OPTIMIZATION OF INNOVATION FEATURES IN MOBILE-BASED ATTENDANCE APPLICATION

Tiya KATRILIA, P.W. ANGGORO, P.K. DEWA SP.
Universitas Atma Jaya Yogyakarta

Abstract:
Improved Human Resources Performance can be realized in the employee's absence. The sophistication of technology to accommodate the absence is the use of a Mobile-Based Attendance Application. Attendance can be used to measure employee performance. One of the measuring tools in measuring performance is the Key Performance Indicator (KPI). KPI values can be obtained from the Mobile-based Attendance Application, as currently implemented by an IT Company. But in its development, there is a shortage on the application features of Daily Attendance, Leave, Report Recaps Attendance and Report Recaps Leave. The value engineering method with the Analytical Hierarchy Process is used in this paper to obtain prioritized alternatives in the development of application feature updates. The results of the research show that the alternative with the largest percentage is owned by Alternative IV (45.6%). These results indicate that this alternative can be used as a recommendation for renewal of attendance application features on IT Company. Alternative IV shows optimal results such as the realization of application feature requirements for users, consumption of fewer workdays for 1-2 days, low costs, easy-to-understand feature design, and uncomplicated programming techniques.

Key words: *Mobile, Application, Analytical Hierarchy Process*

INTRODUCTION

The Industrial Sector is growing rapidly and evolving to Industry 4.0 [1] to the Industrial Era 5.0 and plays an active role in supporting the country's economy. Industry is known as a company, based on its segment, it can be divided into two such as in India there are Manufacturing Companies and Service Companies [2]. Manufacturing companies carry out the production process and produce tangible products, currently developing towards "Smart Manufacturing" which increases manufacturing flexibility [1]. Service companies provide services and produce intangible products that create new experiences for consumers [3]. Examples of service companies are Insurance, Banking, Transportation, Information Technology (IT) and others [4].

Products contain useful qualities and values and can meet consumer needs or desires. Quality and value play an active role in providing satisfaction to consumers. Quality is the main basis in the development of long-term relationships, consisting of trust, satisfaction, and commitment [5]. Values represent product functions/benefits and represent competitive scenarios. Value can be the basis for predicting the behaviour of customers in the future. There is a study that uses the survey strategy method and SEM-

PLS technical analysis to prove that it is true that the relationship between quality and value has an impact on the spread of positive issues on products [5]. Quality and value can be used as product advantages. However, along with the times, product advantages must be improved by providing updates to the product. Product updates need to adapt to changing consumer needs, wants and tastes. Value Engineering is a management technique that provides benefits and increases the proven management value of construction projects [6]. Value engineering evaluates product functions to identify & eliminate unnecessary costs [7]. The existence of value engineering supports the achievement of a balance function of cost, performance, and product (project result). Products can be introduced through promotions to increase the amount of market share. Promotion is related to a business model that defines how companies sell products to consumers, convey the advantages of product value, earn profits, reduce barriers, and face other challenges [8]. Most of the recent literature on PSS has focused on business-to-business and business-to-consumer relationships and their contribution to the economy [9]. Promotional models need to be innovated to attract consumers' attention and create a competitive advantage [10]. Promotional innovation can be initiated by describing management strategies

to communicate business ideas/concepts [9]. The tool that can be used to describe a business model is the Business Model Canvas [11]. Business Model Canvas (BMC) as a supporting tool in the form of a visual chart. In the construction project, research was carried out to model the complex dynamics of promotional innovations until it was found that the results of the empirical model were the embodiment of the conceptual model [12]. Conceptual model consisting of Idea harnessing, Relationship enhancement, Incentivization, and Project team fitness. The conceptual model is proven to affect innovation performance and has a positive impact on productivity, environment, and project cost savings [12]. Innovation promotion of a product is getting better and is ready to compete when the promoted product advantages are better able to meet the needs and desires of consumers.

Value engineering identifies and eliminates unnecessary costs and looks for other alternatives to meet needs. In realizing product excellence, several alternatives should be considered and analysed to obtain the best alternative from decision making for product renewal. Decision making is a complex process considering perspectives, constraints, and variables to be able to provide the best alternative recommendations [13]. The best alternative is to provide functions that are as good as other alternatives but provide more benefits than disadvantages. In theory, Alternatives should optimize costs according to the functional and technical constraints applicable to the project. The decision-making method to generate the best alternative can be applied to any industry for different cases.

In the implementation of green supply chain management (GSCM) Construction Projects, identification and prioritization of factors that influence the implementation are carried out [14]. In this case, the fuzzy decision-making trial and evaluation Laboratory (FDEMATEL) approach was collaborated to determine the relationship between criteria in determining the important factors of GSCM and the fuzzy analysis network Process (FANP) to calculate the weight of the criteria based on causal relationships. In contrast to Marzouk and Sabbah, choosing a supplier for the sustainability of a construction project by implementing the Technique for Order Preference by Similarity to the Ideal Solution (TOPSIS) method. TOPSIS is used to evaluate supplier differences and the Analytical Hierarchy Process (AHP) for calculating the weight of each supplier so that decisions can be made with the best alternative supplier [15]. In the design of information modelling applications (BIM) for the development of sustainable construction, there are 3 alternative clusters with a total of 6 criteria [16]. It is proven that multi-criteria decision making using the Analytical Network Process (ANP) is a good decision-making tool and can be linked to BIM. ANP identified the main factors influencing sustainable construction by reducing the energy contained and operational and carbon emissions, namely a cluster consisting of design optimization factors and reduction of material requirements. The railway industry development strategy in facing the growing demand for railways requires analysing the Moving Block (MB) and Virtual Coupling (VC) criteria

[17]. This analysis uses the Delphi-Analytic Hierarchic Process (DAHP) technique to select, combine, and objectively consider various criteria to obtain a more reliable alternative. In the case of technology and information, the decision-making method of pairwise comparison is used for the selection of programming languages by adjusting the environment system and design science [18].

IT companies are in Jakarta, Surabaya, and Malaysia. This company is one of the businesses that is growing in the Pandemic Era in the field of Information Technology (IT) and has a business model, namely Software as a Service (SaaS). The company sells applications and provides application services. The products produced are desktop, mobile and website-based applications. In addition, this company also acts as a vendor in Business to Business (B2B) which means that the production (business or service) is intended directly for business partners, not for final consumers [19]. The production process of each product is referred to as the application implementation, customization, and installation project. One of the products that will be discussed in this paper is the Mobile-based Attendance Application which can be installed on Android and iOS devices. The purpose of developing this application is to be able to support the attendance process of employees wherever they are, easy to access and easy to use by involving a verification process using facial photos. Research that discusses attendance applications is still rarely found, this is due to the focus on business continuity opportunities [20] and business management innovation [19]. Thus, this application can support work from home (WFH) activities for business continuity in the Covid-19 Pandemic Era [21]. Those advantages create the attraction of consumers to buy the application. This application can assist the personnel team and company management in monitoring employee's absence and as a performance measurement material to assess Key Performance Indicators (KPI).

Value engineering is a method of evaluating, analysing the advantages, dangers, and limitations of each alternative to complete the decision-making process [22], one of which is Determination of Application Feature Innovation Priority Alternatives. For this reason, it is necessary to apply value engineering methods in the development of application features. It is important to determine the method used, to be able to produce appropriate decision-making stages to reduce the difficulty of analysis and be able to achieve goals [13]. The AHP method is a method that helps make decisions to determine priority alternatives in updating attendance applications. Based on the available alternatives, information is obtained that the available alternatives are discrete, and the alternative selection is in the form of ratings. The desired alternative characteristic is that it is easy to understand and apply by managers, so the recommended multi-criteria decision-making methods are Analytical Hierarchy Process (AHP), Best Worst Method (BWM), Evaluations II (PROMETHEE II), and Elimination Et Choix Traduisant la Realite III (ELECTREE III) [23]. The four methods were tested to identify the stability of the results that will be used as a decision. AHP is a combined method of pairwise comparison that is

good for weighting criteria and determining alternative sequences [23]. However, when considering the variables of risk and uncertainty, it is advisable to use the PROMETHEE II method.

This paper aims to find an alternative that is prioritized in the development of feature updates for Mobile-Based Attendance Applications in IT Companies. In this alternative selection process, it is expected to achieve optimal results as measured by the realization of application feature requirements for users by considering the development process. The variables considered in the development process are Workdays, Cost, Design Features, and Technical Programming. This alternative selection focuses on ranking alternatives from best to worst. The best alternative is defined as the result of this paper which becomes a priority alternative to be recommended to IT companies so that they can be developed first. Of course, from the IT company's point of view, it would be better if you could update the features without spending money, but this is not possible. Therefore, it is necessary to select features to achieve optimal results so that the application can be implemented in stages. The AHP method that will be used by the author in this paper supports to get an alternative ranking order of feature updates, from priority to not good..

MATERIALS AND METHODOLOGY

Attendance Application Mobile-based implementation is the realization of the use of sophisticated technology to help the company work activities. As already informed, this application is a tool that can assist the personnel team and company management in monitoring employee absenteeism and as a performance measurement material to assess KPI. The KPI formula for assessing employee performance in IT companies is divided into 2, among others:

$$Formula\ for\ the\ PAWE = \left(\frac{NW}{TAW}\right) \times 100\% \qquad (1)$$

Explanation (1):

PAWE – Percentage of Attendance at Work for Employees (%)
NW – Number of employee work attendance (days)
TAW – Total annual working days (days)

The PAWE formula in equation 1 represents the percentage level of employee present attendance as one of the KPI values in IT companies. If the PAWE percentage value is high, it indicates that the employee has a higher attendance rate (good employee) than other employees and vice versa.

$$Formula\ for\ the\ PELA = \left(\frac{NS+NL-NAS-TAL}{TAW}\right) \times 100\% \qquad (1)$$

Explanation (2):

PELA – Percentage of Employee Leave Absences (%)
NS – Number of sick days of employees (days)
NL – Number of days of leave of employees (days)
NAS – Number of annual sick days of employees (days)
TAL – Total annual leave of employees (days).
Only current year, the previous year's leave allowance is no longer recognized.
TAW – Total annual working days (days)

The PELA formula in equation 2 represents the percentage level of employee absenteeism as one of the KPI values in IT companies such as sickness and permission/leave. If the PELA percentage value is low, it indicates that the employee has a better absenteeism rate than other employees.

To be able to collect KPI variable data with the attendance application, an initial survey was conducted by the author who stated that the attendance application lacked features, so it needed to be updated (Table 1).

Table 1
Survey Data

Criteria	Description	Suggestion
Features	Access to user login and logout attendance (according to employee master data of companies) which NIK and Password.	The daily attendance feature does not accommodate sickness and permission/leave (currently only attendance is present). For this reason, it is necessary to update the attendance feature.
	Access to the user company (corresponding employee master data from company) Company where the user is working.	-
	Access the user's leave balance (ownership of the leave balance that the user can use).	The leave feature has not accommodated the leave application process (currently only checking the leave balance). For this reason, it is necessary to update the leave application feature.
	The Attendance Report feature is not yet available.	It is necessary to provide a feature for the Attendance Recap Report.
	Annual Leave Submission Recap Report feature is not yet available.	It is necessary to provide a feature for the Annual Leave Submission Recap Report.
User Interface	Too much use window/new tab for each activity.	If the system is redesigned, a simple user interface design is needed so as not to use a lot of new windows/tabs.
	The impact of point 1 resulted in large memory resource consumption which can cause buffering	
	Selection of appropriate colours and symbols for the visualization capable of directing users of the application without having to remember a description of the features.	

Based on the survey results, there are 4 types of applications that lack features and 1 type due to poor user interface design. The development of this attendance application feature is carried out in stages by looking at the most prioritized features to help collect KPI variable data.

Therefore, it is important to select the priority features that will be developed first so that the application can be implemented gradually and can meet the main needs of employees as users.

In operating this application, it takes 2 types (Primary Data and Secondary Data). The primary and secondary data used in this paper are employee attendance data for IT companies (see Table 2).

Table 2
IT Company Employee Attendance Data

Primary Data	Secondary Data
Employee Identification Number (NIK) and Employee Name	Company Profile (Name Address)
Employee Access Data to Company	Location Data
Calendar Data (Date, Month and Year)	Employee Leave Balance Data
Time Data (Global)	Attendance Recap Report Format
Employee Photos with 3 Styles (Smile, Flat, Pout)	Annual Leave Recap Report Format
Internet Quota	Application Development Time
	Development Difficulty Level
	Application Design Difficulty Level
	Feature Development Fee

To fulfil the renewal of this application feature, the writer describes the business model in the Business Model Canvas (BMC) as described by [24] as a supporter in the form of a visual chart. Furthermore, the five stages of value engineering are used by the authors to analyse alternatives for updating application features in this paper. The five stages are presented in the methodological framework which can be seen in Figure 1.
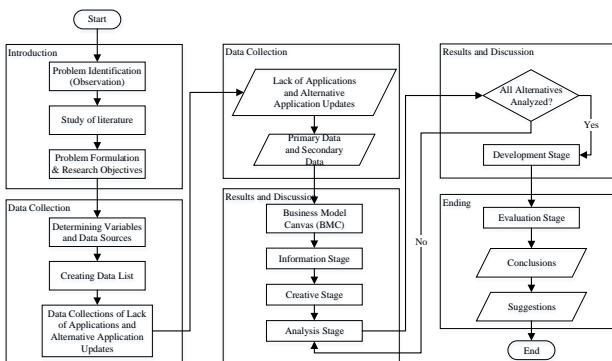

Fig. 1 Framework of Mobile-Based Attendance Application

RESULTS AND DISCUSSION

Table 1 explains that the survey results state that this application has a basic framework that has been implemented internally by IT companies. The basic framework of the description contained into two (2) criteria namely Features and User Interface, the framework can be seen in Figure 2 through Figure 4. This information is obtained by the authors through interviews and discussions with users and consultant's applications attendance this application. This activity is carried out to obtain the basic framework that is already available and to find out the

lack of features or updates needed by IT companies. This information is then used as a new alternative candidate in the selection of feature updates.
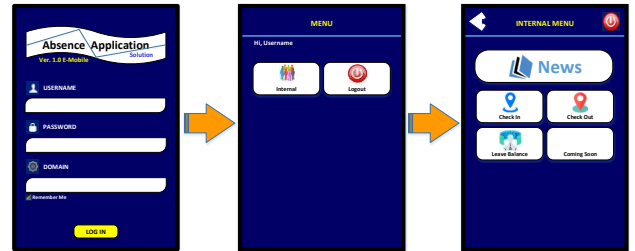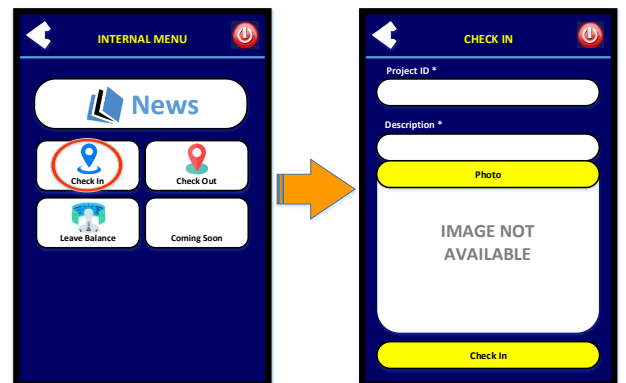

Fig. 2 Main Display of Standard Features Application

Fig. 3 Daily Attendance Display of Standard Features Application

Fig. 4 Display of Leave Balance Standard Features Application

From Table 1, Figure 2 to Figure 4, it can be concluded that the features available in the basic framework of attendance applications in IT companies are still limited so that they require updating the attendance application features. The feature renewal carried out by the authors will be able to improve the function of the application and can support the attendance process as an employee KPI assessment as has also been done by [25]. Furthermore, the function of each feature attendance application is described in Table 3.

To support the process of operating this application, materials are needed consisting of primary data and secondary data. The materials are listed in Table 2, there are 6 types of primary data and 9 types of secondary data.

Table 3
Application Features

No	Features	Function
1	Daily Attendance	Become a mandatory daily activity, conducted before and after office hours.
2	Leave	Becomes a periodic activity and is carried out when there are personal needs/other activities that make it impossible to carry out office activities at the same time. The main activities required are requesting leave and checking leave balances.
3	Attendance Recap Report	Become a useful periodic activity as a means for evaluating absenteeism such as attendance, sickness, and permission/leave.
4	Annual Leave Submission Recap Report	Become a useful periodic activity to inform and evaluate data on submission of annual leave.

Primary data is data that is used directly in application operations, because when this application is run by employees, this data must be available. Secondary data is supporting data whose information can be followed up, such as the company address because it does not interfere with application operations. Secondary data also includes data on application development that will be used for weighting analysis of alternative criteria with AHP. A detailed explanation for each material can be seen in Table 4.

The complete business model is presented in this paper using BMC (see Figure 5). The authors begin to declare the company's business model adapted to the Business Model Canvas (BMC) which describes 9 main components. These components are used by companies to create and deliver value propositions to their customer segments. As in the Financial Services Company which maps its business model with BMC in reviewing innovations that provide sustainable benefits and services to its customers [26]. Figure 5 also shows that IT companies have a broad target market because they include small, medium to large companies. The company provides sustainable information technology services through a mobile attendance application that supports the company's operational activities carried out at home (WFH) such as employee attendance. Support for updating this feature can be viewed from a business model that includes anyone who becomes a broad target market so that it will create new business opportunities and additional new income.

Table 4
Material Description

Primary Data		Secondary Data	
Type	Function	Type	Function
Employee Identification Number (NIK) and Employee Name	Attendance user identity	Company Profile (Name Address)	Company identity
Employee Access Data to Company	Attendance user indication in any company	Location Data	Location of attendance user
Calendar Data (Date, Month and Year)	Date, month, and year of attendance user	Employee Leave Balance Data	Attendance user leave balance indicator
Time Data (Global)	Time/Hour attendance user	Attendance Recap Report Format	Guide for visualizing user attendance recap data
Employee Photos with 3 Styles (Smile, Flat, Pout)	Verification when the user attendance	Annual Leave Recap Report Format	Guide for visualizing user annual leave recap data
Internet Quota	Internet balance for application's access	Application Development Time	Alternative comparison criteria
		Development Difficulty Level	
		Application Design Difficulty Level	
		Feature Development Fee	

The support obtained from the business model can strengthen IT companies in updating features.

However, to get the best alternative order from good to bad alternatives, a value engineering stage is needed by collaborating with the AHP method. This method is used by the authors for decision making in an alternative order.

Fig. 5 Business Model Canvas (BMC)

The stages of value engineering carried out by the authors consist of:

a. The information stage is carried out to obtain project information by identifying the criteria used in the consideration of alternatives.

b. The creative stage is collecting alternative feature updates to achieve the fulfilment of application functions that will be used by researchers to get the best alternative.

c. The analysis stage is carried out to select alternatives by considering the advantages and disadvantages of using the AHP method.

d. The Development Phase is carried out by comparing the selected alternatives with the currently available application framework.

e. Evaluation stage to recommend selected alternatives as feature updates for attendance applications in IT companies.

The five stages above are carried out in a sequential manner in the methodological framework (Figure 1).

This application provides new income opportunities for Authors or System Information Engineers for requested system services or additional features according to special agreements from customers or IT companies. The addition of this feature certainly has the impact of being charged additional fees for adding features by changing the existing system. There are many features that require updating, so IT companies need results that sort alternative updates from good to bad. Based on these results, the Company can follow up the decision to update this attendance application feature. The magnitude of the potential of this application further supports the value engineering process in updating application features. To obtain results that rank alternative renewals from priority to non-priority, the authors adopted the AHP methodology used by [25].

Information Stage

There are 4 criteria that must be considered in each available alternative. The acquisition of these criteria is based on the results of brainstorming, and discussions between Business Consultants and Technical Consultants and other experienced parties. These criteria will be compared to obtain priority criteria in the alternatives (Table 5). The criteria considered are as follows:

a. Workday is calculating the processing time of each alternative. The work consists of application development activities and application testing.

b. Cost is the cost required to update application features. Costs consider worker salaries and additional costs for additional resource specifications.

c. Design Features, namely identifying the level of suitability of alternative designs in mobile-based applications.

d. Technical Programming, namely identifying the level of technical difficulty when developing alternatives in mobile-based applications.

Table 5
Criteria and Alternative Data

Alternative/Criteria	Workdays	Cost	Design Features	Technical Programming
Alternative I	1-2 days	Cheap	Easy	Medium
Alternative II	10-14 days	Expensive	Difficult	Difficult
Alternative III	2-3 days	Medium	Medium	Medium
Alternative IV	1-2 days	Cheap	Easy	Easy

Based on the information obtained, data on the duration of project work (workdays) were obtained based on the results of the breakdown of activities, effects, and levels of difficulty. The assessment of the duration of the project (workdays) is carried out by the technician. The project cost assessment (cost) is obtained based on the use of resources during the development of the feature. However, these costs are only for the company's internal consumption so that this research can be explained by classifying costs. The following is the classification of costs (cost):

− Cheap: Working on features is not difficult, it costs USD 3,44 to USD 68,81.

− Medium: Work on the feature can be done, it costs USD 68,81 to USD 344,07.

− Expensive: Working on features is difficult but can be done, it costs USD 344,07 to USD 688,15.

Then, the assessment of the difficulty level for the Design Feature and Technical Programming criteria uses certain parameters. These parameters are made based on the work experience of Consultants and Technicians. Difficulty levels are as follows:

− Easy: Easy to understand and easy to design.

− Medium: Understandable and acceptable design.

− Difficult: Difficult to understand and difficult to design.

Creative Stage

Based on the results of interviews and discussions with several employees who act as end users, the standard features of the Mobile-Based Attendance Application have a lack of features. For this reason, several alternatives are made that can accommodate the lack of standard application features. Alternative collection was done by using brainstorming and discussions with experienced people. Thus, obtained 4 new alternatives that deserve to be considered in updating the Mobile-Based Attendance Application feature. Alternatives can be seen in Table 6.

The Feature Update Alternatives each have a different look or design. The design and mapping process is determined by the Business Consultant by considering easy to access and easy to use as shown in Figures 6 to 8.

Table 6
Alternatives for Mobile-Based Attendance
Application Feature Updates

| Design	Description
Initial Product	1. Access to user login and logout attendance (according to employee master data of companies) which NIK and Password. 2. Access to the user company (corresponding employee master data from company) Company where the user is working. 3. Access the user's leave balance (ownership of the leave balance that the user can use).
Alternative I	Update attendance features by adding options/information on attendance such as sickness, permission, or present. Benefits: daily attendance data can be recorded every day by the application and employees do not need to do manual confirmation (calling, repeating the same information to several colleagues). The criteria for each attendance statement are divided into 3 parts. Part 1, for sick information, you can add a sick letter document. Part 2, for permission, you can add a permit/leave document. Part 3, to present adding photos in real-time.
Alternative II	Making a new feature for submitting leave from the mobile attendance application. Benefits: the leave application will be automatically synchronized to the open my portal application so that the leave approval process can be continued on the open my portal application. Approved leave applications will be automatically synchronized with the employee's leave balance. The remaining leave balance can be checked in the leave balance feature (the feature is already available).
Alternative III	Making a new feature for Attendance Recap Report. Benefits: to inform daily attendance (present, sickness, and leave) in a report that can be used for employee evaluation (KPI).
Alternative IV	Making a new feature for the Annual Leave Submission Recap Report. Benefits: to inform the submission of data on leave and employee leave balances in a report that can be used for evaluation of employees (KPI).
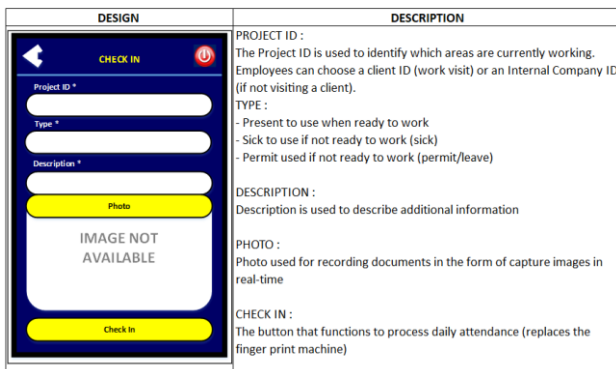
Fig. 6 Display of Alternative 1
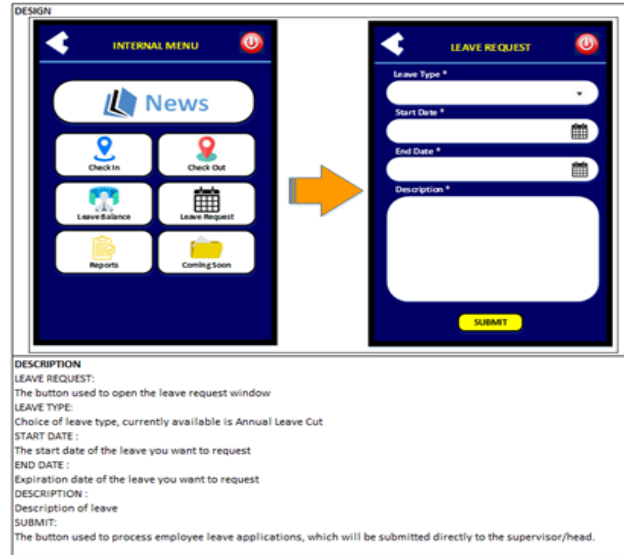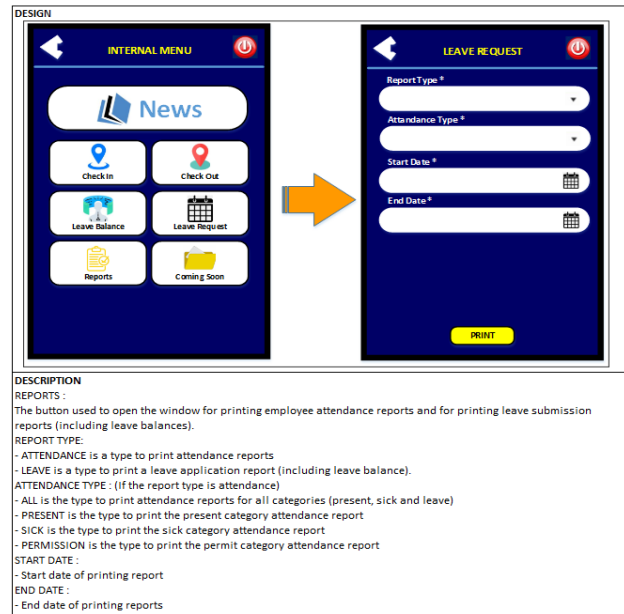

Fig. 7 Display of Alternative 2

Fig. 8 Display of Alternative 3 and Alternative 4

AHP Analysis Stage

At this stage, the AHP method is used to select the best alternative by considering the criteria obtained in the Information Stage such as Workday, Cost, Design Features and Technical Programming. If arranged in a structured manner, a hierarchy of design alternatives is obtained (see Figure 9).
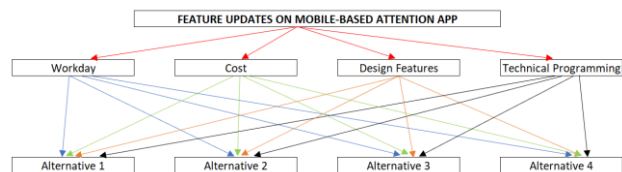

Fig. 9 Hierarchy of Design Alternatives

Based on Figure 9 we get a systematic structure that makes it easier for the authors to assess the weights on the criteria and alternatives. This assessment forms a paired matrix of size 4 x 4, the result of a combination of

alternative features and criteria. In the AHP implementation process, the weight assessment between criteria is carried out. The weight value between criteria is obtained from a questionnaire that is assessed by the IT Company. The standard assessment criteria used in the paired matrix can be seen in Table 7.

Table 7
Priority Vector Value of All Criteria

Criteria	Priority Vector Average (EV)	Percentage
Workdays	0.04	4%
Cost	0.16	16%
Design Features	0.34	34%
Technical Programming	0.46	46%

Based on the results of the consistency test of the criteria, the Consistency Ratio (CR) value of 0.07 is obtained, which means that CR < 0.1, it is concluded that the assessment of the criteria is consistent.

Furthermore, the authors assess the weight of the criteria and alternative weights. The assessment results are normalized so that the value reflects the actual condition. The weighting of the criteria and alternatives is obtained by iterating the matrix until the normalization value is zero. The summary of the weighting can be seen in Table 8.

Table 8
Summary of Criteria Weights & Alternative Weights

Summary of Criteria Weights & Alternative Weights				
Criteria/ Alternative	Workdays	Cost	Design Features	Technical Programming
	0.043	0.154	0.343	0.461
Alternative I	0.067	0.044	0.067	0.046
Alternative II	0.151	0.177	0.149	0.159
Alternative III	0.330	0.357	0.325	0.330
Alternative IV	0.452	0.422	0.460	0.466

After obtaining data on the criteria weights and alternative weights, calculations are carried out to obtain the Final Alternative Weight (see Table 9).

Table 9
Final Alternative Weight

Criteria/ Alternative	Final Alternative Weight				
	Workdays	Cost	Design Features	Technical Programming	TO-TAL
Alternative I	0.003	0.007	0.023	0.021	0.054
Alternative II	0.006	0.027	0.051	0.073	0.158
Alternative III	0.014	0.055	0.111	0.152	0.332
Alternative IV	0.019	0.065	0.158	0.214	0.456

In Table 9, Alternative 4 has the highest Final Alternative Weight compared to other alternatives.

Alternative Development Stage

Based on the Final Alternative Weight, the final alternative percentage value and the order of the alternatives are obtained from the largest to the smallest percentage. In Table 10, the highest percentage of alternatives is owned by Alternative IV at 45.6%. Therefore, it is concluded that the best alternative with the first recommended order for updating mobile-based attendance application features is Alternative IV.

Table 10
Percentage Value and Alternative Order

Criteria/Alternative	TOTAL	PERCENTAGE (%)	RATE
Alternative I	0.054	5.4%	4
Alternative II	0.158	15.8%	3
Alternative III	0.332	33.2%	2
Alternative IV	0.456	45.6%	1

Evaluation Stage

At this stage, it explains that the basic framework for the attendance application gets the first recommendation to update the feature for making the annual leave submission report feature (Alternative 4). When viewed from the basic framework of attendance applications that are currently available, only access to the remaining balance of leave is available. Sometimes application users only know that the leave balance is reduced without being able to browse directly through this attendance application. This is because the operational leave application is done manually through writing on the IT Company work discussion application which is not synchronized with this attendance application. This recommendation is good to implement because it helps inform leave applications and leave balances in a report that can be used for employee evaluation (KPI). In addition, the user interface design for Alternative IV (Figure 8), is designed simply by combining access for Alternative III, making it easier for users to operate this attendance application. Another advantage of combining access to the two alternatives is that it saves time by eliminating the user interface design process for Alternative III.

CONCLUSIONS AND SUGGESTIONS

Paper on the application of Mobile-based Attendance Applications using the AHP method obtained Alternative IV with a percentage value of 45.6% as the best alternative. This best alternative shows optimal results such as the realization of application feature requirements for users, consumption of fewer workdays for 1-2 days, low costs, easy-to-understand feature designs, and uncomplicated programming techniques. The application of this AHP method can also be applied to the selection of application user interface designs, programming languages in making applications and the selection of tools for visualizing employee performance data related to KPIs. It is recommended for the next paper to discuss project management related to how to allocate time and costs so that it can be carried out according to project targets.

REFERENCES

[1] M.S.S. Larsen, & A.H. Lassen. *Design parameters for smart manufacturing innovation processes.* Denmark: Elsevier B.V, 2020, pp. 365-370.

[2] V. Singh, A. Kumar and T. Singh, "Impact of TQM on organisational performance: The case of Indian manufacturing and service industry," *Operations Research Perspectives 5,* pp. 199-217, 2018.

[3] S. Hannah, et al. "Identifying categories of service innovation: A review and synthesis of the literature". *Journal of Business Research,* vol. 69*,* pp. 2401-2408, 2016.

[4] K.W. Lewandowska & M.K. Olejnik. *Logistics 4.0 Maturity in Service Industry: Empirical Research Results.* Ireland: Elsevier B.V, 2019, pp. 1058-1065.

[5] C. Oraedu. "How relationship value and quality motivate positive word-of-mouth behaviour". *Emerald Publishing Limited,* pp. 1-24, 2020.

[6] P. Chan-Sik, et al. "BIM-based idea bank for managing value engineering ideas". *International Journal of Project Management,* pp. 699-713, 2017.

[7] P.H.P. Setti, O.C. Junior, & C.C.A. Estorilio. "Integrated product development method based on Value Engineering and design for assembly concepts". *Journal of Industrial Information Integration,* 2021.

[8] M.C. Peñate-Valentín, M.d.C. Sánchez-Carreira, & Á. Pereira. "The promotion of innovative service business models through public procurement: An analysis of Energy Service Companies in Spain". *Sustainable Production and Consumption,* pp. 1857-1868, 2021.

[9] X. Vence and Á. Pereira, "Eco-innovation and Circular Business Models as drivers for a circular economy," *Contaduría y Administración 64 (1),* pp. 1-19, 2019.

[10] F.H. Taques, M.G. Lopez, L.F. Basso, & N. Areal. "Indicators used to measure service innovation and manufacturing". *Journal of Innovation & Knowledge,* vol. 6, pp. 11-26, 2021.

[11] M. Lewandowski. "Designing the business models for circular economy-towards the conceptual framework". *Sustainability (Switzerland),* pp. 1-28, 2016.

[12] S. Fernando, K. Panuwatwanich, & D. Thorpe. "Introducing an innovation promotion model for construction projects". *Emerald Publishing Limited,* pp. 1-19, 2020.

[13] M. Cinelli, M. Kadzinski, M. Gonzalez, & R. Slowinski. "How to support the application of multiple criteria decision analysis?". *Omega,* vol. 96*,* 2020.

[14] E. Taghavi, A. Fallahpour, K.Y. Wong, & S.A. Hoseini. "Identifying and prioritizing the effective factors in the implementation of green supply chain management in the construction industry". *Sustainable Operations and Computers,* pp. 97-106, 2021.

[15] M. Marzouk, & M. Sabbah. "AHP-TOPSIS social sustainability approach for selecting supplier in construction supply chain". *Cleaner Environmental Systems,* vol. 2, 2021.

[16] A. Haruna, N. Shafiq, & O. Montasir. "Building information modelling application for developing sustainable building". *Ain Shams Engineering Journal,* pp. 293-302, 2021.

[17] J. Aoun, et al. "A hybrid Delphi-AHP multi-criteria analysis of Moving Block and Virtual Coupling railway signalling". *Transportation Research Part C,* vol. 129*,* 2021.

[18] S. Farshidi, S. Jansen, & M. Deldar. "A decision model for programming language ecosystem selection: Seven industry case studies". *Information and Software Technology,* 2021.

[19] S. Markovic, et al. "Business-to-business open innovation: COVID-19 lessons for small and medium-sized enterprises from emerging markets". *Technological Forecasting & Social Change,* vol. 170, 2021.

[20] B. Schmid, E. Raju and P. K. M. Jensen, "COVID-19 and business continuity – learning from the private sector and humanitarian actors in Kenya," *Progress in Disaster Science 11,* p. 100181, 2021.

[21] O. Tønnessen, A. Dhir, & B.T. Flåten. "Digital knowledge sharing and creative performance: Work from home during the COVID-19 pandemic". *Technological Forecasting & Social Change,* vol. 170*,* 2021.

[22] M. Zhong, et al. "Emerging Organic Contaminants in Chinese Surface Water: Identification of Priority Pollutants". *Engineering*, 2021.

[23] M. Haddad, & D. Sanders. "Selection of discrete multiple criteria decision making methods in the presence of risk and uncertainty". *Operations Research Perspectives,* vol. 5*,* pp. 357-370, 2018.

[24] L. Miles, Techniques of Value Analysis and Engineering, New York: McGraw – Hill Book Company, 1972.

[25] F. Abastante, et al. "A new parsimonious AHP methodology: assigning priorities to many objects by comparing pairwise few reference objects". *Expert Systems with Applications,* vol. 127*,* pp. 109-120, 2019.

[26] N. Iheanachor, Y. David-West, & I. O. Umukoro. "Business model innovation at the bottom of the pyramid – A case of mobile money agents". *Journal of Business Research,* vol. 127*,* pp. 96-107, 2021.

Tiya Katrilia (Corresponding Author)
Universitas Atma Jaya Yogyakarta
Department of Industrial Engineering,
Yogyakarta 55281, Indonesia
e-mail: 205603330@students.uajy.ac.id

P.W. Anggoro
Universitas Atma Jaya Yogyakarta
Department of Industrial Engineering
Yogyakarta 55281, Indonesia
e-mail: p.wisnuanggoro@gmail.com

P.K. Dewa SP
Universitas Atma Jaya Yogyakarta
Department of Industrial Engineering
Yogyakarta 55281, Indonesia
e-mail: parama.dewa@uajy.ac.id