction work modules as shown in figure 3.1, 3.2 and 3.3 to support Digital Quantity Surveying operations.

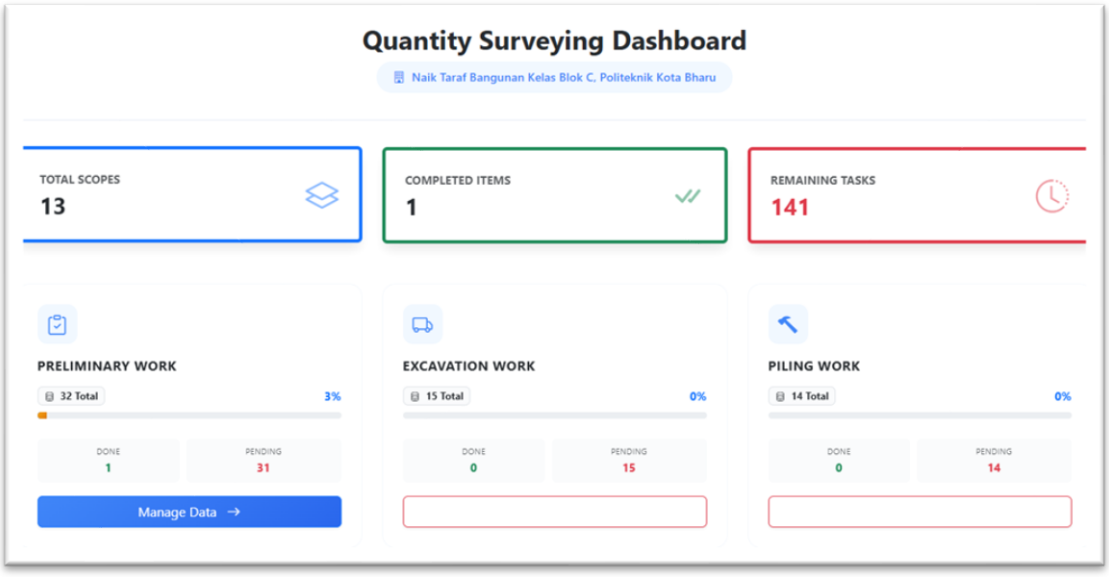



Fig. 3.1: The 13 Work Modules (a)

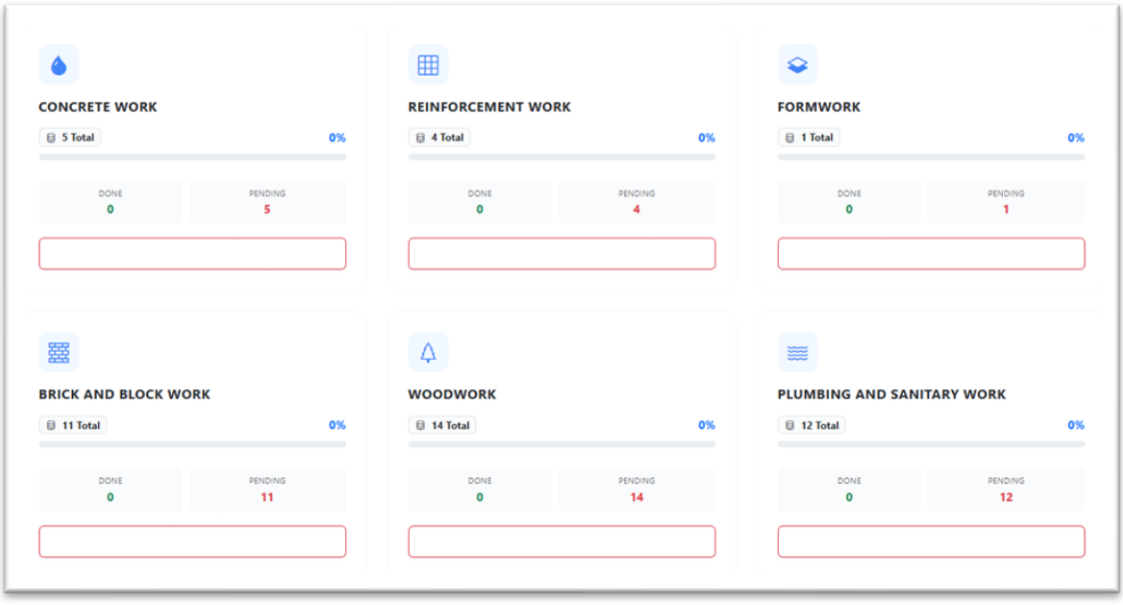



Fig. 3.2: The 13 Work Modules (b)

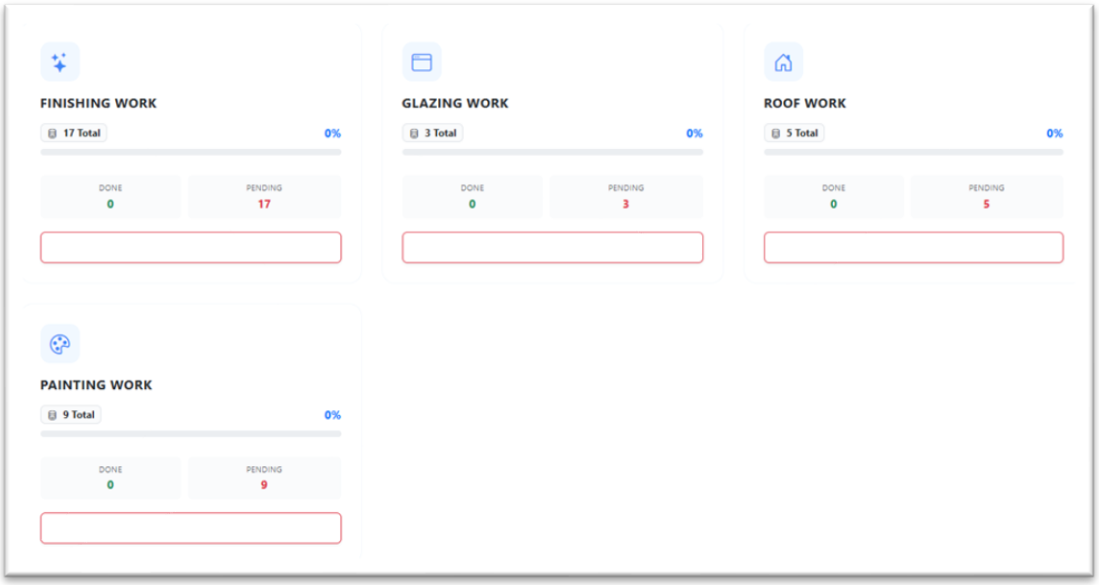



Fig. 3.3: The 13 Work Modules (c)

This modular approach allows construction rate management, cost calculation, and project monitoring to be implemented more systematically and in line with construction cost management practices [3], [6].

*D. Built-Up Rate Analysis and Interactive Cost Calculator Module*

The development of the built-up rate analysis module and interactive cost calculator supports the cost calculation process through the use of parameters such as quantity, price rate, work productivity, profit and overhead.

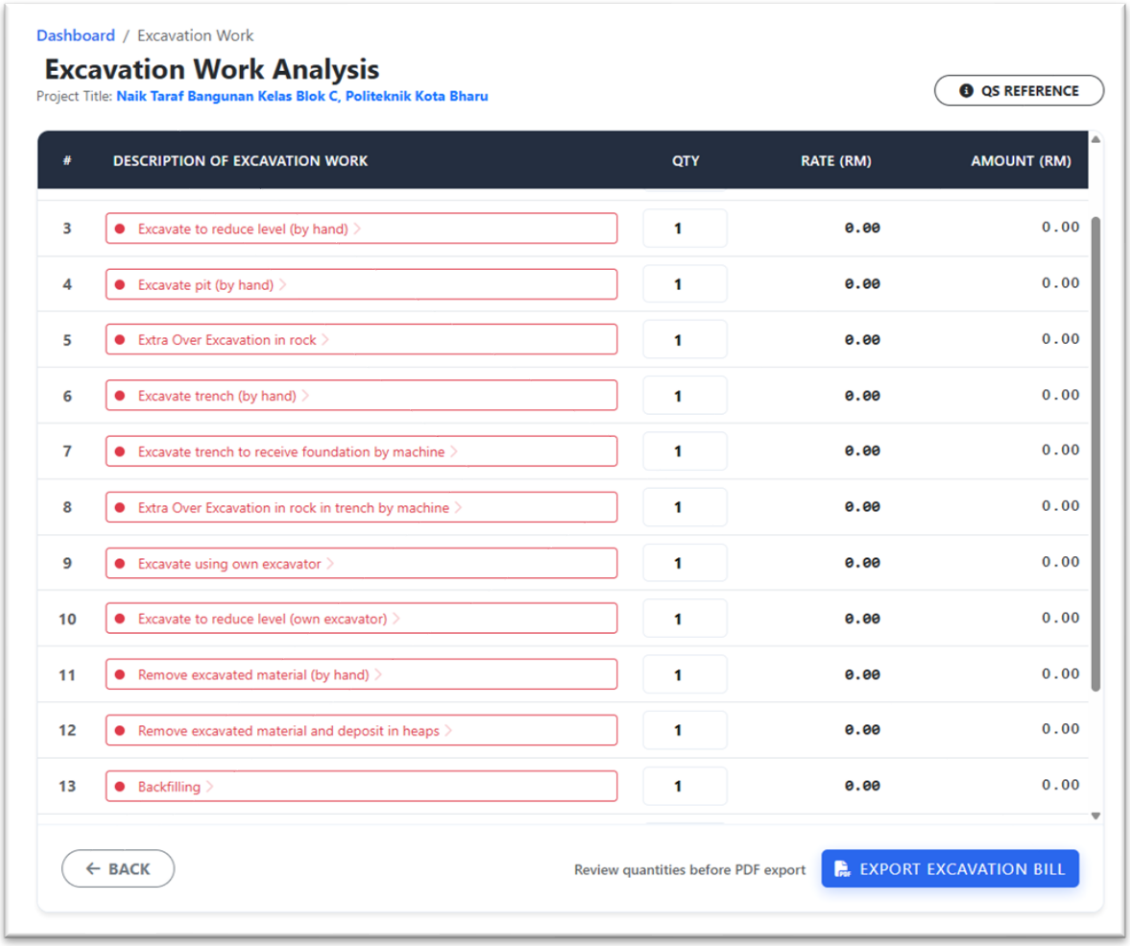



Fig. 4: Summary of Work

This approach helps to strengthen the accuracy of cost calculations and supports the financial management of construction projects [3].

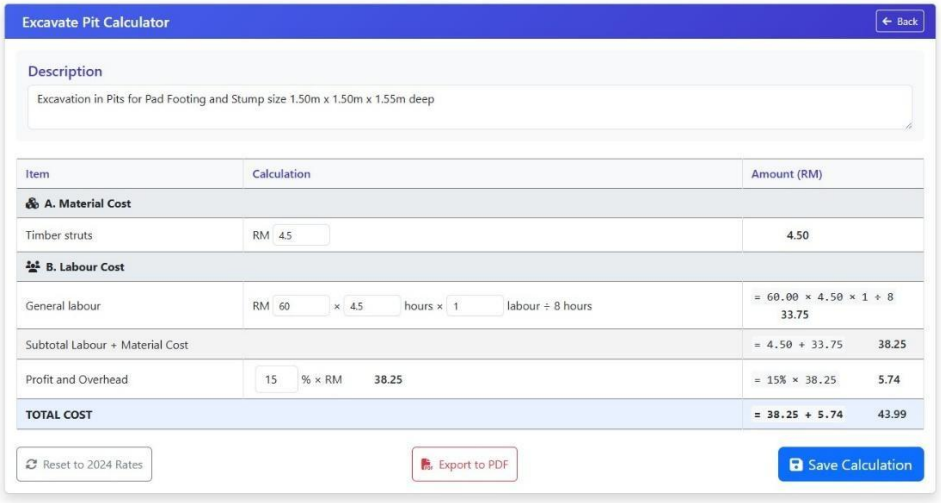



Fig. 5: Cost Calculator

*E. QS Technical Reference and Ask i-Burst Module*

The integration of the QS Technical Reference module provides additional references to support the reliability of calculation data and user understanding of construction cost management practices [3].

In addition, the development of the smart assistance module "Ask i-Burst" demonstrates the integration of AI technology in the Digital Quantity Surveying environment to support information search, user interaction and interactive technical assistance [6], [9].

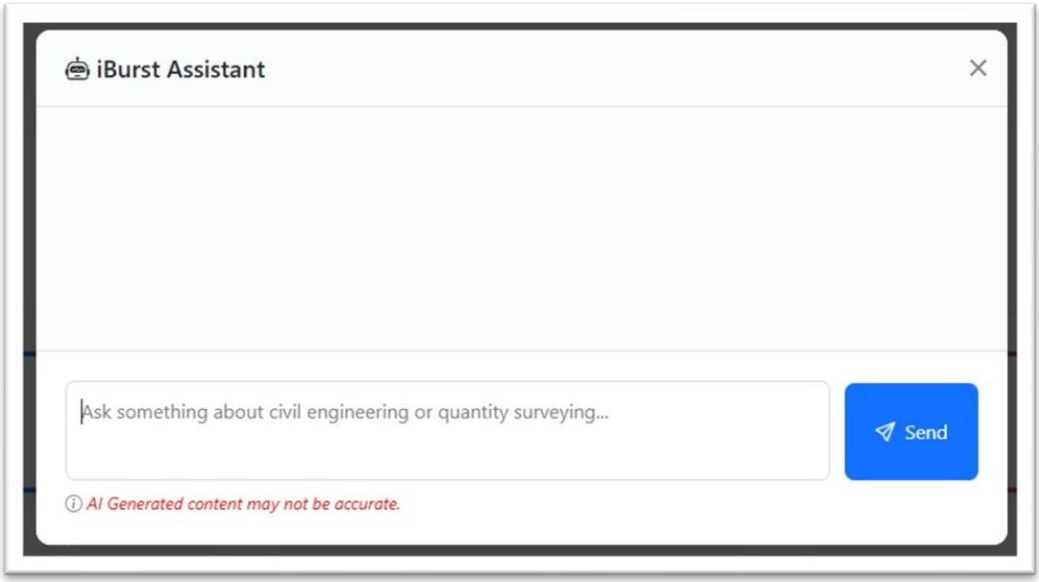



Fig. 6: The i-Burst Assistant

## VI. RESULTS AND DISCUSSION

### A. Sistem i-Burst@PKB Development

The development of the Sistem i-Burst@PKB demonstrates the transformation from a spreadsheet platform to a web-based information system that offers access flexibility, centralized data management and system scalability [7], [8].

This finding is in line with previous studies that emphasize the importance of digital transformation and the use of digital platforms in the construction industry [1], [2].

### B. Dashboard and Project Management Integration

The integration of user dashboards and project management demonstrates the system's ability to support project data management in a more structured and user-oriented manner.

This approach is in line with the principles of modern digital system development that emphasize user experience, data management and information integration [7], [8].

### C. Integration of Quantity Surveying Modules and Construction Rate Analysis

The development findings show that the Sistem i-Burst@PKB successfully integrates 13 construction work modules into an integrated digital platform.

The integration of the construction rate analysis module supports the practice of Digital Quantity Surveying as well as construction cost management as discussed in studies related to digital QS and cost management [3], [6].

### D. Integration of Technical Reference Module and Cost Calculator

The development of the technical reference module and cost calculator demonstrates efforts to improve the accuracy of calculations and the reliability of cost data.

This approach supports the concept of digital cost management that emphasizes data utilization, calculation automation and information integration in construction operations [4], [6].

### E. Integration of the "Ask i-Burst" Smart Assistance Module

The development of the "Ask i-Burst" function demonstrates the potential for integrating AI technology in the Digital Quantity Surveying environment.

This approach is in line with the development of AI applications in the construction industry which are increasingly used to support decision support systems, information management and user interaction [1], [9].

### F. Implications for Digital Quantity Surveying

The development of the Sistem i-Burst@PKB demonstrates the potential for developing a local digital platform in strengthening Digital Quantity Surveying practices in the context of the Malaysian construction industry.

The integration of the project dashboard, construction rate module, cost calculator, technical reference and AI assistance demonstrates how digital systems can support cost management operations in a more integrated, responsive and user-oriented manner [2], [6], [9].

### G. System Commercialization Potential

The development of Sistem i-Burst@PKB has reached a level of system readiness that allows its use to be expanded to industrial environments and commercialization potential.

The developed system has integrated various operational functions including project management, construction rate calculation, interactive cost calculator, technical reference module and AI-based smart assistance in an integrated digital platform.

The readiness of the system for actual use shows that Sistem i-Burst@PKB has the potential to be applied by various stakeholders such as material surveyors, contractors, construction companies, consultants as well as construction-related training and education institutions.

This commercialization potential demonstrates the capabilities of local digital system development in supporting the transformation of construction cost management and strengthening the Digital Quantity Surveying ecosystem in Malaysia.

## VII. CONCLUSION

This study discusses the design and development of the Sistem i-Burst@PKB using a user-based approach to support Digital Quantity Surveying practices in the Malaysian construction industry.

The results of the study show that Sistem i-Burst@PKB was successfully developed as a web-based construction rate management platform that integrates user dashboards, project management, 13 construction work modules, built-up rate analysis module, Interactive Cost Calculator, QS Technical Reference Module as well as the "Ask i-Burst" smart assistance function based on Artificial Intelligence (AI).

From the contribution aspect, this study contributes to the development of the field of Digital Quantity Surveying through the development of a local digital platform that integrates construction cost management, construction rate analysis, technical reference and AI assistance in one integrated system.

From the impact aspect, the development of Sistem i-Burst@PKB has the potential to improve the efficiency of construction rate management, cost management and access to technical information through the use of a more flexible, easily accessible and centralized digital platform. In addition, this system has the potential to support the transformation from the traditional spreadsheet approach to digital construction cost management in the Malaysian construction industry.

Furthermore, Sistem i-Burst@PKB has reached the level of usability and is ready for commercialization, thus demonstrating the potential of the system's real application in the construction industry, professional sectors, training and education related to Quantity Surveying.

However, further studies are still recommended to conduct empirical evaluations of usability, user acceptance, system performance and the impact of long-term use in a real industrial environment.

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## DECLARATION OF GENERATIVE AI USAGE

During the preparation of this work, the authors used ChatGPT (OpenAI) to assist with language editing, grammar checking, manuscript organisation, and formatting. The authors critically reviewed and revised all generated content and take full responsibility for the final version of the manuscript.

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