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Research paper



An Efficiency and Effectively of Methodology in Software Development Workflow Based on Malaysia

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Abstract

The process of software development life cycle (SDLC) is an important element of development phases to develop the application. In fact, there are needs to upgrade the sequence of methodology in software development. The SDLC methodology is the highest level of abstraction and is defined as a collection of problem-solving methods governed by a set of principles and common philosophies in solving targeted problems for extended project timeline teamwork as well as a decrease of a high team collaboration and understanding in the software development. Thus, the SDLC is very crucial in order for them to ensure the quality of skills is placed accordingly in the workflow. This research contributes to the development of a new approach in system development workflow with the aim to properly manage system development projects. It started by providing some background data related to the previous mode of operation in the teamwork samples as shared by the stakeholders of the transformation projects and the new proposed Analysis System Development Framework (ASDF) method team members. Then, the key findings related to themes of 1) input for User Requirement Specification (URS) and 2) System Requirement Specification (SRS), 3) proses for module, 4) process for database, 5) process for User Acceptance Testing (UAT) 6) output for Final Acceptance Testing (FAT) and empowerment for the whole level based on ASDF method. This research contributes mainly to the findings, more than previous research has found, that significantly support the perception that a high quality of skills in a teamwork results in better performance of software development.

Keywords: *Software Development Life Cycle, Quality Skill, Teamwork, Framework, System Analysis*.

1. Introduction

In the 21st century of Malaysian context, by supporting ubiquitous access to any kind of web-based software development, there are needs to upgrade the sequence of software development life cycle (SDLC) methodology. The software development life cycle methodology is defined as a collection of problem-solving methods governed by a set of principles and common philosophies in solving targeted problem, and it is the highest level of abstractions. In fact, the system analyst, project manager, and top management are the parties involved throughout the software development.

Thus, the software development life cycle is very crucial in order for them to ensure the quality of skills is positioned accordingly in the workflow. According to Bacon and Blyton (1), the world of workflow is severe and it acknowledges the problems of workflow management systems are due to their demanding and formal nature. Most of the time the natural human interaction incorporates flexibility, opportunistic behaviour, social awareness and compromise, however, the workflow implementations tend to be coercive, isolationistic and inflexible.

The software development life cycle composition systems are designed to enable users to distribute components into workflows. In the 21st century teaching and learning, the main concern is how to measure the skills. Among the civil rights advocates, there is a concern that the measurement would affect the progress towards ensuring common standards of learning for all students due to the high cost and time required as well as the difficulty to score in the tests which result in a slow adoption of such tests. Collectively, these concerns derailed efforts in the late 1990s to move toward the use of performance-based assessments such as portfolios, exhibitions, and projects (2).

The workflow as the ability to support workflow processes in which a static representation of the process and its resources has to be made. This static representation is referred as a workflow definition, such a workflow definition can be divided into two important parts: the process model and the resource classification. The process model consists of various steps and stages while the resource classification indicates the kind of work an employee is allowed to perform (3).

In addition, according to the encountered issues were related to the known disadvantages of the agile method long cycle time and integration problems before the system level testing. The first step towards an agile method was to put more focus on a separate integration testing. This is to identify the potential problem areas in the integration earlier than the regular system level testing phase which is at the end of the project. Therefore, the whole software was integrated more often, and earlier during the development phase, to form the full system product consisting of those components which were ready at that time (4).

In today's government, every ministry has its own information system department. However, some of the departments do not develop their own system. Therefore, there is a need for them to engage vendors in developing a system for them. In most cases, the system needs to be ready in a very short period of time. This puts a pressure on vendors that results in them forcing their team

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to put extra effort to ensure the system is developed and delivered within the given timeframe.

This research contributes to the development of a new approach in system development workflow with the aim to properly manage system development projects in public sectors. Some vendors take the initiative to engage practical students so that they can experience some of the system development approaches as well as to have a deeper understanding of system development in the real development environment. This new approach is being developed based on the previous Business System Development Framework (BSDF) (5). BSDF is focusing on Business Analysis (BA) that accepts a certain specific set of responsibilities within a more general process of business transformation and change, even though the precise scope of the role may differ between organizations. However, many business analysts have the tendency to adopt any methodology or approach that is being applied by their information technology vendors or consultants. These are often recognized as software development methodologies or proprietary change frameworks.

The new proposed software development workflow in this research is being compared to the agile method. Therefore, the agile method was defined as a holistic product development strategy and flexible in which the development team works as a unit to reach a common goal. Generally, in software development, the tasks are designed an interdependently in which team members handling those tasks should work interdependently on each other (6). Subsequently, as the task interdependency increases, the need for coordination among the team members would increase.

Furthermore, depending upon the complexity of the goal, the complexity of its underlying tasks will increase exponentially and call out for a tight coordination among the team members to work collectively and interact effectively, which is accomplished through teamwork.

This research introduces a proposed new development workflow known as Analysis System Development Framework (ASDF). Hence, it is up to each development process to decide the workflow that is deemed appropriate for the system analyst. The ASDF has six steps to complete the system that are user requirement system (URS), specification requirement system (SRS), module, database, user acceptance test (UAT) and final acceptance test (FAT). Thus, this workflow is proven to be the most efficient in software development workflow as it reduces the workflow time and cost especially when it is being compared to the agile methodology.

2. Problem Statement

People's capability in terms of performance is now being challenged by the influence of technologies in the system development. Thus, there are companies who take advantage of this situation by developing software for the public sector in order to change the working environment.

Therefore, the main problem "1" is extended project timeline teamwork. Therefore, according to Pfaff and Huddleston (4), project success has been much desired by the industry. In general, project aims to achieve the best of the golden triangle such as timeline, budget, teamwork and quality. As such, timely completion stands as one of the main measures of success. For the previous research, this is according to Laanti et al.(7) who are said that everyone needs to think carefully about the decision to option for the extended project because it is a big commitment. In fact, in relation to how it can benefit one's work, being confidence in your own abilities and the self-awareness of knowing your limitations are vital to career success. The second problem 2nd is a decrease of a high team collaboration and understanding in the system development. Thus, according to Mathieu et al.(8), software quality was shown to be dependent on good teamwork. In fact, according to Moe et al.(9), The concept of teamwork carries with it a set of values that encourage listening and responding constructively to views expressed by others, giving others the benefit of the doubt, providing support, and recognizing the interests and achievements of others. However, teamwork has been considered a crucial success factor for software development projects in the theoretical literature (10-11).

However, the software development in the public sector tends to be developed in a short period of time. In most cases, the development is being delayed due to insufficient development timeline as well as the project is being awarded late without revisiting the project timeline. In such cases, the project team requires quality skills in teamwork among the project team members in order to perform well in completing the development work according to the project timeline. The quality of skills in teamwork has to be measured, thus, there is a need to enhance the software development life cycle methodology in software development.

2.1 Research Objective

The aims of this research to use new proposed Analyst System Development Framework (ASDF) for software development. In order to achieve the aim, this research covers the following research areas:To verify the main problem of extended project timeline teamwork and the decrease of a high team collaboration and understanding in system development;

1. To verify the main problem of extended project timeline teamwork and the decrease of a high team collaboration and understanding in system development;
2. To determine the project development is on time in order to control and increase the quality of skills in a teamwork collaboration and understanding in system development;
3. To enhance the agile method by proposing a new ASDF software development method; and for specific objective is to measure the quality of skills in a teamwork based on new proposed ASDF method during the development work. This research covers the following research areas;
4. To validate the ASDF method in the quality of skills in teamwork of user requirement specification (URS), system requirement specification (SRS), module, database, user acceptance test (UAT) and final acceptance test (FAT).

2.2 Research Questions

This research attempts to answer the following research questions:

1. What is the quality of skills in a teamwork concerning the model development for students and lecturers to apply in order to help them to embrace the technology and to move forward with the university based on ASDF method?
2. Who can measure the quality of skills in a teamwork in the web-based system development technology based on ASDF method as a new approach?
3. What is the quality of skills in a teamwork based on ASDF method compared to the agile method in software development?
4. How the quality of skills in a teamwork based on ASDF method can help to reduce problems in software development?
5. How the quality of skills in a teamwork in technology environment can help the administrators, lecturers and students to maintain their performance inside or outside the classroom in the responsive lecture concept based on ASDF method compared to the agile method?

3. Literature Review

Nowadays, the existence of a system that becomes a foundation for a rapid development of the information technology sector is able to create a new environment around the world. Historically, the development of information technology that focuses on the workflow development such as an agile method is no longer relevant to be practiced due to the fast advancement of system development technology. Thus, a change in system development workflow should be enhanced in accordance with the current advance-

ment. In fact, the system development should be focusing on the quality of skills required in improving the performance in order to reduce the risk and improve the skills in software development.

An employee team is a collection of individuals who are interdependent in the tasks and share responsibilities for the outcomes (12). The team enables those individuals, without any conflict among them, to cooperate, enhance individual skills and provide constructive feedback (13). In order to ensure a smooth functioning of an organization, it is crucial to focus on teamwork especially when the advancement of technology causes most of the organizational activities to be more complex. Teamwork is an accurate organizational measure that shows many different features in all type of organizations including non-profit organizations (14). Thus, teamwork can be considered as a significant tool of a new type of working organization. In fact, one research study concluded that teamwork is necessary for all types of the organization including non-profit organizations (15) in which each team member has the opportunity to enhance knowledge, skills, and abilities while working in a team (16).

Organizations which emphasize more on teams, are more likely to experience increased employee performance, greater productivity and better problem-solving at work (12). One research study concluded that teaching individuals on how to work in a team is inappropriate. Thus, it is not an easy task when it comes to getting individuals to work in a team (17). However, highlighted self-management team and interpersonal team skills as the two important factors that enhance the communication as well as the interpersonal relationship between team members and also boost the employee performances (3). One research study concluded that a good manager is someone who has the ability to assign responsibilities to his or her subordinates in a form of a group or team in order to optimize the output from them (18).

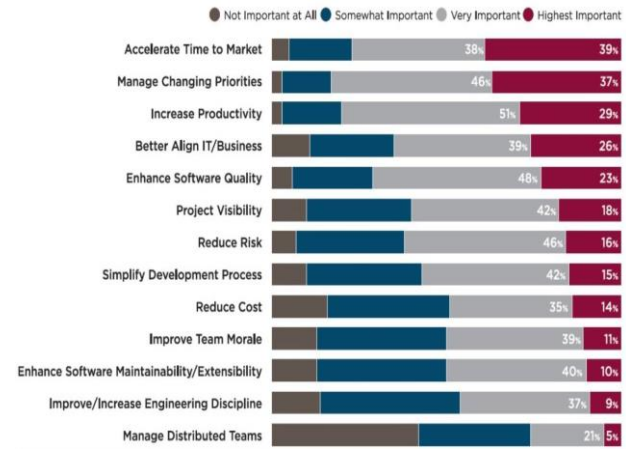
Another study concluded that it is possible to design a team building system for employees within every organization in order to establish best practices and obtain maximize output. In addition, the main purpose of having such a system in place is to improve employee learning (19). The teamwork is a strategy that has a potential to improve the performance of individuals and organizations, but it needs to be nurtured over time (20). Organizations need to constantly look at ways to improve performance, especially in a rapid changing working environment. Management needs to inculcate teamwork activities within the organizations, be flexible to promote it and be willing to allow the teams to be part of decision making. In fact, reported that teams offer greater participation, challenges, and feelings of accomplishment (19).

For the previous of findings research, the issue of what processes and components comprise teamwork and how teamwork contributes to team effectiveness and team performance has been much studied, but there is no consensus concerning its conceptual structure (8). Therefore, using recent research and previous reviews, identified and defined seven core components of teamwork.

The previous research, today‘s system environment is very much dynamic, and organizations are constantly changing their software requirements to adjust to the new environment. They also demand a fast delivery of software products as well as an acceptance of requirements change. In this regard, the traditional plan-driven developments fail to fulfill these requirements (12). The correlations between raters’ evaluation of team performance in previous research Moreover, according to Mathieu et al. (8), team performance may be defined as the extent to which a team is able to meet established quality, cost, and time objectives. In fact, for previous research by Wilcox and Peter (21), team performance and team effectiveness are often used synonymously in the literature, sometimes team performance is part of team effectiveness.

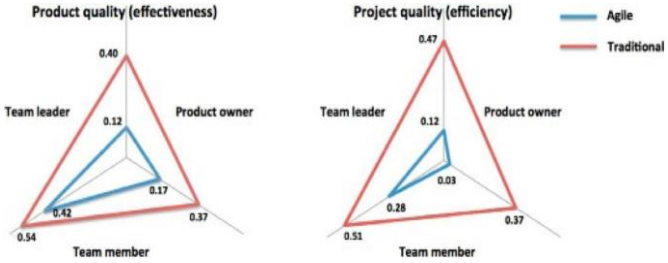
Nevertheless, according to Dingsoyr and Lindsjorn (22), the previous result of research revealed large differences among team members, team leaders, and product owners in how team performance is evaluated. Figured 5.4 shows the collerations for between the three categories of raters. Therefore, overall the figure shows that the agile survey has weaker agreements among raters than in the traditional survey. In fact, one may expect that close communication between team members, team leaders, and product owners in agile development will lead to consensus in the evaluation plan-driven approach involves more documentation and reporting, which may make it easier to have a shared view of team performance.

They may be several reasons for the differences between the rater groups. However, regarding product quality, product owners, and to some extent team leaders, may consider the product more from the customers point of view such as functionality and usability. Then do team members, who may emphasize code qualities of the product such as maintainability and testability, which are invisible to the client.



Source: Prof. Dr. Syed Akhter Hossain & A.B.M Moniruzzaman, 2011

Figure 3.1: Reasons for adopting the Agile method in previous research



Source: Y. Lindsjorn et al./ The Journal of Systems and Software 122 (2016) 274-286

Figure 3.2: The collerations for between the three categories of raters

The theoretical literature, teamwork has been considered a critical success factor in software development projects (11). However, highlighted the lack of empirical evidence concerning the importance of teamwork for the success of innovative teams in previous works (8). They pointed out two issues that are 1) previous research did not address the multifaceted nature of terms but rather focusing on the relationship between team-based organizations and performance (20) and 2) there are conflicts in the literature about the impact of teamwork on team success (23).

In order to address these issues, the influence of six 6) teamwork quality (TWQ) factors are communication, coordination, the balance of member contribution, mutual support, effort, and cohesion which have a significant impact on the success of innovative projects. The view is based on the basis that the success of teams depends on the degree to which team members are able to collaborate. This study is hoped to be able to perform an independent verification of some of the factors of teamwork quality model, to extend the model to factors such as trust for which to have indications that they are important for software projects, and to validate a more encompassing model by measuring the relationship between the various aspects of teamwork and performance (8).

4. Methodology

This chapter will describe the qualitative methods used for obtaining the research data. The data gathered for this case study are based on 10 thematic questionnaires on a new proposed approach of software development life cycle model known as Analysis System Development Framework (ASDF). The ASDF is being compared to an agile method through informal discussions and interviews with vendors, clients and stakeholders of software development projects as well as Intelligent Notes Lecture System (INOLES) sampling. First, it will describe the case study through the use of the questionnaire in conducting a research. The aim of this study is to focus on developers in a public sector, private sector, statutory body as well as students to measure the quality of skills in teamwork. Second, it will present the methodology used to gather primary data that is thematic interviews through the use of a questionnaire. Third, it will describe the samples and respondents participating in this study as well as the interview recruitment techniques used. Lastly, the validity and credibility of thematic interviews through the use of a questionnaire as a qualitative research methodology are evaluated.

Being a new proposed method, analysis system development framework allows projects to be developed more efficiently during the requirement process by having work tracks running in parallel rather than waiting for fully developed requirements that may have little interaction with the industry and little opportunities for mid-course correction. There are heaps of benefits compared to the agile way of requirement elicitation and elaboration. This new proposed analysis system development framework method definitely marks a big change in the way solutions are designed and delivered in shorter time frames by various organizations. The comparison is shown in Table 4.1 below.

Table 4.1: Comparison of Agile and ASDF Models

Agile Model	ASDF Model
Fewer of Predictability In some cases, software deliverables, especially for a short time frame project of over three (3) months, the developer cannot quantify and extent it is difficult to assess the effort required at the beginning of the software development	**Precise of step in predictability** Every step in development, they can use for backward and forward to review to predict precisely. An adaptive teamwork which is able to respond to the changing requirements.
Deficiency of necessary documentation Lack of emphasis on necessary in user and system requirement, layout designing of system and documentation.	**Complete of necessary documentation** The teamwork does not have to invest time and effort, by the time they deliver the product, it is found that the client's requirement has changed. The documentation is crisp which result in time saving.
Plan timeframe an easily falls off track The project has the tendency to be off track if the client representative is not clear with what is expected to be the final outcome at the end of the project.	**Plan timeframe in track** Tracking the project in first action can help the teamwork in track for finished the development. Face to face communication and continuous inputs from the client representative leave no space for guesswork.
Grander demand on developer and clients Only senior programmers are capable of making the required decision during the development process. Hence there is no place for newbie programmers unless with the existence of experienced resources.	**Grander developer and client's effort** The end result is high-quality skills of teamwork in the least possible timeframe and satisfied client. Therefore, they get the great result and development to produce for user.
Extended time and commitment If the project needs the extended of timeframe, mean is the project is failed to finished on time. Therefore, the tester, developer, and committee of project needs to more commitment and extra time to teams commit for the project. This is can be effected to the time and energy to whom involved.	**Time of punctuality** The project development can handle the punctuality time to make sure the project on time deliver to the end user. This is to produce the time for effectively of quality in teamwork.

4.1 Structure of ASDF Method

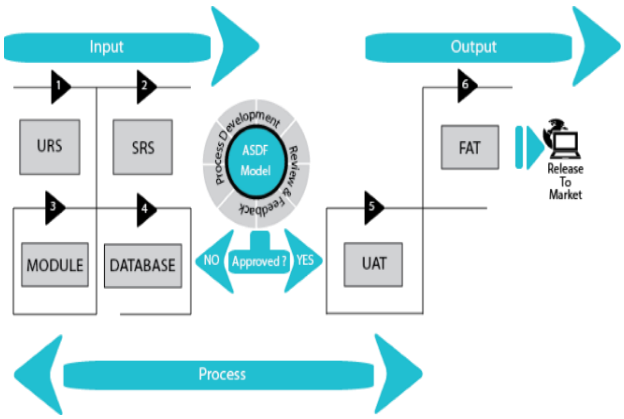


Figure 4.1. Diagram of New Proposed ASDF Method

In developing Intelligent Notes Lecture System (INOLES) sampling, the study is adopting ASDF method. Figure 3.1, shown the steps in ASDF. In this research, the principles of such a framework are proposed, based on a structure known as the Unified Modeling Language (UML). Despite the exact scope of the roles and responsibilities may differ from one system development to another, System Analysis (SA) has been perceived by those involved in system developments as a specific set of responsibilities within a more general process of system transformation and change. Nevertheless, if system analysis is not appropriately positioned within a defined framework that guides the overall change process in an integrated design, the value of system analysis work in software development may be deteriorated.

Certain aspects of a typical analysis change process have associated methodologies. For example, a software development may be guided by Waterfall, Rational Unified Process (RUP), Agile, Dynamic System Development Method (DSDM), Structured System Analysis and Design Method (SSADM) or a host of derivatives and for project management, one might resort to methodologies like PRINCE, among others.

However, it looks like an over-arching framework that covers business change and transformation in a holistic way, right from the expression of a change initiative within a strategic change programme and ending in a delivered change accepted as Fundamental Process of IT (FPIT), with the benefits of the change duly evaluated does not exist until now. Thus, system analysis may be able to be positioned appropriately together with other roles and disciplines if the said framework exists.

From the perspective of business transformation and change, System Analyst is perceived as an increasingly useful set of responsibilities. Thus, a methodology to define the tools, techniques, and activities that System Analyst may get involved is expected to be in place. Unfortunately, that is not the case. This may be due to the fact that the scope, as well as the roles and responsibilities of System Analyst, is still vague which requires an effort to clearly define them.

It is quite common for many System Analysts to simply adopt any methodology practiced by IT Suppliers or Consultants. Most of the time the methodology is known as software development methodologies or proprietary change workflow model.

Nevertheless, it is a wise move if a general workflow model to be put in place in order to control the process of system change prior to developing a methodology specifically to cater SA. Once the general workflow is in place, it is easier to identify which part of the workflow is relevant and under the purview of System Analyst together with other disciplines involved. This approach, in a way, is in-line with software application development, for example, a Solution Architect is responsible for completing certain tasks together with other experts in order to develop or modify a software product.

4.2 Tables

In thematic interviews for qualitative studies, since the objective is not to simplify the data obtained beyond the respondents of the research study, non-probability sampling is often opted as a recruitment strategy for the interviewees. In probability sampling techniques, a probability for the sample to represent a larger population can be calculated. Non-probability sampling, on the other hand, does not meet this criterion, and the sample may or may not represent a larger population. Nevertheless, determining the important characteristics of respondents is important and the sample should be formed according to these Ingram (24). In this study, the researcher wanted to obtain diverse opinions and standpoints, and especially people who have contrasting viewpoints on analysis system development framework method. It was done by asking the interviewees if they know anyone who is against analysis system development framework method within the teams. The respondents did not know any of these kinds of people, apart from Teamwork B. The respondent in Teamwork B pointed out two people, who supposedly were a bit resistant towards analysis system development framework (ASDF) method, of which the researcher interviewed one of them (Developer, Teamwork B). In addition, the researcher wanted to see if respondents' opinions varied depending on their experience on ASDF method compared to the agile method. For example, the amount of experience they had on applying the agile method as well as ASDF method. Therefore, the researcher opted to interview respondents from teamwork that have adopted ASDF method (Teamwork A and B). The samples of this study comprised of 222 and 116 respondents for the ASDF and agile methods respectively based on the feedback received during the interview through the use of a questionnaire across two different groups of respondents.

In Teamwork A, the new proposed ASDF method has been adopted quite recently and people have been working in ASDF mode for less than a year, apart from the test interviewees who were interviewed only a few weeks after the new proposed ASDF method transformation process was completed. The Teamwork A comprised of people with 1 – 8 years, and the average being 3 – 7 years' experience of working in the agile mode in the public and private sector. Thus, after reviewing the new environment of development, which is based on ASDF method, this method is much better and completed the development requirements for less than three months and above for working development rules.

In Teamwork B, in general, the people have been working a bit less in the public sector, with the average being 3 – 7 years and the experience varies from 1 to 8 years inside the public sector. Therefore, when comparing the agile method to the new proposed ASDF method concerning the quality of skills in a teamwork and the development work progresses smoothly in between three months and above. The sample comprised of both sexes with females being the minority. In order to protect people's anonymity, every teamwork will be referred as "me", and people's opinions will be implied as their assigned number and role. Here is the sample according to people's roles and the assigned number:

Teamwork A – *Analysis System Development Framework (ASDF) method*

Teamwork B – *Agile method*

In addition to acquiring data from the interviews with software development teams, the researcher also conducted informal interviews and conversations with other stakeholders, who were somehow connected to the projects of pursuing agile development in public and private sectors or to the teams that were the focus of this research. Hence, the introduction of the new proposed ASDF method development. The communication took place via face-to-face, telephones, and emails. The people whom the researcher communicated with are those who being as a source to explain the situational background information on the agile and new proposed ASDF methods. Therefore, Software Quality Manager, System Analyst, Developer and Programmer who has an insight into the situation in the organization that Teamwork A and B operate in, and External Consultant who was part of executing the change process in Teamwork A and B will remain anonymous in order to protect the anonymity of the people within Teamwork A and B.

Table 4.2: Demographic Information of Sampling

Teamwork A	Experience in Development System	Sector		Designation	No.	Gender	
		Public	Private			Female	Male
New proposed ASDF Method	1 – 8 years	22	3	Software Quality Manager	32	94	128
				System Analyst	57		
				Developer	49		
				Programmer	43		
				External Consultant	41		
Teamwork B	**Experience in Development System**	**Sector**		**Designation**	**No.**	**Gender**	
		Public	**Private**			**Female**	**Male**
Agile Method	1 – 8 years	22	3	Software Quality Manager	18	29	87
				System Analyst	34		
				Developer	37		
				Programmer	17		
				External Consultant	10		

4.3 System Design Phase

System design phase emphasizes on logical and physical designs. In fact, the model is a logical view of system design on site. The logical model is first generated and later converted into a physical form. The physical model involves a process of designing the user interface and database. The logical and physical designs will be used again as a guideline for model formulation (25). The analysis is performed to determine the information required, processes involved and system functionality information such as input (URS and SRS), processing (MODULE, DATABASE, and UAT) and output (FAT). The analysis will be conducted using tools such as object-oriented design algorithm, activity diagram, and sequence diagram to show the logical process and the relationship between the data.

5. Result and Discussion

This chapter begins by answering the research questions and followed by testing the research data analysis based on the questionnaire. There are two teamwork, Teamwork A and B, in this study. Teamwork A represents ASDF method which is a new proposed system development environment for system analysts. On the other hand, Teamwork B represents the agile method. The quality of skills in both teamwork is being compared in order to prove the project development control in terms of its timeliness as well as the increase of quality of skills in a teamwork collaboration and understanding in system development throughout the new proposed methodology is more efficient and effective. The questionnaire is focusing on the new proposed ASDF method for system development workflow analysis and the comparison between the new proposed ASDF and agile methods for system development workflow analysis.

According to Mathieu et al. (8), it is use the construct of teamwork quality which refers only on the quality of communication. Measures of the task process, the task strategy, and the quality of the performance of the task activities performed by the individual team members are not the subject of this teamwork quality construct, nor are management activities such as task planning, allocation of resources, or management by objectives.

Table: 4.3: Team performance and team members' success of previous research findings

Construct	Subcontract	Description
Team performance	Effectiveness	Degree to which the team meets expectations regarding quality of the outcome, e.g. functionality, robustness, reliability, and performance. Reflects a comparison of intended versus actual output.
	Efficiency	Degree to which the team meets expectations regarding time, cost, adherence to schedule, and adherence to budget. Reflects a comparison of intended versus actual input.
Team members' success	Work satisfaction	Degree to which team members are motivated to participate in future team projects.
	Learning	Degree to which team members learn social, project management, technical, and creative skills.

Therefore, with the new proposed ASDF method, the problem of extended project timeline teamwork and decrease of high team collaboration and understanding in the system development is solved. After analysing the research findings and as shown in the result of the questionnaire, it is confirmed that the use of the new proposed ASDF method is better compared to the agile method.

5.1 The Accomplishment

The accomplishment of this study involves four main objectives. The first objective is to verify the main problem of extended project timeline teamwork and decrease of high team collaboration and understanding in the system development. Next, the objective is to determine the project development control in terms of its timeliness and the increase of quality of skills in a teamwork collaboration and understanding in system development. It is followed by the third objective which is to enhance of the agile method by proposing a new ASDF system development method. The final objective is to validate the ASDF method in the quality of skills in a teamwork of user requirement specification (URS), system requirement specification (SRS), module, database, user acceptance test (UAT) and final acceptance test (FAT). The data are analysed according to parts and later combined to form the overall achievement. Thus, meeting the overall objectives of the new proposed system development environment based on ASDF method simply means achieving the overall quality of skills in a teamwork.

The questionnaire is designed to gather information and collect data concerning the new proposed method for system development known as ASDF method. This new proposed method is being compared to the agile method. The teams are categorized as Teamwork A for ASDF method and B for the agile method. The statements are carefully formulated to measure the quality of skills in a teamwork. The questionnaire uses a five-point of Likert scale that is Strongly Disagree 1), Disagree 2), Neither Agree nor Disagree 3), Agree 4) and Strongly Agree 5). However, the results derived from the data analysis are presented in the form of graphics and tables using Minitab.

Table 4.4: (See Appendix – A) Overall Results of Mean, Median and Standard Deviation for Part II to Part X of the Questionnaire

Part	Criteria	Mean		Median		Standard Deviation	
		ASDF	Agile	ASDF	Agile	ASDF	Agile
Part II	Quality of skills in a teamwork of user requirement specification (URS) in workflow method	4.2	3.4	4.3	3.4	0.3	0.2
Part III	Quality of skills in a teamwork of system requirement specification (SRS) in workflow method	4.1	3.5	4.0	3.4	0.3	0.2
Part IV	Quality of skills in a teamwork of module integration in workflow method	4.2	3.4	4.0	3.4	0.3	0.2
Part V	Quality of skills in a teamwork of database implementation in workflow method	4.1	3.5	4.0	3.4	0.3	0.2
Part VI	Quality of skills in a teamwork of user acceptance test (UAT) in workflow method concerning the interface, programming syntax, module, and database before handing over to end users	4.2	3.4	4.1	3.4	0.3	0.2
Part VII	Quality of skills in a teamwork of final acceptance test (FAT) in workflow method concerning the final interface, programming syntax, module and database after handing over to end users	4.3	3.5	4.3	3.4	0.2	0.2
Part VIII	Quality of skills in a teamwork concerning the effectiveness of workflow method	4.4	3.5	4.4	3.6	0.2	0.3
Part IX	Quality of skills in a teamwork concerning the efficiency in workflow method	4.2	3.5	4.3	3.4	0.2	0.2
Part X	Overall quality of a teamwork skills in workflow method	4.5	3.5	4.5	3.5	0.5	0.4

Figure 4.2, 4.3 and 4.4 below show the comparison of mean, median and standard deviation between ASDF and agile methods in graphical forms respectively.

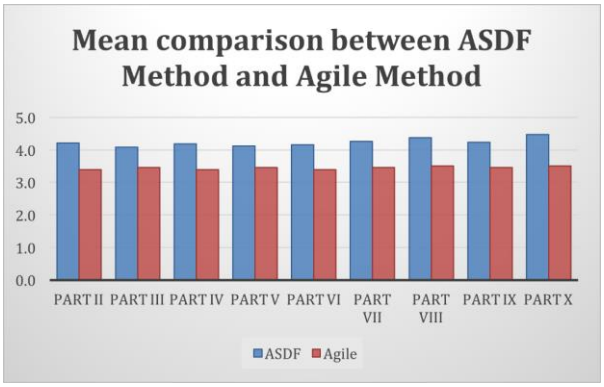


Figure 4.2: Mean Comparison between ASDF and Agile Methods

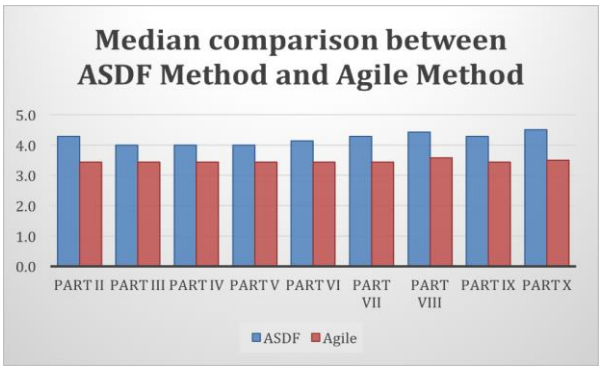


Figure 4.3: Median Comparison between ASDF and Agile Methods

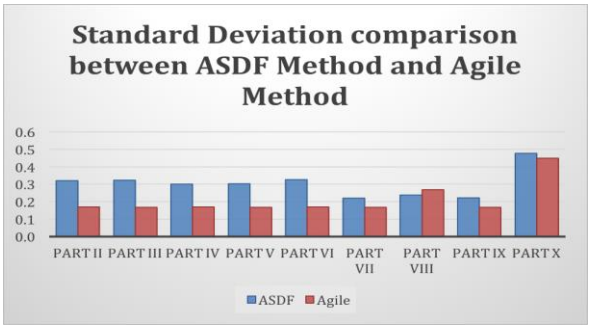


Figure 4.4: Standard Deviation Comparison between ASDF and Agile Methods

Figure 4.5 indicates that the p-value of all samples are <0.05 which simply means that all sample distributions are non-normal. Thus, a non-parametric test (Mann-Whitney) is used for data analysis.

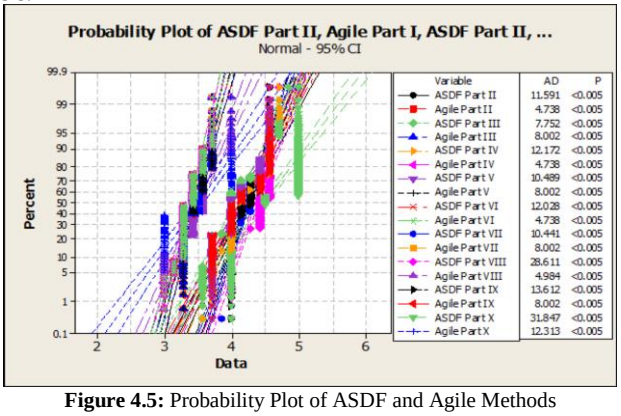


Figure 4.5: Probability Plot of ASDF and Agile Methods

5.2 Findings

The findings provided the input concerning the development of the new proposed ASDF and agile methods which derived from the interviews. It started by providing some background data related to the previous mode of operation in the teamwork samples as

shared by the stakeholders of the transformation projects and the new proposed ASDF method team members. After presenting the baseline situation, the researcher elaborated people's perceptions and experiences with regards to the new proposed ASDF mode of operation. Many of the statements made by the interviewees were comparisons to the previous agile mode of operation, which become the evident in the resulting questionnaire to base the findings on. As previous studies, such as (26-27), have pointed out that a person's attitude towards the new proposed ASDF method seems to change for the more positive due to the quality of skills in a teamwork in which the researcher wanted to take this into consideration as well. Therefore, the researcher presented the findings by describing people's attitudes at the beginning of the change process first, and how they have developed on time and short time based on new proposed ASDF method. Then, the key findings related to themes of performance, quality, workload, stress level, team dynamics, communication, empowerment, trusting, wellbeing and contentment on ASDF method were presented. In relation to these themes, the researcher tried to point out the distinctive differences in opinions among the team members who are new to ASDF method and the team members with more experience working in the agile mode. Lastly, the researcher summarized the main benefits of new proposed ASDF method as perceived by the respondents in ASDF teamwork A.

5.2.1 Input for User Requirement Specification and System Requirement Specification

Teamwork A and B went through the transformation process into ASDF mode quite recently that is started in April 2014 and ended in September 2015. An External Consultant who was interviewed in this study prepared a "current state analysis" concerning teamwork A when the agile method was still in place. In addition, the researcher also interviewed a Software Quality Manager, who has an insight into the way things were organized inside the organizational unit that teamwork A is a part of.

Teamwork B has gone through the agile transformation process since 2008, thus, it was not that simple to gain an insight into the baseline situation in that case. However, some of the interviewees who have been on the team long enough to explain what the situation was before the transformation process. In addition, there were some new team members in teamwork B who were able to share the transformation process in teamwork A. Overall, it did not seem to make a lot of difference on which agile method team the person has been a part of previously. No matter what the background is, the same themes arose in the conversations across the teams with regards to practicing the agile method. The shortcomings in the agile method seemed to be very similar to those often explained in the literature, such as there is no documentation to be referred to in the next development cycle by different people. In addition, ineffective prioritizing of requirements and estimation, not being able to concentrate on actual development due to additional things such as meetings, and general lack of order and even chaos in work practices were experienced.

The agile method has been predominantly being the case of working model across public sector previously which is similar to the sample of this study that is teamwork B. Work was organized according to projects across software development teams, as opposed to which contain tasks from different entities. This resulted in employees have to ineffectively switch between tasks and meetings several times a day for different projects. Each project has its own priority order and budget and at the same time, the resources for each project were allocated separately according to their priorities. Therefore, this put the projects in a competing environment according to their significance. In most cases, projects with lower significance were highly likely to be terminated should there be any change in priorities or downsize exercise. In addition, rather than prioritizing the tasks according to their priority they were actually prioritized based on the priority of the project instead. Moreover, the priorities evaluation and estimation for given tasks were fallen on a single developer's shoulders and not prioritized strategically by an input in URS and SRS teams, such as in ASDF mode (External Consultant, ASDF model, August 2014). As a matter of fact, a project was required to be set up first prior to addressing any required change and this normally took longer time. As a result, projects and their milestones were lacking behind schedule (Software Quality Manager, interview, October 2014).

The previous work mode was System Analyst driven. Instead of dividing the responsibility among team members, each team was assigned to one System Analyst who is responsible for ensuring the success of the project as well as to assign tasks to team members. Furthermore, the work was carried out in a manner that focuses on people conducting their own, individual projects and domains, instead of working on the same entities through a teamwork. This is a nature in organizations that carry out their work based on the agile method.

5.2.2 Process for Module

There were mixed feelings when people first heard that ASDF method to be implemented in their team. It could be seen that members in teamwork A were quite enthusiastic and curious about it, however, those in teamwork B experienced high levels of change resistance. People came from different team backgrounds, and have been working using ASDF method for quite some time, so their initial feelings varied as well. Thus, it was quite noticeable that the team tends to have quite a uniform views about ASDF method, either good or bad, and there are a lot of factors contributing to these feelings. If they experienced some difficulties in the implementation process itself, there was a high tendency for them to question the benefits of ASDF method. Moreover, those who have worked in the agile mode, especially the senior developers, for quite a number of years seemed to be more resistant towards the change and it required quite an effort to persuade them to internalize the benefits of working in an ASDF mode and to get used to it.

Those who preferred and curious about the idea of ASDF method from the very beginning have a very positive attitude despite not having the attitude changing experience for quite some time. Nevertheless, some of the team members did have quite a negative feeling or, at least, felt skeptical in the beginning towards the new ASDF development environment. After quite some time, all the interviewees, who were skeptical and might have been resistant towards the change in the beginning, said that their attitudes changed for the better. This was due to a better understanding of the ASDF method such as attending training sessions as well as having the first-hand experience of getting responsibilities and getting involved in the new ways of doing things. It is quite an understatement to say that the process is always viewed as easy since it was quite a challenge to manage the mixed feeling among those involved as well as the strong resistance to change in some people. The negative attitudes were mostly prevailing in teamwork B. Managing such attitudes was a tough process in the beginning. Although some of the challenges are still there but things seem to be in place and the team is heading towards the right direction. According to teamwork B, in the very beginning, 50% of them felt that it was a positive change, however, the remaining 50% felt that it was awful since it looked like it is promoting micromanagement. It took a lot effort to change the negative perceptions and to reduce the resistance. It was as though there were some distinctive qualities in teamwork B that triggered a lot of negative feelings in the beginning. The ASDF method was quite broad and did not support the change enough and at the same time the team comprised of more senior people, who were so used to working in certain ways.

5.2.3 Process for Database

After adopting the ASDF method, the majority felt that the productivity, performance and quality of skills in a teamwork have significantly improved. In terms of the performance, they felt that the most significant factors were shorter iterations and regular checking with the client, as well as working according to the database. The shorter iterations were considered as the enabling factor to enable getting completed products out to the client faster and the developers enable transparency as well as overall control over things that need to be done.

According to teamwork B, the productivity has significantly increased, because they were able to accelerate the completed product release to the client. In the past, there were so occupied with many overlapping projects and other ad-hoc tasks that small things tend to be drowned in the workload, and they were completed really late behind the schedule. Now, they are able to complete more things and little things are accelerated and it is also quicker to get them into usage. Previously, it was hard to see any result for months. However, now, every single week and depending on how long the project milestone is, they are combining results into something and are actually releasing things for the business. Even though the entities are small, they always have the feeling that something is moving forward.

Developers pointed out that in most cases ASDF method does increase effectiveness, but this is subject to the current know-how of people. They claimed that ASDF will not work in a team comprises of mostly junior level developers. This is due to the fact that each team member has to independently design the functionality of each level in ASDF method. In contrary, in the agile method, the design is done earlier by certain people who have the required competencies. Therefore, in the ASDF teamwork, each team member must have the required competencies and know-how to complete different test levels quite individually, otherwise, the team will not perform effectively. A lead developer stated that he has the experience in which the team performance decreased when a newcomer joined the team. On the other hand, he stated that newcomers learn faster in the ASDF team than in the agile one because they are straight away getting involved in every level of the method.

The number of those who could not see any difference in productivity in ASDF mode compared to the previous mode may have even lessened. They basically said that the team has always been extremely effective regardless how things are organized. Thus, some of the developers during the interview, through the questionnaire, felt that before the agile mode, they were able to react quite fast and perhaps complete the end-product to be released to the market sooner than now, however, they admitted that the release process itself was more chaotic back then. However, it was common in the past that a person agreed to complete bigger tasks by breaking them into smaller tasks between individuals, thus, there is no reason for a person to work longer. Therefore, they felt that the productivity has in fact decreased as it took a longer time to complete things because people did not work extra hours. On the other hand, they felt that product quality has improved in accordance with skills in a teamwork.

5.2.4 Process for User Acceptance Testing

All respondents felt that ASDF method has improved the collaboration and openness within the teamwork. In most cases, people felt that because of close collaboration, the relationships between people were closer and better compared to in agile method. All interviewees also thought that teamwork has significantly improved communication, which resulted in a more effective transfer of knowledge and know-how, thus, improved the learning process. Most of the interviewees enjoyed the close teamwork and collaboration, or, at least, nobody admitted that they would prefer working alone instead. In fact, everyone agreed that analysis system development framework (ASDF) enhances open communication and teamwork within a team. But the way they affect the team dynamics is not a directly positive. This is because open communication can cause both negative and positive feelings across the team. In both teamwork A and B, the current team spirit was regarded as positive.

However, all the interviewees had a uniform opinion on the definite increase in communication within the team after analysis system development framework (ASDF) was adopted. The main reason for improved communication was said to be the compulsory meetings that are a vital part of analysis system development framework (ASDF) practices. In analysis system development framework (ASDF), meeting with any team of different levels were often mentioned as the most obvious association to the improved communication, because they enable the whole team to gather face-to-face at least once a day, and briefly discuss what everyone is doing and possibly give advice and recommendation to fellow team members. Nevertheless, some pointed out that one disadvantage of having such meetings is that there are people working off-site, thus, they may have to use emails or other available technologies in order to participate in the meeting. The transparency that is the result of information sharing during the meeting was associated with being able to give more positive feedback to others. It was also perceived that the communication with the customer at every level has significantly increased as well. It enables the team members to share their progress and accomplishment with the client and the client can give their feedback as they progress.

The ASDF mode changes people's roles and responsibilities in the sense that there should no longer be strict, predetermined areas of responsibility for everyone as everyone should be able to take any task. The interviewees have been working in the agile mode for the past five years and many of them felt that people are no longer specialized that much in a single area in which everyone is pretty much able to conduct any task that has a top priority at that moment. Therefore, those who are in ASDF mode for only half a year when the interviews were conducted, felt that they have started practicing a lot of transfer of knowledge and know-how among team members since the agile method was adopted. Even though they felt the process was not any near to the final state, nevertheless, a lot of improvement have already taken place.

However, some people still prefer to work just within their own specialized areas. Normally, these are senior level employees who are so used to working in certain ways in the same organization for many years, in fact, in some cases for more than a decade. Nevertheless, these people also admitted that learning new skills and, therefore, able to conduct various tasks was ultimately beneficial for the whole team and organization.

5.2.5 Output for Final Acceptance Testing

Most of the employees did not see a direct impact on the workload either increasing or decreasing after the adoption of ASDF method. It was perceived as a very personal thing, in both modes, that is depending on the individuals on how much work they are willing to commit. Thus, most people did not feel the amount of work conducted has significantly changed after adopting the agile method. However, ASDF principles of sustainable pace and transparency were seen to have an impact on the fluctuation of workload as well as effective planning of the way things are executed.

In fact, approximately half of the interviewees did not see a clear association between stress level and work mode. This can be seen based on two different viewpoints. Some people felt that the nature of the work itself is still quite similar although the work mode has changed. On the other hand, some people felt that it is simply a personality trait that is to either feel stressed out about work or not, thus, the work mode does not have any significant impact on that characteristic. Those who could see some kind of an association between work mode and stress level, in most cases, felt that working in ASDF mode decreases stress.

Many respondents were of the opinion that the main reason for decreased stress among ASDF team members was due to the fact that one can simply take one task at a time during the development and there is no need to think about other stuff while working on it. Therefore, if too much work is assigned to the developers, it can cause stress to certain individuals. This is basically a question of inaccurate estimation techniques of workload within the team or the fact that, in some cases, it is very difficult to estimate the amount of time required to complete certain tasks. The aim of ASDF is to avoid situations in which too little or too much work is assigned to each developer and focus on the quality of skills in a teamwork.

However, it was difficult for some people to objectively analyse if stress level has increased or decreased since the adoption of the agile method. This is because the change process from one mode to another often involves new roles and changes in the job description as well. Moreover, at the time the agile method was adopted to teamwork B, the change process was overlapping with INOLES structure implementation, thus, some people experienced a difficult time to evaluate how much that has affected their stress level in the equation and which part was caused by working in ASDF mode. Those were the main reasons some people found that it was hard to comment on this question.

In ASDF method, there were some interesting contradictions in terms of feeling stressed out. On one hand, the deadlines are stricter when working in a fixed cycle of two or three weeks compared to in a project mode in which the project milestones were regarded as more vague targets. The environment does not allow the employees to take additional days easily as they are now supposed to be working at a sustainable pace and, in fact, they are supposed to get work done every day. Moreover, they cannot take upon multiple and large-scale projects to work by themselves as work is split among team members into smaller tasks. This was seen to decrease stress.

5.2.6 Empowerment for the Whole Level Based on ASDF Method

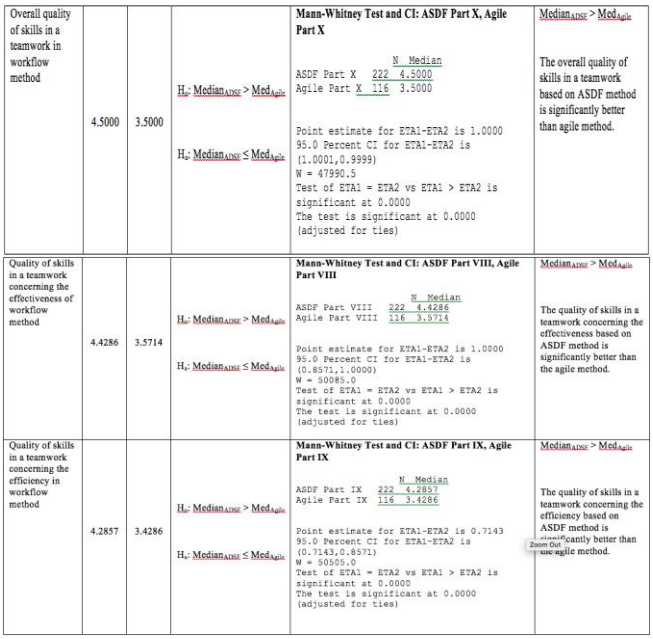
Based on the data obtained from the interviews, through the use of a questionnaire, there were mixed views on the effect of empowerment based on the ASDF method. Empowerment, in this case, is referred to the ability to freely make decisions regarding one's work and taking on responsibilities, on individual and teamwork level. It also means, without anyone trying to interfere with or control the process, the team feels trusted for being able to conduct its work independently.

All except for one person noticed that there is a difference in empowerment as compared to the previous work mode. Most of the interviewees also noticed a positive effect, for example, they felt that the teamwork was more independent than before. However, many interviewees said that teamwork responsibilities were better when ASDF method was adopted. This was seen either as a negative or positive with the most positive comments came from teamwork A and B while other people felt that the agile method has a negative effect on being able to take on responsibilities.

Therefore, many of the employees felt that, in ASDF, a single developer is able to influence their own work less than before while the team as a whole has more power to decide what to do than before. The latter was mainly because all ASDF team members gather together in the development planning meeting to decide on what and how much work is required for each task. Thus, the power at the team level was seen to have increased. Many interviewees started talking about the transparency, which is a vital part of the ASDF process when they were asked whether they feel that ASDF and agile practices have any influence on trust and controlling. From the feedback received, it was obvious that they felt the control over what was done has improved a lot. Nevertheless, there were mixed of personal feelings towards control and monitoring despite they acknowledged that these benefit the company as well as the teamwork. Most interviewees did not have any problem with the monitoring issue, however, some people did have negative things to say. In fact, some people felt that the control has taken away their personal freedom to work according to their own pace. Moreover, it also brought about the fear of people watching everyone else's doings and comparing results. However, people said that this was not the mentality inside any of the teamwork, but that they know a teamwork that has this kind of atmosphere.

Table 4.3: Overall Results of Data Analysis extracted from Minitab

Parts	Median ASDF	Median Agile	Hypothesis (Mann-Whitney)	Result from Minitab	Analysis Result
Quality of skills in a teamwork of user requirement specification (URS) in workflow method	4.2857	3.4286	H_0: $Median_{ADSF} > Med_{Agile}$ H_1: $Median_{ADSF} \leq Med_{Agile}$	**Mann-Whitney Test and CI: ASDF Part II, Agile Part II** N Median ASDF Part II 222 4.2857 Agile Part II 116 3.4286 Point estimate for ETA1-ETA2 is 0.8571 95.0 Percent CI for ETA1-ETA2 is (0.7143,1.0000) W = 50211.5 Test of ETA1 = ETA2 vs ETA1 > ETA2 is significant at 0.0000 The test is significant at 0.0000 (adjusted for ties)	$Median_{ADSF} > Med_{Agile}$ The quality of skills in a teamwork of user requirement specification (URS) based on ASDF method is significantly better than the agile method.
Quality of skills in a teamwork of system requirement specification (SRS) in workflow method	4.0000	3.4286	H_0: $Median_{ADSF} > Med_{Agile}$ H_1: $Median_{ADSF} \leq Med_{Agile}$	**Mann-Whitney Test and CI: ASDF Part III, Agile Part III** N Median ASDF Part III 222 4.0000 Agile Part III 116 3.4286 Point estimate for ETA1-ETA2 is 0.5714 95.0 Percent CI for ETA1-ETA2 is (0.5714,0.7143) W = 49564.5 Test of ETA1 = ETA2 vs ETA1 > ETA2 is significant at 0.0000 The test is significant at 0.0000 (adjusted for ties)	$Median_{ADSF} > Med_{Agile}$ The quality of skills in a teamwork of system requirement specification (SRS) based on ASDF method is significantly better than the agile method.
Quality of skills in a teamwork of module integration in workflow method	4.0000	3.4286	H_0: $Median_{ADSF} > Med_{Agile}$ H_1: $Median_{ADSF} \leq Med_{Agile}$	**Mann-Whitney Test and CI: ASDF Part IV, Agile Part IV** N Median ASDF Part IV 222 4.0000 Agile Part IV 116 3.4286 Point estimate for ETA1-ETA2 is 0.7143 95.0 Percent CI for ETA1-ETA2 is (0.7143,0.8571) W = 50337.0 Test of ETA1 = ETA2 vs ETA1 > ETA2 is significant at 0.0000 The test is significant at 0.0000 (adjusted for ties)	$Median_{ADSF} > Med_{Agile}$ The quality of skills in a teamwork of module integration based on ASDF method is significantly better than the agile method.
Quality of skills in a teamwork of database implementation in workflow method	4.0000	3.4286	H_0: $Median_{ADSF} > Med_{Agile}$ H_1: $Median_{ADSF} \leq Med_{Agile}$	**Mann-Whitney Test and CI: ASDF Part V, Agile Part V** N Median ASDF Part V 222 4.0000 Agile Part V 116 3.4286 Point estimate for ETA1-ETA2 is 0.7143 95.0 Percent CI for ETA1-ETA2 is (0.5714,0.7143) W = 49893.0 Test of ETA1 = ETA2 vs ETA1 > ETA2 is significant at 0.0000 The test is significant at 0.0000 (adjusted for ties)	$Median_{ADSF} > Med_{Agile}$ The quality of skills in a teamwork of database implementation based on ASDF method is significantly better than the agile method.
Quality of skills in a teamwork of user acceptance test (UAT) in workflow method concerning the interface, programming syntax, module, and database before handing over to end users	4.1429	3.4286	H_0: $Median_{ADSF} > Med_{Agile}$ H_1: $Median_{ADSF} \leq Med_{Agile}$	**Mann-Whitney Test and CI: ASDF Part VI, Agile Part VI** N Median ASDF Part VI 222 4.1429 Agile Part VI 116 3.4286 Point estimate for ETA1-ETA2 is 0.7143 95.0 Percent CI for ETA1-ETA2 is (0.7143,0.8571) W = 50224.5 Test of ETA1 = ETA2 vs ETA1 > ETA2 is significant at 0.0000 The test is significant at 0.0000 (adjusted for ties)	$Median_{ADSF} > Med_{Agile}$ The quality of skills in a teamwork of user acceptance test (UAT) based on ASDF method concerning the interface, programming syntax, module and database before handing over to end users is significantly better than the agile method.
Quality of skills in a teamwork of final acceptance test (FAT) in workflow method concerning the final interface, programming syntax, module and database after handing over to end users	4.2857	3.4286	H_0: $Median_{ADSF} > Med_{Agile}$ H_1: $Median_{ADSF} \leq Med_{Agile}$	**Mann-Whitney Test and CI: ASDF Part VII, Agile Part VII** N Median ASDF Part VII 222 4.2857 Agile Part VII 116 3.4286 Point estimate for ETA1-ETA2 is 0.7143 95.0 Percent CI for ETA1-ETA2 is (0.7143,0.8571) W = 50505.0 Test of ETA1 = ETA2 vs ETA1 > ETA2 is significant at 0.0000 The test is significant at 0.0000 (adjusted for ties)	$Median_{ADSF} > Med_{Agile}$ The quality of skills in a teamwork of final acceptance test (FAT) based on ASDF method concerning the final interface, programming syntax, module and database after handing over to end users is significantly better than the agile method.



Overall quality of skills in a teamwork in workflow method	4.5000	3.5000	H_a: $Median_{ADSF} > Med_{Agile}$ H_o: $Median_{ADSF} \leq Med_{Agile}$	**Mann-Whitney Test and CI: ASDF Part X, Agile Part X** N Median ASDF Part X 222 4.5000 Agile Part X 116 3.5000 Point estimate for ETA1-ETA2 is 1.0000 95.0 Percent CI for ETA1-ETA2 is (1.0001,0.9999) W = 47990.5 Test of ETA1 = ETA2 vs ETA1 > ETA2 is significant at 0.0000 The test is significant at 0.0000 (adjusted for ties)	$Median_{ADSF} > Med_{Agile}$ The overall quality of skills in a teamwork based on ASDF method is significantly better than agile method.
Quality of skills in a teamwork concerning the effectiveness of workflow method	4.4286	3.5714	H_a: $Median_{ADSF} > Med_{Agile}$ H_o: $Median_{ADSF} \leq Med_{Agile}$	**Mann-Whitney Test and CI: ASDF Part VIII, Agile Part VIII** N Median ASDF Part VIII 222 4.4286 Agile Part VIII 116 3.5714 Point estimate for ETA1-ETA2 is 1.0000 95.0 Percent CI for ETA1-ETA2 is (0.8571,1.0000) W = 50085.0 Test of ETA1 = ETA2 vs ETA1 > ETA2 is significant at 0.0000 The test is significant at 0.0000 (adjusted for ties)	$Median_{ADSF} > Med_{Agile}$ The quality of skills in a teamwork concerning the effectiveness based on ASDF method is significantly better than the agile method.
Quality of skills in a teamwork concerning the efficiency in workflow method	4.2857	3.4286	H_a: $Median_{ADSF} > Med_{Agile}$ H_o: $Median_{ADSF} \leq Med_{Agile}$	**Mann-Whitney Test and CI: ASDF Part IX, Agile Part IX** N Median ASDF Part IX 222 4.2857 Agile Part IX 116 3.4286 Point estimate for ETA1-ETA2 is 0.7143 95.0 Percent CI for ETA1-ETA2 is (0.7143,0.8571) W = 50505.0 Test of ETA1 = ETA2 vs ETA1 > ETA2 is significant at 0.0000 The test is significant at 0.0000 (adjusted for ties)	$Median_{ADSF} > Med_{Agile}$ The quality of skills in a teamwork concerning the efficiency based on ASDF method is significantly better than the agile method.

6. Future Work

Although the findings of this study revolve around the new proposed ASDF method as a whole, some recommendations for future research have been provided to enhance the findings .The researcher plans to conduct a comprehensive survey to identify issues and challenges experienced in software development projects based on the new proposed ASDF method.

Another interesting research goal to be considered is to identify human and social factors and to investigate their impacts on the success or failure of software development projects based on the new proposed ASDF method. This study covers only the new proposed ASDF method, whereas the tools of this method are not included in the scope of this study. Thus, to further extend the current context, another possible research topic could be to study the tools used to support the new proposed ASDF method.

7. Conclusions

The present research of new proposed ASDF method is accomplished. Regarding objectives for system development are concluded to verify the main problem of extended project timeline teamwork and the decrease of a high team collaboration and understanding in system development are proved and accomplished. Therefore, concluded for determine the project development is on tie in oder to control and increase the quality of skills in a teamwork collaboration and understanding in system development.

The present survey found teamwork quality and team performance to be highly related when team members rated these two concepts. Futhermore, the correlation between teamwork qualityand members' success – their work satisfaction and learning – approach unity. One interpreation is that the team members consider teamwork quality and team members' success as indistinguishable concepts. The team leaders' preception of team performance had a medium correlation with teamwork quality. In contrast, no effect of teamwork quality on team performance was found when product owners rated team performance. The effect of teamwork quality on team performance was higher for product quality (in particular regarding team members and team leaders) than for project quality.

Despite the emphasis on teamwork quality in the agile community, in the traditional and the agile surveys alike, both the evaluation of teamwork quality itselft and its effect on team performance and team members' success were similar. However, the agile survey showed lower agreement among the raters regarding evaluation of team performance than was the case in the traditional survey. An implication of this survey is that the quality of teamwork is a major factor in improving team performance, especially for improving the quality of the team's product. Note that when trying to optimize team performance, one needs consensus of whose view of team performance should be considered. For the future, we recommend that more research efforts be made to validate the teamwork quality construct and to advance the measurement of team performance with to enhance the agile method by proposing a new ASDF software development method and for specific objective is to measure the quality of skills in a teamwork based on new proposed ASDF method during the development work. This research covers the following research areas as to validate the ASDF method in the quality of skills in a teamwork of user requirement specification (URS), system requirement specification (SRS), module, database, user acceptance test (UAT) and final acceptance test (FAT).

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