Journal of Information Technology Management

Print ISSN: 2008-5893

Online ISSN: 2423-5059

The Evaluation of an Improved Model of the Agile Kanban Using Focus Group

Hamzah Alaidaros

*Corresponding author, Assistant Professor, Faculty of Computer Science and Engineering, Al-Ahgaff University, Mukalla, Hadramaout, Yemen. E-mail: m7amza7@yahoo.com

Mazni Omar

Associate Professor, Institute for Advanced and Smart Digital Opportunities (IASDO), School of Computing, UUM College of Arts and Sciences, University Utara Malaysia, 06010 UUM Sintok, Kedah, Malaysia. E-mail: mazni@uum.edu.my

Rohaida Romli

Associate Professor, Human-Centred Computing Research Lab, School of Computing, UUM College of Arts and Sciences, University Utara Malaysia 06010 UUM Sintok, Kedah, Malaysia. E-mail: aida@uum.edu.my

Abdullah Al-Sakkaf

Ph.D. Candidate, Institute for Advanced and Smart Digital Opportunities (IASDO), School of Computing, UUM College of Arts and Sciences, University Utara Malaysia, 06010 UUM Sintok, Kedah, Malaysia. E-mail: abbdullah1@hotmail.com

Abstract

The improved model of the Agile Kanban (i-KAM) is developed to enhance the software project monitoring task when employing Agile project management (APM) approach. The i-KAM have been initially verified by 11 knowledge and domain experts. In consequence, it has been reconstructed and enhanced based on the remarks and recommendations provided by the experts. This paper aims to present the final evaluation results of i-KAM achieved from seven software practitioners participated in a focus group. The focus group method was selected because it is an empirical approach used in the evaluation studies conducted in the software engineering (SE) domain. Therefore, this method was employed to obtain the practitioners' feedback on the proposed model. Results confirm the effectiveness of i-KAM, in which it can assist the project managers and team members in monitoring their projects' progress effectively. In addition, it is indicated that i-KAM is an applicable model with easy and practical implementation. This study contributes to improve the task of monitoring software development projects within the APM environment. Accordingly, this would systematically facilitate the top managements' work, and assist in making meaningful decisions regarding to the management of projects' workflow. Practically, case studies will be carried out in different software development organizations (SDOs) to implement i-KAM in actual projects within real environments.

Keywords: Agile Kanban; Software Development; Software Project; Monitoring Task; Evaluation; Focus Group.

DOI: https://orcid.org/10.22059/jitm.2022.84882 Manuscript Type: Research Paper University of Tehran, Faculty of Management

Received: January 12, 2020 Accepted: March 25, 2020

Introduction

Agile project management (APM) is an innovative modern approach for managing software development projects that has currently caught interest for small and co-located projects (Lill, Wald, & Gleich, 2020). APM enables the organization to adjust their plans in line with changes in the project environment, and delivers a number of novelties and benefits for the projects' team and client as well (Masood & Farooqi, 2017). In contrast to the traditional project management, APM methods are characterized by short cycles of iterative, incremental delivery of product features, and continuous integration of code changes (Lill et al., 2020). Among these methods, the Agile Kanban which has gained momentum mostly in managing software projects (Alaidaros, 2020b; Fitriawati & Lestari, 2019). During the development process, the Agile Kanban uses the Kanban board to visualize the project workflow by limiting the work in progress (WIP) in order to assist in monitoring the progress and focusing on only one task at a specific time (Ahmad, Dennehy, Conboy, & Oivo, 2018; Alaidaros & Omar, 2017).

The advantages of adopting the Agile Kanban include better visibility and understanding of the whole development process as well as controlling of the workflows and WIP limits. In addition, it can improve the communication and work transparency, customer satisfaction, and team coordination among different stakeholders (Alaidaros, 2021b; Mirza & Datta, 2019). Despite getting an increased popularity in the software organizations, several studies reported that the Agile Kanban still has some challenges face the software practitioners when implementing this method. The main challenge of Agile Kanban concerns with the lack of effective progress monitoring task, which negatively impacts the delivery of software projects on time (Alaidaros, 2020b). To addresses the problem, a study was conducted by Alaidaros, Omar, and Romli (2018) developed an improved model of the Agile Kanban (i-KAM) focuses on enhancing the software project monitoring task. This model has been initially verified through experts' review study and an updated version of i-KAM was redesigned based on the experts' remarks (Alaidaros, 2020a). However, the authors claimed that i-KAM needs to be evaluated by software practitioners, in which they can provide insights from the real life environment point of view, as the proposed model is intended to be used by them (Mohamed, Baharom, Deraman, & Yusof, 2016).

Typically, any proposed model is evaluated through two main processes; verification and validation (Alaidaros, Omar, & Romli, 2019a). According to the IEEE Standard Glossary of Software Engineering Terminology (1990), verification is defined as "the process of evaluating a model or component to determine whether the products of a given development phase satisfy the conditions imposed at the start of that phase". Nonetheless, validation is defined as "the process of evaluating a system or component during or at the end of the development process to determine whether it satisfies specified requirements" (IEEE Standard Glossary of Software Engineering Terminology, 1990). That is, validation focuses on determining whether the proposed model can be practically implemented in the real environment or not (Alaidaros et al., 2019a). Thus, this study aims to discuss the evaluation results of the i-KAM achieved through conducting a focus group with software practitioners. The focus group particularly carried out:

1. To verify the effectiveness of the components and criteria, which have been included in i-KAM.
2. To validate the applicability of i-KAM in real environment.

The organization of this paper starts with an overview of the i-KAM model, and continues with explaining the procedures for conducting the focus group. The evaluation results are then presented, followed by illustrating the study findings and discussions. Finally, the study is concluded and remarks for future work are highlighted.

Literature Review

The i-KAM is a model, which is developed to improve the progress monitoring task of the software development projects. It is aimed overcome the significant problem of the Agile Kanban, which has negative impacts on the success of software projects because the delays in project scheduling lead to late delivery (Alaidaros, 2020b). The problem is represented in three main issues, which are: (1) this method has inadequate technique for effective progress tracking, (2) has difficulty to determine the optimum WIP limits, and (3) has insufficient information to visualize the project progress (Omar, Alaidaros, & Romli, 2020).

The i-KAM was developed based on the theoretical model proposed in (Alaidaros, 2020b), and it consists of three main components. The first component is for the extension of the progress-tracking mechanism using the earned value analysis (EVA) method. The second component is for the generation of WIP limits using a formula that can dynamically generate the optimum limits of all stages in the Kanban board according to project's needs. The third component is for the visualization of useful insights for the progress workflow, using additional beneficial information. Besides these components, the criteria, which influence the progress-monitoring task, were also involved. Then, i-KAM has been initially verified by 11 experts from related domain to ensure that i-KAM components and associated criteria were appropriately constructed (Alaidaros, 2020a). The results revealed that i-KAM could improve the software project monitoring task of the Agile Kanban in terms of extending its tracking mechanism, controlling the WIP limits, and providing useful insights on the project status. Thereafter, i-KAM has been redesigned based on the constructive suggestions and recommendations provided by the experts, and an updated version of i-KAM was released which is depicted in Figure 1.

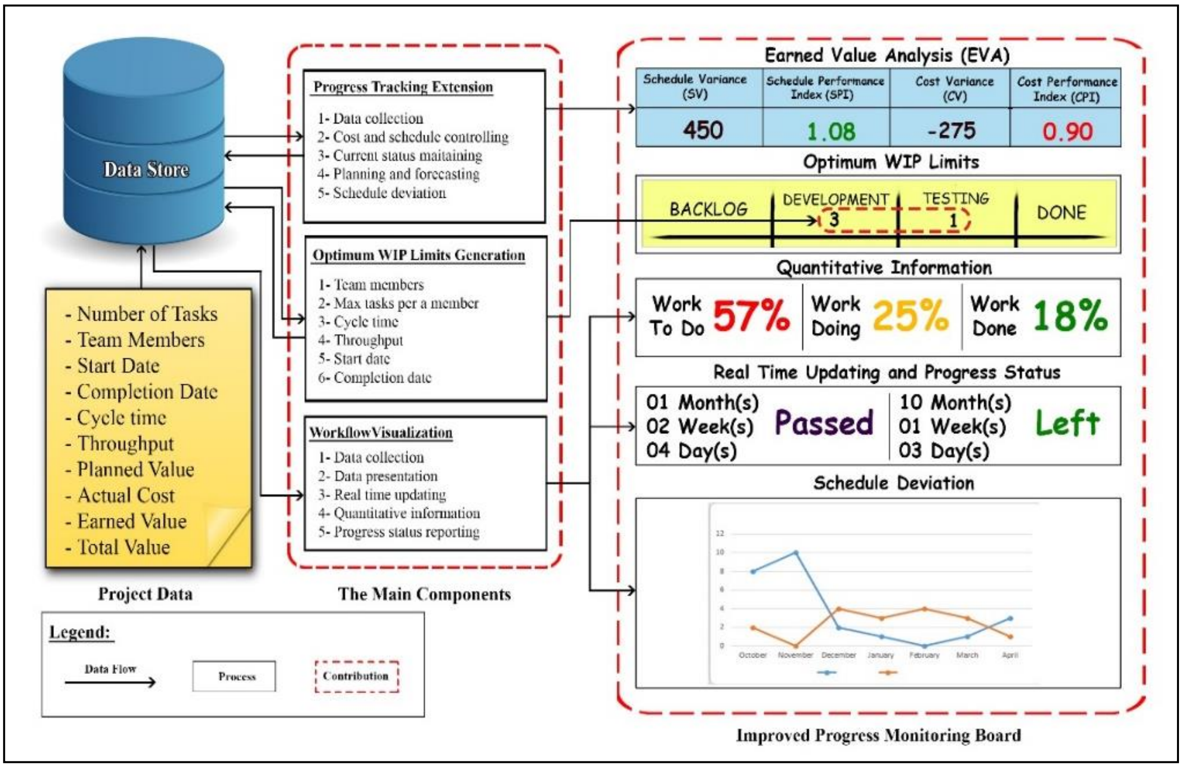

Figure 1. The i-KAM model (Alaidaros, 2020a)

Although the previous study concluded that i-KAM is a well-accepted model, however, the authors claimed that i-KAM needs to be evaluated by software practitioners. This is because software practitioners can provide valuable insights from the real life environment point of view as the proposed model is intended to be used by them. Hence, Alaidaros, Omar, Romli, and Hussein (2019b) developed a progress monitoring prototype tool (PM-PT) based on i-KAM to prove its concepts. PM-PT consists of several web pages, and each page has different functions represent all tasks and processes of i-KAM. Figure 2 shows two screenshots, as examples, for the PM-PT, whereby the first one depicts the main page that appears after successful login, and the second displays the improved progress monitoring board.

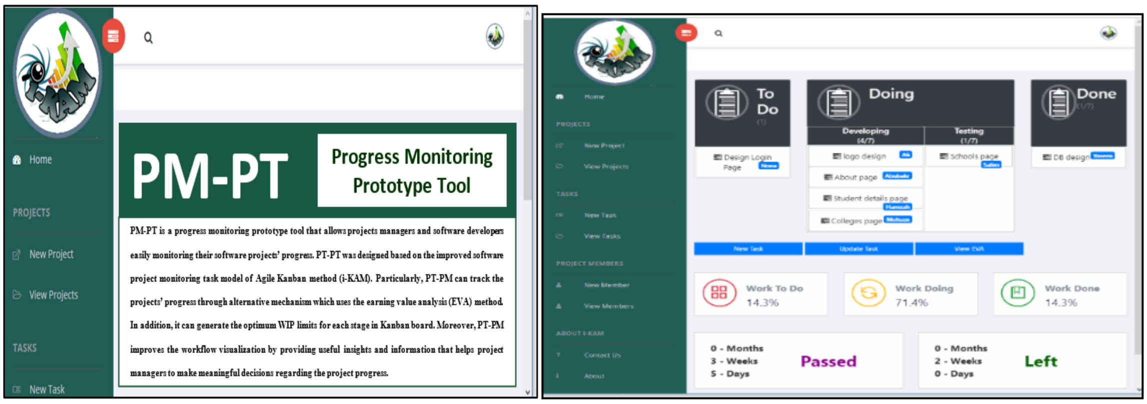

Figure 2. Screenshots for the PM-PT

PM-PT has been evaluated by interviewing experts in Malaysia, and the results indicated that the PM-PT has gained their satisfaction, as it is a useful for software project monitoring task. Nevertheless, the interviewees suggested testing the tool by software practitioners. Therefore, besides verifying the i-KAM effectiveness, the PM-PT has been tested in this study by the participants in order to validate the applicability of i-KAM.

Methodology

The i-KAM model has been mainly evaluated through conducting a focus group, which was attended by software practitioners from different Malaysian SDOs. Through the focus group, the software practitioners verified the effectiveness of i-KAM and validated its applicability in the real environment via using PM-PT. The focus group method was chosen because it is an empirical approach used in the SE domain pertaining to the evaluation studies to obtain the experts' feedback on the designed models or prototypes (Alaidaros, 2021a). In this study, the focus group was carried out through conducting five main procedures; (1) focus group planning, (2) participants identification, (3) focus group execution, (4) data collection, and (5) data analysis. All procedures are further illustrated in the following subsections.

Focus Group Planning

In order to evaluate the proposed model through a focus group, a thorough planning is needed. The first step in planning the focus group was aimed to book a suitable meeting place based on the recommendations provided by Mohamed et al. (2016). Hence, the identified place for conducting the focus group was held at one of the co-working spaces in Kuala Lumpur that equipped with meeting room facilities such as projector, projector screen, tables and chairs, flip chart with paper and markers, as well as complimentary internet. The place provides pleasant and comfort environment for the participants. The focus group was then scheduled on the weekend (Saturday) afternoon, which was convenient for all the participants.

Participants Identification

To identify the participants of the focus group, the purposive sampling technique was used as it is usually used to select participants whom having specific characteristics of interest (Jain & Prasad, 2018). The participants were approached through telephone, e-mail and social networking groups such as the Agile Malaysia group in Facebook and their workplaces' WhatsApp groups. Importantly, the participant should: (1) be an Agile software practitioner, (2) have experience in software development for more than 3 years, and (3) work in Kuala Lumpur or nearby area. These characteristics were recommended and employed by Mohamed et al. (2016).

Accordingly, an invitation letter was created for participating in the focus group. Besides, an invitation brochure was also designed to outline the main objective and detailed activities of the focus group, whilst an RSVP form was used to confirm the attendance of the software practitioners. The RSVP is a procedure of getting a response from the invited person or people. The term RSVP is initially derived from the French phrase (Répondez S'il Vous Plait) meaning "please respond" to require confirmation of an invitation. An URL of the RSVP was added at the end of the brochure in order to count and confirm the practitioners' attendance. As a result, ten software practitioners initially agreed and their attendance was confirmed; however, three of them apologized for not being able to attend the session since one had to work extra shift while the remaining two had emergency matters. Therefore, only seven software practitioners had attended the focus group, whereby this number of attendees is still considered and sufficient for conducting the focus group and yielding reliable results (Mohamed et al., 2016; Nyumba, Wilson, Derrick, & Mukherjee, 2018). The demographic data for the focus group participants are presented in the results section.

Focus Group Execution

The focus group was conducted on the scheduled day and time. The participants arrived to the meeting room, whereby the seating was set up in a U-shaped discussion table for easier interactions between the focus group mediator and participants. Once ready, all participants were welcomed with a speech from the mediator. The mediator introduced the research team and started presenting the agenda of the focus group session. Most importantly, the study objective was highlighted and the process of constructing i-KAM was also explained to the participants. In addition, the results of the initial verification and revised i-KAM obtained from the expert review study were also presented.

Following that, the PM-PT was demonstrated to the participants to be later used and tested out. As the prototype is a web-based tool, the participants were provided by the authorization in order to access and use the PM-PT through their mobile phones. Finally, the evaluation forms were distributed to the participants in order to evaluate i-KAM. The evaluation form comprises of factors and items, which have been adopted from related works and relevant studies such as (Alaidaros et al., 2019a; Mohamed et al., 2016).

Data Collection

The evaluation form was used to collect data and feedback from the seven software practitioners participated in the focus group. The evaluation had two aims; 1) to verify the effectiveness of i-KAM, and 2) to validate the applicability of i-KAM. Specifically, the model effectiveness has been verified according to five factors, which are (1) understandability, (2) relevance, (3) feasibility, (4) organization, and (5) comprehensiveness. Nonetheless, the model applicability has been validated according to five factors, which are (1) gain satisfaction, (2) interface satisfaction, (3) task support satisfaction, (4) perceived usefulness, and (5) perceived ease of use (Alaidaros et al., 2019a).

For the validation, the participants were asked to rank their response on a four-point Likert scale, where 1 = “Strongly Disagree” (SD), 2 = “Disagree” (D), 3 = “Agree” (A), and 4 = “Strongly Agree” (SA). The four-point Likert scale was used in this study because it is feasible and useful to yield the experts’ opinion as explained in (Abdullah, 2018; Omar et al., 2020). Besides that, the participants were also be asked to provide demographic data to assess their background. They were informed that the information provided would be treated as confidential and would be used for the research purposes only. Indeed, using this time and cost effective method (focus group), the data collection was completed around three hours.

Data Analysis

Two main approaches, quantitative and qualitative, were used to analyze the data collected from the participants in the focus group. Using the mixed analysis approach compensates the shortages of both, the qualitative and quantitative, approaches by each other. Hence, it would enable researchers to achieve the complementarity, completeness, expansion, compensation, and diversity (Venkatesh, Brown, & Bala, 2013). In this study, the verification results were qualitatively analyzed, while the validation results were quantitatively analyzed. Detailed discussion on the analysis approaches is provided in the following subsections.

Qualitative Analysis

Qualitative analysis is an approach that involves analyzing and interpreting texts to discover patterns seeking to describe a specific issue (Krippendorff, 2018). In this study, the textual data provided by the participants were analyzed using the content analysis method to explain the research findings, and provide richer and more in-depth information about the study. According to Patton (1990), “The content analysis is the process of identifying, coding, and categorizing the primary patterns in the data”. Thus, this method was used to analyze and interpret the participants’ feedbacks using two analysis types, which are frequency and cross tabulation.

Quantitative Analysis

Quantitative analysis is a statistical approach comprises of procedures and rules to reduce the significant amounts of data into a more manageable form that will enable people to draw required results (Lampard & Pole, 2015). In this study, the descriptions of the findings were based on the descriptive statistics analysis such as mean (M), standard deviation (S.D.), and frequency as recommended by Creswell (2016). To interpret the level of achievement for the validation results, the researchers looked at the mean scores obtained directly from the four-point Likert scale. Accordingly, an appropriate interval scales were required to represent the achievement levels of the evaluation factors based on its mean results. To do so, Sugiyono (2017) recommended using the following mathematical equation:

$$\text{Size} = (X_n - X_0) / n$$

Where Xn is the highest score on the scale, X0 is the lowest score on the scale, and n is the number of levels used. In the four-point Likert scale, the highest score Xn is equal to 4, the lowest score is X0 equal to1, and the number of levels n is 4. Therefore,

$$\text{Size} = (4 - 1) / 4 = 3/4 = 0.75$$

As a result, the interval size of the consideration level between one through four was calculated as 0.75. Table 1 shows the mean interval presentation and achievement level.

Table 1. Interpretation of the mean scores of items

NO	Mean interval	Achievement level
1	From 1 to 1.75	Not Achieved
2	From 1.76 to 2.50	Limited Achieved
3	From 2.51 to 3.25	Largely Achieved
4	From 3.26 to 4	Fully Achieved

The above defined achievement levels have been used in various studies such as (Alrwaili, 2017; Rost et al., 2017). Consequently, this classification was also used in this study to describe the findings from the validation results.

findings

This section presents the evaluation results of the i-KAM, which have been evaluated by seven software practitioners from different SDOs. It starts by describing the participants' demographic profiles, followed by outlining the verification results of i-KAM, and then demonstrating its validation results.

Participants' Background

Table 2 presents the anonymized overview of the seven software practitioner participated in the focus group.

Table 2. Anonymized overview of the participants

ID	Current Position	Size of Organization	Experience Years on Kanban	Used Tools	Experience Years on	
					Software Development	Software Development
1	Project Manager/ Head of DevOps	> 250	7	Jira, Rational Team Concrete, and Trello	21	7
2	Senior Developer	< 50	2	Jira, Trello, and MS Team Foundation	12	9
3	Senior Developer	50-100	3	Jira and Trello	7	5
4	Senior Developer	< 50	3	MS Project	23	3
5	Assistant Manager	> 250	1	Jira	7	6
6	Senior Developer	50-100	2	Jira and Trello	5.5	2
7	Developer	> 250	2	MS Project	4	3

All the seven participants work in private SDOs, whereby three of them work in large software organizations which have more than 250 people, whilst the other four work in organizations that have less than 100 people. Most of them are working as developers except one as project manager. The project manager is currently the head of the DevOps (development and operations), while the last developer is also an assistant manager. All the participants had experience in software development between four to twenty-three years. Specifically, they had experience in Agile development ranging from two to nine years.

To ensure the validity of the data, the respondents were asked whether they are familiar with the Kanban method. All of them are familiar with the method where they had directly used it or using the existing software project management tools that apply the concept of Kanban. Among these tools that they have used are Jira, Rational Team Concrete, Trello, MS Team Foundation, and MS Project. They have been using these tools for a reasonable number of years of one to seven.

Overall, it is clear that all participants represent various background, which is sufficient to establish the validity of the i-KAM evaluation.

Verification Results

This section presents the verification results of i-KAM according to five factors, which are understandability, relevance, feasibility, organization, and comprehensiveness.

Understandability of the Terminologies used in i-KAM

Table 3 demonstrates the results of the understandability factor and degrees of all terminologies used in i-KAM. It can be seen that majority of the terminologies were easy to understand (83%), while the others require further explanation (14%) with only (3%) of terminologies needing very detailed explanations.

Table 3. Understandability of i-KAM terminologies

NO	Terminology	Frequency (n=7)		
		Easy to understand	Needs some explanation	Needs very detailed explanation
1	Project Data	6	1	0
2	Data Store	5	2	0
3	Optimum WIP Limits Generation	5	1	1
4	Progress Tracking Extension	7	0	0
5	Workflow Visualization	5	2	0
6	Improved Progress Monitoring Board	7	0	0

As shown in Table 3, only one participant rated that the “project data” terminology needs more explanation, while two participants also claimed that the term “data store” is ambiguous to them. Their suggestion was to provide a specific database name instead of just stating the term “data store”. Nonetheless, the suggestion was not take up because this term is used as a general term for all types of databases that could be used within i-KAM. Moreover, some participants indicated that the “optimum WIP limits generation” terminology needs some and further explanation. However, the terminologies used in i-KAM are commonly used in the existing models of APM.

Relevance of the i-KAM Components

Table 4 presents the results of the relevance factor for each component included in i-KAM. Majority of the participants (95%) agreed that the proposed components are relevant, while the others (5%) disagreed. Nevertheless, none of the participants stated that components are definitely not relevant.

Table 4. Relevance of i-KAM components

NO	Component	Frequency (n=7)		
		Is relevant	May not be relevant	Is definitely not relevant
1	Progress Tracking Extension	6	1	0
2	Optimum WIP Limits Generation	7	0	0
3	Workflow Visualization	7	0	0

It is clear that the software practitioners confirmed the relevance of the components proposed in i-KAM. However, only one pointed out that the first component may not be relevant. Unfortunately, the justification for the disagreement was not provided.

Feasibility of Criteria used in i-KAM

Table 5 exhibits the results of the feasibility factor and the degree of each criterion associated with the proposed components in i-KAM.

Table 5. Feasibility of criteria used in i-KAM

	Items	Frequency (n=7)			
		SD	D	A	SA
Progress Tracking Extension	Using EVA method in i-KAM is feasible for extending the progress tracking mechanism	0	2	2	3
	Data collection is a vital criterion for progress tracking in i-KAM	0	0	3	4
	Controlling the cost and schedule is realistic in i-KAM	0	1	4	2
	Maintaining the current status is feasible in i-KAM	0	1	2	4
	Forecasting the schedule is achievable in i-KAM	0	2	4	1
	Tracking the schedule deviation is viable in i-KAM	0	1	4	2
Optimum WIP Limits Generation	The number of team members is feasible to determine the optimum WIP limits	0	0	4	3
	The maximum tasks per member is a vital criterion to set the optimum WIP limits	0	1	5	1
	Cycle time is an essential criterion to compute the optimum WIP	0	0	6	1
	Throughput is a crucial criterion to find the optimum WIP	0	1	2	4
	Starting date is feasible to identify the optimum WIP	0	0	3	4
	Completion date is viable to define the optimum WIP	0	0	2	5
Workflow Visualization	Data is presented to provide useful insights for workflow	0	1	1	5
	The i-KAM provides real time updates	0	0	5	2
	The i-KAM displays quantitative information	0	0	2	5
	The i-KAM visualizes the schedule deviation	0	0	5	2
	The i-KAM reports the progress status	0	0	2	5
	Data is presented to provide useful insights for workflow	0	1	1	5

SD= Strongly Disagree, D= Disagree, A= Agree, SA= Strongly Agree

Almost half of the criteria (47%) were marked as representing by the strongly agreed scale. The other half (45%) were rated as agree, whilst (8%) as disagree. None of the participants selected the strongly disagree scale. The participants affirmed the feasibility of the criteria associated with the components of i-KAM. Only a few criteria were disagreed (but not strongly disagreed). For example, majority of the participants agreed to integrate the EVA and Kanban methods because they realize that this integration can extend the progress tracking that would ultimately improve the monitoring task of the Agile Kanban. Nonetheless, two participants disagreed on that combination as for them it is not practically feasible. In addition, in the progress tracking extension component, two participants indicated their disagreement on the feasibility of four criteria. However, these disagreements were unjustified.

In the optimum WIP limits generation component, two criteria, which are the maximum tasks per member and throughput, received disagreed by two participants, as they believe that these two criteria are not vital to generate the optimum WIP limits. Nevertheless, identifying the maximum tasks per member is one of the basic project data as it is an essential criterion to generate WIP limits. Moreover, the throughput criterion is a key input of the Little's Law, which is used to calculate the WIP limits (Alaidaros et al., 2018). In the workflow visualization component, only one participant disagreed on including the data presentation criterion, as it does not have any impact on improving the workflow visualization. However, this single opinion conflicts with the other thorough agreements indicated by the remaining participants.

Overall, the participants have conveyed positive perspectives towards the feasibility of the criteria associated with each component. More clarification, agreement responses (agree and strongly agree) as well as disagreement responses (disagree and strongly disagree) are combined together in order to facilitate the data analysis. Figure 3 illustrates the results of the feasibility of using these criteria for each i-KAM component separately based on the combined responses.

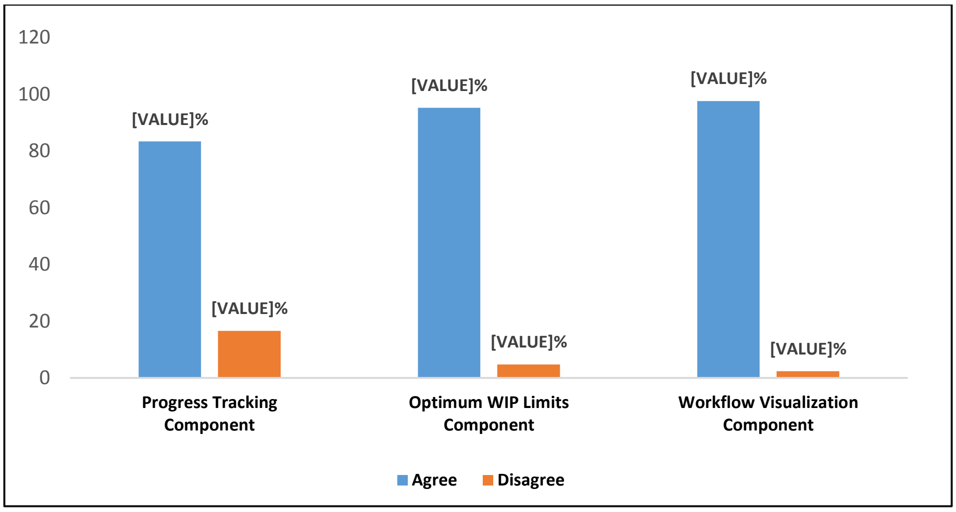

Figure 3. Feasibility of i-KAM criteria for each component

Figure 3 shows that 83% of participants have agreed to use the criteria associated in the progress tracking extension component, while 17% disagreed. In contrast, 95% of the participants agreed with the criteria used in the optimum WIP limits generation component, whilst only 5% disagreed. Furthermore, 98% of the participants agreed to use the criteria associated with workflow visualization, whilst only 3% disagreed.

Organization of the Connections and Flows in i-KAM

Figure 4 depicts the results of the organization factor, whereby majority of the participants (86%) emphasized that the connections and flows between the i-KAM components are well organized.

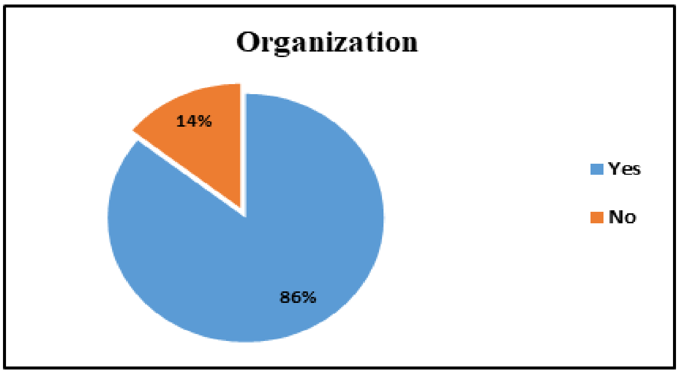

Figure 4. Organization of the connections and flows in i-KAM

As shown in Figure 4, only one participant (14%) indicated that the i-KAM elements are not well-organized. He suggested displaying the relations between the data and each component. Nonetheless, the current presentation of the data store and the components is clearly and logically represented as confirmed by majority (86%) of the participants.

Comprehensiveness of i-KAM

Figure 5 illustrates the results of the comprehensiveness factor, in terms of showing that all required components and criteria are involved in i-KAM. Again, majority of the participants (86%) confirmed that i-KAM represents a comprehensive model.

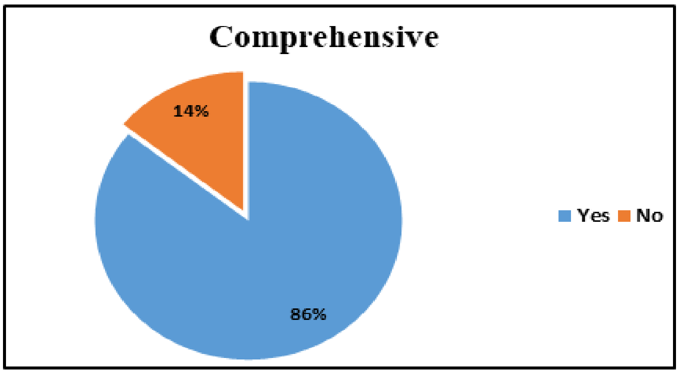

Figure 5. Comprehensiveness of i-KAM

Similar to the results of the organization factor, only one participant (14%) indicated that i-KAM is not a comprehensive model. His recommendation was to focus more on the costing criteria in order to increase i-KAM comprehensiveness. However, i-KAM model intendedly focuses on monitoring the project schedule over cost because the significant challenge that faces the SDOs during developing software projects is the exceeding of the scheduled completion dates. Besides that, majority (86%) of the participants agree on the comprehensiveness of i-KAM.

Validation Results

The validation of i-KAM applicability was performed according to five factors, which are gain satisfaction, interface satisfaction, task support satisfaction, perceived usefulness, and perceived ease of use.

Gain Satisfaction of PM-PT

Among the variables that were measured the gain satisfaction factor are decision support satisfaction, comparing with current methods, clarity, and task appropriateness.

The results for this factor are exhibited in Table 6. The results reveal that majority of the participants (14.29% strongly agree and 71.43% agree) confirm that PM-PT helps the management to take a well-defined decision based on the process of software project monitoring task (M = 3.00, S.D. = 0.577). Nevertheless, the results show that PM-PT is better than the old and current development tools (M = 2.75, S.D. = 0.535), in which the process is clear to the project manager and development team (M = 2.71, S.D. = 0.756). All participants confirm that the components and criteria of PM-PT are appropriate for improving the monitoring task during the development of software projects (M = 3.29, S.D. = 0.488).

Table 6. Results of gain satisfaction factor

	The Question	M	S.D.		Frequency (n=7) SD	D	A	SA
Q1	Is the PM-PT helped the management to take a well-defined decision based on the process of software project monitoring task?	3.00	0.577	N (%)	0 (0)	1 (14.29)	5 (71.43)	1 (14.29)
Q2	Is the PM-PT better than the old/current development tool that you used in terms of the visualizing results?	2.57	0.535	N (%)	0 (0)	3 (42.86)	4 (57.14)	0 (0)
Q3	Is the PM-PT process clear to the project manager and development team, where each phase clearly presents the required inputs, processes, and outputs?	2.71	0.756	N (%)	0 (0)	3 (42.86)	3 (42.86)	1 (14.29)
Q4	Is the PM-PT process clear to the project manager and development team, where each phase clearly presents the required inputs, processes, and outputs?	3.29	0.488	N (%)	0 (0)	0 (0)	5 (71.43)	2 (28.57)

As presented in Table 6, three quarters (75%) of the software practitioners gained satisfaction on PM-PT, whereas the remaining (25%) were not. These disagreeing opinions have risen by three participants. The first participant justified his opinion by stating that PM-PT is a root initiated just for prototyping, but not for real life scenarios, while the second one claimed that PM-PT needs more focus on projects cost. The third participant did not gain satisfaction on PM-PT because he thinks that some functions need improvements in order to generate perfect user experience.

Interface Satisfaction of PM-PT

The interface satisfaction was assessed based on four variables; internally consistent, organization (well organized), appropriate for audience, and presentation.

Table 7 presents the results for the interface satisfaction factor of PM-PT. All participants are satisfied that PM-PT is internally consistent in terms of its interfaces (M = 3.14, S.D. = 0.378). They emphasize that the components of PM-PT are well organized and structured that make the processes easy to perform (M = 3.29, S.D. = 0.488). Most of the participants (42.86% strongly agree and 28.57% agree) found that PM-PT is appropriate for the project managers and development team (M = 3.14, S.D. = 0.900), while all participants believe that the results presented by performing the PM-PT processes are produced in a readable and useful format (M = 3.57, S.D. = 0.535).

Table 7. Results of interface satisfaction factor

	The Question	M	S.D.		Frequency (n=7)			
					SD	D	A	SA
Q1	Is the PM-PT helped the management to take a well-defined decision based on the process of software project monitoring task?	3.14	0.378	N (%)	0 (0)	0 (0)	6 (85.71)	1 (14.29)
Q2	Is the PM-PT internally consistent in terms of interface?	3.29	0.488	N (%)	0 (0)	0 (0)	5 (71.43)	2 (28.57)
Q3	Are the components of PM-PT well organized and structured that makes the processes easy to perform?	3.14	0.900	N (%)	0 (0)	2 (28.57)	2 (28.57)	3 (42.86)
Q4	Is the PM-PT appropriate for the audience? Those audiences are referred to the project managers and development team.	3.57	0.535	N (%)	0 (0)	0 (0)	3 (42.86)	4 (57.14)

It is clear that that majority (93%) of the software practitioners were satisfied on the PM-PT interfaces, whilst the others were not. Only two disagreement responses (7%) indicated that the PM-PT is not appropriate for the audience variable, in terms of predicting the progress status. However, the PM-PT is able to report the progress status quantitatively in real time update. This shows that the PM-PT interfaces are good enough as majority of the participants indicate their satisfaction.

Task Support Satisfaction of PM-PT

Table 8 displays the results for the task support satisfaction factor of PM-PT. The factor was validated based on three variables; ability to produce expected result, completeness, and ease of implementation.

The results reveal that all participants in an agreement in terms of the ability of the PM-PT to produce expected results (M = 3.00, S.D. = 0.577). Nonetheless, majority of the participants (57.14% strongly agree and 28.57% agree) highlight that PM-PT is adequate and sufficient for monitoring the progress during the development process of software projects (M = 2.57, S.D. = 0.535). The results also show that all participants indicate that the process of PM-PT is easy to implement in the real environments (M = 2.71, S.D. = 0.756).

Table 8. Results of task support satisfaction factor

	The Question	M	S.D.		Frequency (n=7) SD	D	A	SA
Q1	Is the PM-PT able to produce its expected results?	3.00	0.577	N (%)	0 (0)	0 (0)	5 (71.43)	2 (28.57)
Q2	Is the PM-PT adequate and sufficient for monitoring the progress task during software development projects	2.57	0.535	N (%)	0 (0)	1 (14.29)	4 (57.14)	2 (28.57)
Q3	Is the process of the PM-PT easy to implement?	2.71	0.756	N (%)	0 (0)	0 (0)	5 (71.43)	2 (28.57)

As shown in Table 8, majority (95%) of the software practitioners are satisfied on the PM-PT tasks support. The one disagreement response (5%) indicates that the PM-PT is not adequate or sufficient for monitoring the progress of software development projects. The participant claimed that the PM-PT could be used in developing simple projects by small teams in educational context.

Perceived Usefulness of PM-PT

Table 9 presents the results for the perceived usefulness factor of PM-PT. The perceived usefulness factor was assessed according to five variables, which are: accomplish more work, work performance, make tasks easier, useful, and increase productivity. The results presented in Table 9 indicate that most of the participants (57.14% strongly agree and 14.29% agree) affirm that PM-PT is useful to their work (M = 3.29, S.D. = 0.951), in which it can increase their productivity (M = 3.14, S.D. = 0.900). Only (57.14%) of the participants agree that using PM-PT enable them to accomplish their tasks more quickly, while the remaining disagree (M = 2.71, S.D. = 0.756). Furthermore, the results indicate that using PM-PT can improve the performance of the participants' work (M = 3.00, S.D. = 0.816) and helps in performing their tasks easier (M = 3.00, S.D. = 0.816).

Table 9. Results of perceived usefulness factor

	The Question	M	S.D.		Frequency (n=7) SD	D	A	SA
Q1	Does using PM-PT enable you to accomplish your tasks more quickly?	2.71	0.756	N (%)	0 (0)	3 (42.86)	3 (42.86)	1 (14.29)
Q2	Does using PM-PT improve the performance of your work?	3.00	0.816	N (%)	0 (0)	2 (28.57)	3 (42.86)	2 (28.57)
Q3	Does using PM-PT make performing your tasks easier?	3.00	0.816	N (%)	0 (0)	2 (28.57)	3 (42.86)	2 (28.57)
Q4	Is PM-PT useful to your work?	3.29	0.951	N (%)	0 (0)	2 (28.57)	1 (14.29)	4 (57.14)
Q5	Does using PM-PT increase your productivity?	3.14	0.900	N (%)	0 (0)	2 (28.57)	2 (28.57)	3 (42.86)

All variables of the perceived usefulness factor have at least two disagreeing responses (31%) with 69% agreement. Based on the demographic profile of the participants who disagreed, it is found that they are actually new in using the Kanban method with at most two years of experience. In addition, the testing of the PM-PT in a focus group session is not enough to obtain its perceived usefulness compared to the real projects implementation within the SDOs.

Perceived Ease of Use of PM-PT

The perceived ease of use was validated based on six variables, which are ease of learning, confusing, flexible, understandable, effort to become skillful, and ease to use. Table 10 shows the results of the perceived ease of use factor of the PM-PT. The results affirm that the PM-PT is sufficiently easy to use (M = 3.57, S.D. = 0.535), wherein the learning of operating PM-PT is easy for the software practitioners (M = 3.43, S.D. = 0.535). Moreover, all participants are in consensus that they can easily make the PM-PT does exactly what they want (M = 3.29, S.D. = 0.488). Majority (42.85% strongly agree and 42.85% agree) also confirm that PM-PT is flexible to interact with (M = 3.29, S.D. = 0.756), and their interaction with PM-PT is clear and understandable as well (M = 3.29, S.D. = 0.756). Finally, all participants believe that it is easy to become skillful in using PM-PT (M = 3.29, S.D. = 0.488).

Table 10. Results of perceived ease of use factor

	The Question				**Frequency (n=7)**			
		M	**S.D.**		**SD**	**D**	**A**	**SA**
Q1	Is learning to operate PM-PT easy for you?	3.43	0.535	N (%)	0 (0)	0 (0)	4 (57.14)	3 (42.86)
Q2	Is it easy to get PM-PT to do what you want to do?	3.29	0.488	N (%)	0 (0)	0 (0)	5 (71.43)	2 (28.57)
Q3	Is PM-PT flexible to interact with?	3.29	0.756	N (%)	0 (0)	1 (14.29)	3 (42.86)	3 (42.86)
Q4	Is your interaction with the PM-PT clear and understandable?	3.29	0.756	N (%)	0 (0)	1 (14.29)	3 (42.86)	3 (42.86)
Q5	Is it easy for you to become skilful in using i-KAM?	3.29	0.488	N (%)	0 (0)	0 (0)	5 (71.43)	2 (28.57)
Q6	Overall, is the PM-PT easy to use?	3.57	0.535	N (%)	0 (0)	0 (0)	3 (42.86)	4 (57.14)

Significantly, majority of the software practitioners (95%) agreed on the ease of use of the PM-PT. However, only two disagree responses (5%) are specified by one participant. He indicated that PM-PT is not flexible to interact with, and the interaction with PM-PT was not clear and understandable. This objection could have happened because the use of PM-PT was not executed in a real project, but only as a tested tool that is designed to prove the concepts incorporated in i-KAM.

Discussion

This section discusses the findings from the focus group, whereby it begins by presenting the findings from the verification results followed by illustrating the findings from the validation results.

Findings from the Verification Results

In order to show whether the results are different or not, this section demonstrates a comparison between the results of the initial verification yielded from the expert reviews (Alaidaros, 2020a) and the results of the final verification achieved from the current study.

As illustrated in Table 11, for the understandability factor, the scale **Yes** means that the terminologies are easy to understand, **Partially** indicates need some explanation, and **No** signifies the requirement of very detailed explanation. The scale **Yes** for measuring the relevance factor indicates that the components are relevant, **Partially** denotes may not be relevant, and **No** means definitely not relevant. The **Agree** and **Disagree** scale was used to measure the feasibility of each component proposed in i-KAM. The organization and comprehensiveness factors were measured using a dichotomous (‘‘**Yes**” or ‘‘**No**”) scale.

Table 11. A comparison between the results of initial and final verification

		Initial Verification			**Final Verification**		
Method Used		Expert review			Focus group		
Number of participants		11			7		
Factor / Scale		**Yes**	**Partially**	**NO**	**Yes**	**Partially**	**NO**
Understandability		61%	29%	10%	83%	14%	4%
Relevance		88%	12%	0%	95%	5%	0%
Factor	Scale / Component	**Agree**	**Disagree**		**Agree**	**Disagree**	
Feasibility	PT	97%	3%		83%	17%	
	LWIP	89%	11%		95%	5%	
	WV	95%	5%		98%	2%	
Factor / Scale		**Yes**	**No**		**Yes**	**No**	
Organization		64%	36%		86%	14%	
Comprehensiveness		82%	18%		86%	14%	

PT=Progress Tracking, LWIP=limiting WIP, and WV=Workflow Visualization

From the Table 11, the results of the final verification are clearly better than the results of the initial verification. This is to confirm that the proposed model has been enhanced based on the value suggestions provided by the knowledge and domain experts. Notably, there are an obvious increasing in the results of the measured factors. For instance, the percentage of the terminologies understandability used in i-KAM has sharply increased from 61% to 83%, and the percentage of the components’ relevance has also increased from 88% to 95%. Regarding the feasibility of the associated criteria of the i-KAM components, there is an increased from 89% to 95% in the LWIP component and from 95% to 98% in the WV component.

Nevertheless, the percentage of the PT component decreased from 97% to 83% because two of the participants in the current study disagreed with the integration of the EVA with Kanban methods. In contrast, the other software practitioners and experts in the initial verification are totally agreed with the integration.

For the organization factor, there is a sharp increasing from 64% to 86%, which confirms that the connections and flows between the i-KAM components are better and well organized than the previous one. However, due to the response by one respondent indicating that i-KAM is not a comprehensive model, the comprehensiveness percentage has slightly increased from 82% to 86%. To achieve the comprehensiveness, the participant claimed including additional aspects to i-KAM, such as organization structure, human resource (HR) factor, learning and development, workplace culture, leadership, and return on investment (ROI). Indeed, the suggested aspects are related to the top administration of the SDOs instead to the projects' environment in which the proposed model would be implemented. Thus, the components and criteria that have been included on i-KAM are considered adequate, as confirmed by the majority of the participants (86%). To sum up, the findings from the verification results confirm that i-KAM has been enhanced after applying the experts' suggestions.

Findings from the Validation Results

Based on the classification described in Table 1, the mean score of the gain satisfaction of the PM-PT is 2.89 falls under the "Largely Achieved" level, whilst the interface satisfaction is 3.29 falls under "Fully Achieved". The overall means of the task support satisfaction and perceived usefulness factors are 3.24 and 3.03 respectively, also fall under "Largely Achieved". Finally, the perceived ease of use factor with the highest overall mean which is 3.36 classified under the "Fully Achieved" level. The levels of achievements of the PM-PT validation results are presented in Table 12.

Table 12. Level of achievements

NO	Factor	Overall Mean	Level of Achievement
1	Gain satisfaction	2.89	Largely Achieved
2	Interface satisfaction	3.29	Fully Achieved
3	Task support satisfaction	3.24	Largely Achieved
4	Perceived usefulness	3.03	Largely Achieved
5	Perceived ease of use	3.36	Fully Achieved

Table 12 demonstrates that two validation factors; interface satisfaction and perceived ease of use, have gained the "Fully Achieved" level. Nonetheless, the remaining three factors; gain satisfaction, task support satisfaction, and perceived usefulness attained the "Largely Achieved" level. Definitely, it is hard to obtain full levels of satisfaction and usefulness from validating a new prototype because the participants typically examine the prototype (in this study is PM-PT) only for few hours as opposed to their familiarity in using similar tools in their daily work (Mugisha, Babic, Wakholi, & Tylleskär, 2019; Qian, Shen, Mo, & Chen, 2016). Hence, PM-PT might not gain their satisfaction entirely or perceive their usefulness as well since this is their first usage. Generally, the findings from the validation results affirm the applicability of i -KAM in the real development environments, as the factors used to measure PM-PT has gained high levels of achievement.

Conclusion

This paper presents the evaluation results of i-KAM through conducting a focus group, which has been attended by seven software practitioners from different SDOs in Malaysia. The objectives of the focus group are twofold, (1) verifying the i-KAM effectiveness, and (2) validating its applicability in actual settings. In addition, this paper discusses the study findings from both verification and validation results. Overall, results reveal that i-KAM is an effective model could be utilized in the APM settings. It can benefit the project managers and team members to effectively monitoring their progress. Besides that, the results confirm the applicability of i-KAM in the real projects with-in tangible SDOs.

However, some of the participants have provided few comments related to i-KAM applicability. Usually, this objection could be happened because the PM-PT was not executed in a real project, instead it just used by the participants for around an hour. As a consequence, the tested prototype was not gain their satisfaction entirely or perceive their usefulness. Therefore, future works will be directed to practically validate i-KAM through conducting case studies in different SDOs with the use of PM-PT in actual projects. The case studies are commonly used by the SE researchers to validate the newly proposed tools, methods, or models within the real-life, contemporary context, or settings. Additionally, as the current evaluation of i-KAM was carried out based on the characteristics of a limited number of software practitioners who work in the Malaysian SDOs. Thus, in the future, further studies on evaluating i-KAM will be conducted more extensively by including SDOs from other countries in order to assess the comprehensiveness of the research results.

Acknowledgements

The authors would like to sincerely thank the participants of the focus group and special thanks go to the Universiti Utara Malaysia, Malaysia and Al-Ahgaff University, Yemen for supporting this research.

Conflict of interest

The authors declare no potential conflict of interest regarding the publication of this work. In addition, the ethical issues including plagiarism, informed consent, misconduct, data fabrication and, or falsification, double publication and, or submission, and redundancy have been completely witnessed by the authors.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

References

Abdullah, S. N., Fauzi, W.F., Sudin, M.N., Zahari, N.N., Rahman, Z.B., Ismail, A., Suradi, N.R., Rambely, A.S., Kusenin, N.B., Shaari, A.H., Samian, S., Arsad, N., Saad, M.H., Mohd, M., Ayob, M., Jyn, K.V., Ariffin, K.A., Nazri, M.Z., & Yaakub, M.R. (2018). Assessment of Self-Identity Among Teens Towards Self-Crime Prevention Program. Paper presented at the 2018 Cyber Resilience Conference (CRC), Putrajaya, Malaysia, Malaysia.

Ahmad, M. O., Dennehy, D., Conboy, K., & Oivo, M. (2018). Kanban in software engineering: A systematic mapping study. Journal of Systems and Software, 137, 96-113. doi: 10.1016/j.jss.2017.11.045

Alaidaros, H., & Omar, M. (2017). Software project management approaches for monitoring work-in-progress: A review. Journal of Engineering and Applied Sciences, 12(15), 3851-3857.

Alaidaros, H., Omar, M., & Romli, R. (2018). Towards an improved software project monitoring task model of Agile Kanban method. International Journal of Supply Chain Management (IJSCM), 7(3), 118-125.

Alaidaros, H., Omar, M., & Romli, R. (2019a). The key factors of evaluating Agile approaches: A systematic literature review. International Journal of Supply Chain Management (IJSCM), 8(2), 954-964.

Alaidaros, H., Omar, M., Romli, R., & Hussein, A. (2019b). The development and evaluation of a progress monitoring prototype tool for software project management. Paper presented at the 2019 First International Conference of Intelligent Computing and Engineering (ICOICE), Hadhramout, Yemen.

Alaidaros, H., Omar, M., & Romli, R. (2020a). An improved model of Agile Kanban method: Verification process through experts review. International Journal of Agile Systems and Management (IJASM), 13(4), 390-416. doi: 10.1504/IJASM.2020.10034550

Alaidaros, H., Omar, M., & Romli, R. (2020b). Improving the progress monitoring task of Agile Kanban method: An enhanced theoretical framework and its implication. International Journal of Scientific and Technology Research (IJSTR), 9(1), 611-615.

Alaidaros, H., Omar, M., Romli, R. (2021a). A Review on the Methods of Evaluating the New Approaches Proposed in the Agile Context. International Journal of Computer and Information Technology (IJCIT), 10(1), 5-10. doi: 10.14807/ijmp.v12i8.1482

Alaidaros, H., Omar, M., Romli, R. (2021b). The State of the Art of Agile Kanban Method: Challenges and Opportunities. Independent Journal of Management & Production (IJM&P), 12(8), 2535-2550. doi: 10.14807/ijmp.v12i8.1482

Alrwaili, S. R. (2017). Challenges facing productive university approach from faculty perspective at Alpha University in Saudi Arabia. International Journal of Educational Sciences, 17(1-3), 20-28. doi: https://doi.org/10.1080/09751122.2017.1305762

Creswell, J. W. (2016). Research design : Qualitative, quantitative, and mixed methods approaches (4th ed.). Thousand Oaks, California: SAGE Publications, Inc.

Fitriawati, M., & Lestari, R. H. (2019). Design of the information system for kindergarten learning evaluation used Kanban methodology. Paper presented at the IOP Conference Series Materials Science and Engineering

IEEE Standard Glossary of Software Engineering Terminology. (1990). Institute of Electrical and Electronics Engineers (Vol. Std. 610.12-1990). New York: ANSI/IEEE.

Jain, C., & Prasad, N. (2018). Quality measurement: Tools and techniques Quality of Secondary Education in India (pp. 51-64): Springer.

Krippendorff, K. (2018). Content analysis: An introduction to its methodology. United States: SAGE Publications, Inc.

Lampard, R., & Pole, C. (2015). Practical social investigation: Qualitative and quantitative methods in social research. Abingdon, United Kingdom: Routledge.

Lill, P. A., Wald, A., & Gleich, R. (2020). Agility and the role of project - Internal control systems for innovation project performance. International Journal of Innovation Management (ijim), 24(07), 1-29.

Masood, Z., & Farooqi, S. (2017). Benefits and key challenges of agile project management under recent research opportunities. International Research Journal of Management Sciences, 5(1), 20-28.

Mirza, M. S., & Datta, S. (2019). Strengths and weakness of Traditional and Agile processe: A systematic review. JSW, 14(5), 209-219. doi: 10.17706/jsw.14.5.209-219

Mohamed, S. F. P., Baharom, F., Deraman, A., & Yusof, Y. (2016). The validation of extended software process assessment and certification model using focus group. Paper presented at the Proceeding of the First International Conference on ICT for Transformation (IC-ICT4T 2016), Kota Kinabalu, Sabah, Malaysia.

Mugisha, A., Babic, A., Wakholi, P., & Tylleskär, T. (2019). High-Fidelity Prototyping for Mobile Electronic Data Collection Forms Through Design and User Evaluation. JMIR Human Factors (JHF), 6(1), 1-11. doi: 10.2196/11852

Nyumba, T., Wilson, K., Derrick, C. J., & Mukherjee, N. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. Methods in Ecology and evolution, 9(1), 20-32. doi: https://doi.org/10.1111/2041-210X.12860

Omar, M., Alaidaros, H., & Romli, R. (2020). An improved software project monitoring task model of Agile Kanban method: A practitioners' perspective. International Journal on Advanced Science, Engineering and Information Technology, 10(2), 120-127.

Patton, M. Q. (1990). Qualitative evaluation and research methods. United States: SAGE Publications, Inc.

Qian, Z., Shen, B., Mo, W., & Chen, Y. (2016). SatiIndicator: Leveraging user reviews to evaluate user satisfaction of SourceForge projects. Paper presented at the 2016 IEEE 40th Annual Computer Software and Applications Conference (COMPSAC), Atlanta, GA, USA.

Rost, T., Stein, J., Löbner, M., Kersting, A., Luck-Sikorski, C., & Riedel-Heller, S. G. (2017). User acceptance of computerized cognitive behavioral therapy for depression: systematic review. Journal of medical Internet research, 19(9), 1-13. doi: 10.2196/jmir.7662

Sugiyono. (2017). Qualitative and quantitative research methods. Bandung, Indonesia: Alfabeta.

Venkatesh, V., Brown, S. A., & Bala, H. (2013). Bridging the qualitative-quantitative divide: Guidelines for conducting mixed methods research in information systems. MIS quarterly, 37(1), 21-54. doi: 10.25300/MISQ/2013/37.1.02

Bibliographic information of this paper for citing:

Alaidaros, Hamzah; Omar, Mazni; Romli, Rohaida & Al-Sakkaf, Abdullah (2022). The Evaluation of an Improved Model of the Agile Kanban Using Focus Group. *Journal of Information Technology Management*, Special Issue, 1-22.