Information Technology Personnels' Understanding, Knowledge, and Attitude towards Modern Application Development

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Abstract
The objective of this research is to investigate Information Technology Personnels' understanding/confidence, knowledge and attitude of Modern Application Development. A mixed method approach is chosen for their strength in acquiring objective and subjective findings. For the questionnaire, a descriptive interpretive analysis is used while for the qualitative data, a thematic analysis is carried out. The findings show that almost all the participants cited that they could see the improvement in their understanding, knowledge and attitude to the training topic. It is concluded that ,modern application development training attributed positively to the skills development of the participants. Thus, the recommendation is that further training following Bloom's Taxonomy be carried out for the participants to strengthen their core skill which is then applied at the workplace.
Keywords: Information Technology, Modern Application Development, Understanding, Knowledge, Attitude

Introduction
The onset of global pandemic has created upheaval in all walks of lives. Technology use is no longer a choice but a must (Yoon, 2020). People are suddenly required to be apt in the use of technology in the blink of an eye. This too is happening in businesses. The requirement for businesses to be more technology based, more agile and flexible is ever stronger. One of the solutions to address the technology needs in businesses is through modern application. Companies are expected to strategically develop applications which suit their specific needs,

unlike traditional businesses which could use existing applications. This proposal is to look into this issue in more detail.

The 21st century economy is heavily dependent upon digital transformation. Organisations' and businesses' strategic approach to address this digital transformation could include modern application development (MAD). This foundational level is imperative before other more elaborate and extensive applications are created. Technically skilled developers are then needed for MAD. Despite the importance of digital skills, "the technology skills gap is growing worldwide" (Computer weekly, 2022). On top of that, Marson (2019) states that "Hiring new talent is costly and not just in terms of money spent on recruiting a new employee. Companies lose valuable capital when employees who have deep knowledge of the business quit. Also, it's tough to find external candidates who have the latest skill sets." To fight this technology skills gap, there is a need to (1) upskill where employees are equipped with new skills so they could work more efficiently and effectively in their existing job scope (2) reskill where employees are equipped with new skills so they could work more efficiently and effectively in their new job scope. Reskilling and upskilling can take many forms; such as through added responsibilities in a current job role, job rotation, being coached by peers or through a company's learning and development programme. Tech Target report (2019) stated that CEO and workers, internationally especially in the United States of America are onboard of these upskill and re-skill.

In the Malaysian context, upskilling and reskilling are seen as pertinent as reported in the News Straits Times (2022) where "workers have to pivot their careers and align with industry needs". This is supported by the Malaysian government with an "allocation of RM1 billion in the 2022 Budget for upskilling and reskilling programmes." This commitment by the Malaysian government shows the seriousness of the matter in current time as well as in the future. The research objectives are thus:

- To find out Information Technology Personnels' understanding/confidence of Modern Application Development.
- To explore Information Technology Personnels' knowledge of Modern Application Development.
- To investigate Information Technology Personnels' attitude towards Modern Application Development.

The Literature
The literature review is to look into related topics that are included in this research, namely the definition of modern application as well as modern application development.

Modern Application Development
In looking at Modern Application, Crawford (2018) put forward the importance of looking at heritage applications which include web applications, applications servers, waterfall software delivery among others. Knowing heritage applications is vital in understanding and appreciating modern applications for what is modern to some is heritage to others. Scanlan stated that "a Modern App is a resilient, multi-cloud supportive software service comprised of orchestrated releases of virtual machines, containers, and serverless functions" 2019. The term is concocted from two words. Modern, which could be related to the recency of time and application which is highly influenced by evolution in technologies,

tools, programming languages, and platforms. Yet another definition of Modern Application is shared by Stetson (2018) who states that "A modern application is one that supports multiple clients – whether the client is a UI using the React JavaScript library, a mobile app running on Android or iOS, or a downstream application that connects to the application through an API. Modern applications expect to have an undefined number of clients consuming the data and services it provides." This definition uses more Information Technology jargons to make it more specific.

Modern Application is said to have certain attributes of its own as shown in Figure 2. Understanding these attributes could strengthen on when and how to use the modern application.
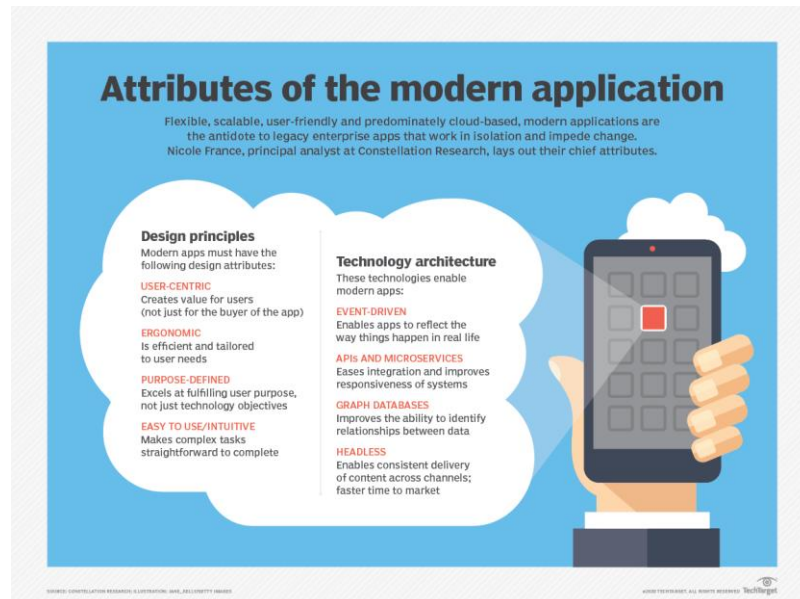

Figure 1: Attributes of the Modern Application

Other authors have also been looking into the characteristics of modern application and this is better presented in Table 1.

Table 1

Characteristics of Modern Application (Source: author)

Tom Scanlan (2019)		Andrea C. Crawford (2018)	
Software Service	Modern apps are composed of several services, which may include calls out to legacy systems that haven't been modernised. Software services take their definition originally from service oriented architecture, and the more modern variant, microservices.	Flexible.	Modern applications are collections of microservices, which are light, nimble, fault tolerant and small. Microservices can run in containers deployed on a private or public cloud and usually stand alone, though they often call other services.
Resilient	Modern applications factor failure into their design by enabling graceful handling of any possible failure mode.	Evolving	Eventual consistency is preferred over immediate consistency.
Multi-Cloud	Modern applications are designed for multi-cloud deployment models.	High quality.	development and operations silos are broken down with software reliability estimations (SREs) on the delivery squads with the developers.
Orchestrated Releases	Modern applications are easier to deploy, and can improve overall application deployment reliability		
Virtual Machines, Containers, and Serverless Functions.	Modern applications don't care where they are running		

The two authors share some similarities in the characteristics of modern application. The difference is more on the naming of the characteristics for example to the concept of Crawford's flexible is named as Scanlan's Virtual Machines, Containers, and Serverless Functions.

Modern Application definitions are important in understanding the concept. In developing the modern application, it is important to have "architectural and developmental principles that will assist you in designing, implementing, and maintaining a modern application" (Stetson, 2018). The author further explains that there are three principles - small, networked and developer-oriented (Figure 3).
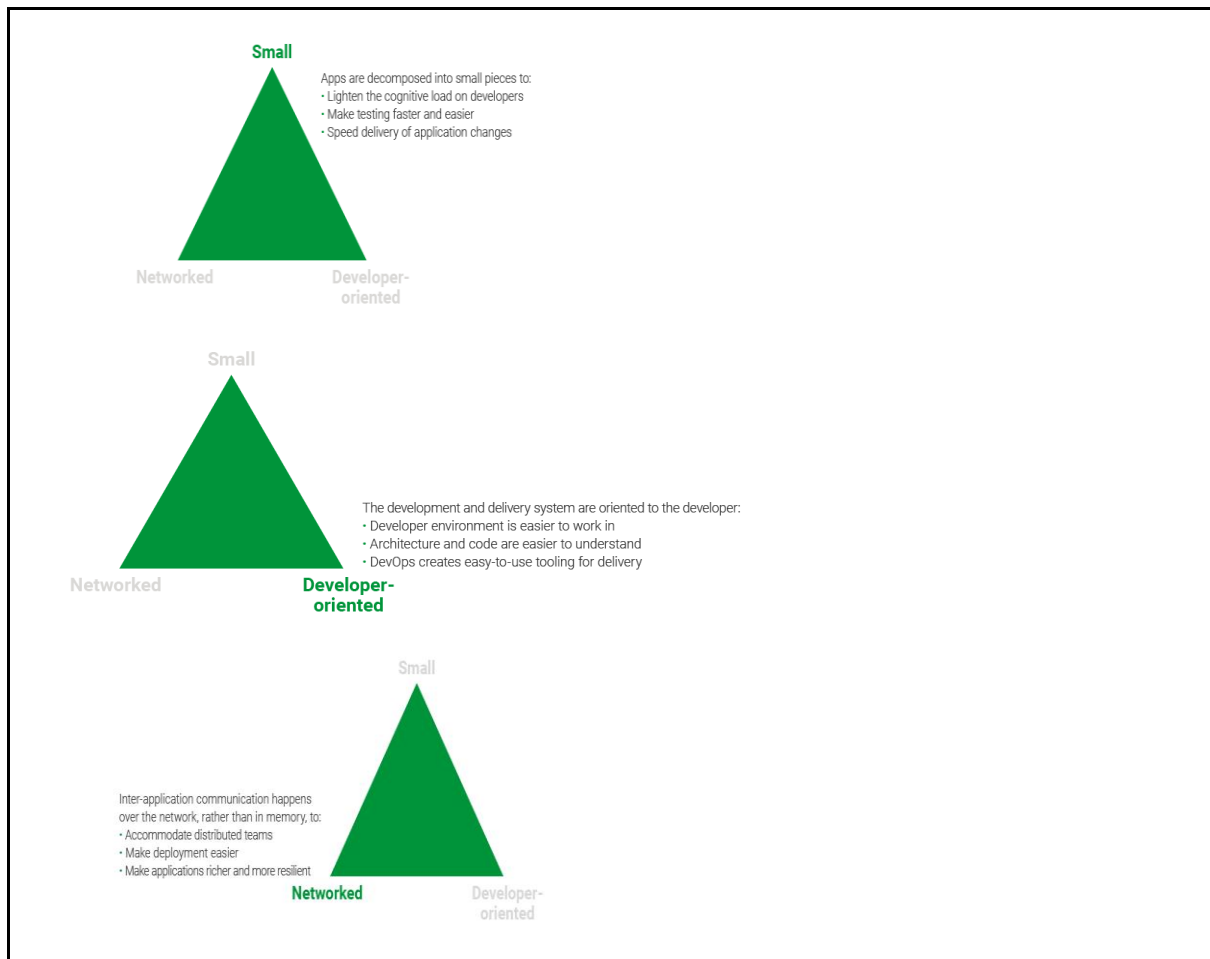
Figure 2: Principles of Modern Application Development (Source: Stetson, 2018)

Theoretically, Bloom's taxonomy (Figure 4) is seen as to be of most relevance to this training and research. The developmental process concept of the participants from remembering, understanding, applying, analysing, evaluating and creating is of essence for the training. Participants are encouraged to move up from one stage to another, with the intention to develop their thinking. At this juncture of the training, the focus is more on the participants' understanding of LPAM with the intention to move to the next stage of application at the workplace.
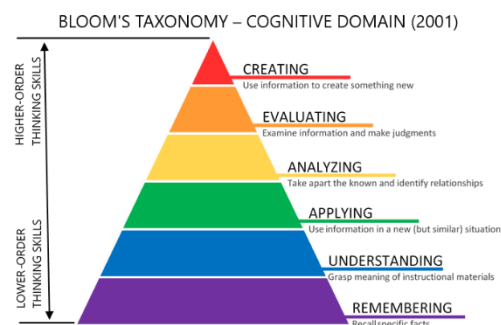

Figure 3: Bloom's Taxonomy

Methodology

This research is to apply the mixed method research design. Specifically, it is to use Triangulation Design (Creswell, Plano Clark, et al., 2003). There are many types of triangulation design and this research is more suited to the interpretation based on quantitative and qualitative triangulation design.

A questionnaire is used to collect the data for both quantitative and qualitative. The questionnaire is to be administered as a set of pre- and post-training questions. The pre-training questions include 9 Likert scale pre-training questions while the post-training questions include 11 (10 Likert scale + 1 Open) post-training questions. The pre and post training questionnaire for the quantitative data is designed to follow the research objectives and it is as follows

The questions are made up of 6 sections covering the following sentiments:
SECTION A: What is the participants' overall understanding/confidence of Modern Application Development
SECTION B: What is the participants' knowledge of Modern Application Development
SECTION C: What is the participants' attitude towards Modern Application Development
SECTION D: How is the organization of the Modern Application Development program
SECTION E (post-training questionnaire): How is the trainer for Modern Application Development program

The qualitative data is included only in the post-training questionnaire (Section F) as follows:
SECTION F: Open comments/suggestions
This open ended question allows for participants to express their opinions or suggestions in relation to the topic of Modern Application Development.

The quantitative analysis of the data is descriptive in nature whereby the interest is on the details of the specific sample of the population (Jensen and Warren, 2020). The qualitative analysis focuses on words, descriptions, concepts or ideas. Therefore, thematic analysis which looks at patterns of meaning in a data set and which appears to be more exploratory in nature is to be adopted. Similarities and differences in the data set are used as the basis for the themes.

Purposive sampling is the method of participants recruitment in this study. The samples are ICT staff of different government agencies in one state of Malaysia. The groups are of mixed abilities in terms of Modern IT knowledge and skills. The participants are grouped into 3 cohorts for the training and each cohort is to participate in the training full time for 5 days.

Findings
The findings of the questionnaire are presented according to the sections pertaining to the research objectives.
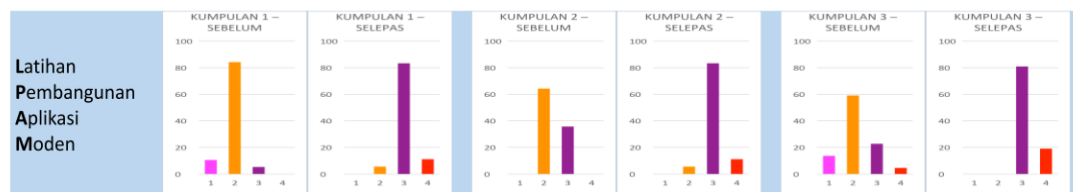
Section A, Question 2

Figure 4: Modern Application Development Confidence Level

The findings show an increase in the participants' confidence level in Modern Application Development across all the three groups (Figure 4). To the statement of "My confidence level with this topic before/after training is…", Group 1 findings of "very high" likert scale was 0% at the beginning of the training and has increased to 11.1% after the training. The same findings were recorded for Group 2. Group 3 shows an even higher increase in the "very high" likert scale. The difference of 14.5% was recorded for before (4.5%) and after (19%) training. At the "High" likert scale, Groups 2 and 3 recorded a high increase. Group 2 shows a difference of 46% (36% before, 82% after). Group 3 shows an even higher difference of 58% (22% before, 80% after). For group 1, the interesting finding is in the "very low" likert scale where it recorded 0% after the training whereas before the training, it was at 20%. The interpretation of these findings is that the training has helped to enhance the participants' confidence in modern application development.
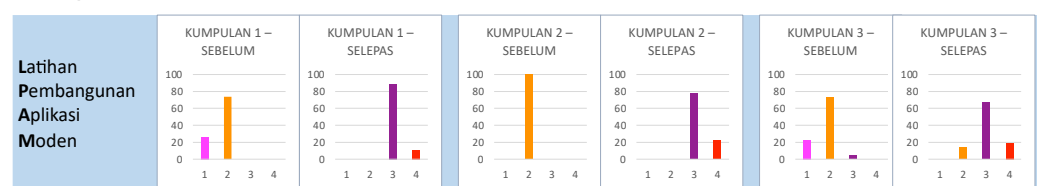
Section B, Question 4

Figure 5: Modern Application Development Knowledge

All the participants in the training agreed that their knowledge of Modern Application Development (LPAM) concept has increased post LPAM. By the end of the trainings, participants with very low and low levels of knowledge before the training (mean of 98.2%) agreed that this training has increased their knowledge levels to high and very high (mean of 94.7%). A more detailed finding of the three groups is important. The first group findings show from high (80%) which decreases to 55% while the very high (20%) increases to high (42%). The second group before is at high (78%) decreases to 38% while the very high (20%) increases to 60%. The increase in the very high Likert scale after the training is a very encouraging indicator of the training effectiveness.

Section C, Question 6

Figure 6: Modern Application Development Attitude

On average, there are increases in interest in the first and second group to learn Modern Application Development in greater depth. This is exemplified in the finding for the two groups' before and after the training. Group 1's before is at 21.1% and after is at 44.4% (23.3% difference) while Group 2's before is at 21.4% and after is at 61.1% (39.7% difference). However, this is not the case for LPAM Group 3. The "strongly agreed" before is at 45.5% and after is at 42.9%. There is a decrease and even though the difference is rather low (2.6%) this should not be neglected. The possible explanations for this finding might be due to two reasons. First, the participants were nominated for the training but had neither the interest nor the desire for the topic. Secondly, the participants had different expectations for the course.

Figure 7: Modern Application Development Content and Materials' Usefulness during the training

The findings show an increase in the level of content and materials' usefulness in all the three groups. The first group findings in the strongly agree scale was 0% before the training but has increased to 27.8% after the training. The second group strongly agree that it has increased to 66.7% as compared to the before training (14.3%). The third group strongly agreed was at 22.7% but has increased to 42.9%.
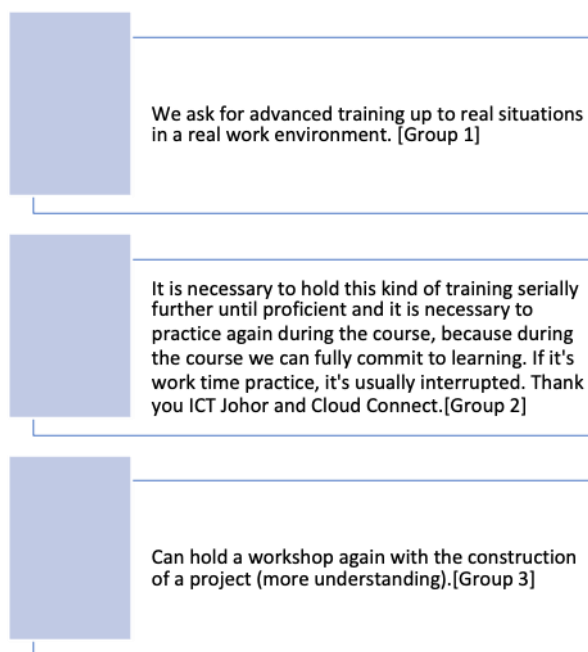

Figure 8: Thematic Analysis of Open Ended Question – more in-depth skills training

The thematic analysis of the open ended question in the questionnaire revealed a consistent theme across the three groups. The open comments' theme was for a more in-depth skills training or perhaps even a training-cum-development program to hone in their newly learnt skills. One of the participants from Group 1 stated that "we request advanced

training up to real situations in a real work environment". A representative from Group Two stated that "it is necessary to hold such training in series further until proficient and need to practise again during the course, because our course time can be fully committed to learning. If I practise during working time there is always a lot of disruption. Thank you ICT Johor and cloud connect" A participant from Group Three added that "can hold another workshop with the construction of a project (more understanding)".

Conclusion

The findings of the quantitative and qualitative data affirm that the participants are experiencing an increase in their understanding, knowledge and their criticality of the subject, as theorised by Bloom's Taxonomy of Hierarchical Framework for Cognition and Learning (1956; revised, 2001). Following Bloom's 6 levels of taxonomy to its logical conclusion will lead the participants to the creation stage where they can be coached to maximise their ability and creativity in production process and purposes. It is thus recommended that further training and research be carried out with the same cohort of participants to continuously motivate them to improve. To conclude, this research is not only beneficial to the participants but to the institutions and workplace as well as the individual participant. The likelihood for productivity at the work place to increase is made higher with this training and therefore, continuity of training is encouraged. This is to cater for the more agile technology development at present and in the future.

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