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"Applying Best Practices for Improving the Performance of Software Project Manager"

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Abstract:

This paper focuses on proposing a quality assurance model for Software Projects Management. This paper presents some important concepts related to this field. It presents the phases and activities of software project management. This paper presents a set of proposed steps for achieving each activity of planning ISs projects. Depending on the proposed steps and a combination of statistical techniques, this paper introduces a proposed quality assurance model for software project management activities. This proposed model can be used to build an automated software tool.

Keywords: Software Projects Management, Quality Assurance Tool, Quality Assurance Model, Information Systems Projects.

1- Introduction

Software Project Management (SPM) is the ongoing activity for planning, organizing, directing, and controlling progress to develop an acceptable system, i.e., conforming to the quality standards within the allocated time and budget. Process management is the ongoing activities that establish standards for activities, methods, tools, and deliverables of the life cycle. In other words, process management aims to manage the process of IS development, but SPM aims to manage the project.

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Project management is very important for the success of IS projects. The mismanaged projects may lead to unfulfilled or unidentified requirements, uncontrolled change of project scope, uncontrolled change of technology, uncontrolled risk of the project, uncontrolled subcontracting and integration, cost overruns, and late delivery [5].

ISs projects frequently fail. The rate of failure in large IS projects is larger than the rate of success. The failure rate of large projects is reported as being between 50%-80% [7]. An IS project is considered a failed project if it does not achieve the requirements or specifications. In other words, it is executed less or more than the planned scope. Also, it is considered a failed project if it is executed out of the budget or schedule.

The problem is that there is a considerable number of failed IS projects. Also, there is no integrated standards that can be used to increase the success chance of IS projects. Most international quality standards or frameworks such as ISO, IEEE, CMM, CMMI, and TICKIT don't focus on SPM.

There is many literatures for quality of software and IS development but there is no sufficient literature on the quality of SPM activities. For previous reasons, the quality of SPM is the main concern of this paper.

2- SPM Phases and Domains

SPM activities can be organized as life cycle phases that include initiating the project, planning the project, executing the project, and closing the project [18]. Also, SPM activities can be organized in SPM domains that include project scope management, project schedule management, project costs management, project integration management, etc.

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2-1 SPM Phases

SPM can be viewed as life cycle phases that include initiating the project, planning the project, executing the project, and closing the project [4]. Each phase includes a set of activities. SPM activities are achieved throughout developing software or information system projects. The life cycle of SPM. A common life cycle of SPM that includes four phases [4]:

1. Initiating the project.
2. Planning the project.
3. Executing the project.
4. Closing the project.

Initiating the IS project aims to understand project environment, background, stakeholders, and management [6]. Planning the project is the process of defining clear, discrete activities and the work needed to complete each activity within a single project. The product of the planning process is the project plan, a document that describes the project and how the project manager intends to execute it [4].

Executing the project includes a set of on-going activities that are achieved throughout the project development. It includes all activities that must be continuously carried out until the project is finished [6].

Closing the project aims to bring the project to an end. Projects can conclude with a natural or an unnatural termination. A natural termination occurs when the requirements of the project have been met – the project is successful. An unnatural termination occurs when the project is stopped before completion [4]. This paper focuses on planning the project.

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2-2 SPM Domains

Another common approach for viewing SPM activities is SPM domains that include:

- Project Scope Management: involves activities to define and control what is included in the project and what is out of its scope. Project scope is the base of the subsequent phases and activities in the project.
- Project Schedule Management: is the administration and control of the finite resource of time. The project manager must manage the schedule carefully for preventing or correcting any slippages.
- Project Costs Management: is the planning and control required to ensure that a project is completed within the approved budget. The three conventional measures of project success are budget, schedule, and functionality.
- Project Integration Management: includes the processes required to ensure that the various elements of the project are properly coordinated.
- Project Quality Management: quality of IS projects means that these projects conform to the requirements or specifications and have minimized errors. The quality of IS projects must be achieved within the planned time and cost for these projects.
- Project Human Resources Management: involves those processes required to make the most effective use of the people involved in a project [2].
- Project Communication Management: involves the timely and appropriate generation, collection, dissemination, storage, and ultimate disposition of project information. It provides critical links among people, ideas and information that are necessary for success within the project team and out to the business.

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- Project Risk Management: includes the processes concerned with identifying, analyzing and responding to project risks, maximizing the results of positive events and minimizing the consequences of adverse events.
- Project Subcontracting Management: has a great importance because if one of the subcontractors late, this may lead to project slippage. So, the project manager must ensure that everything is clear to subcontractors. Also, the project manager must know the legal and financial issues of subcontracting.
- Project Documentation Management: there are two types of project documents: those that the project manager needs in order to manage the project, and the vastly more voluminous technical data. The documents of technical data must be kept and accessible to all project staff.
- Users Participation Management: the project manager and his team must make time for users, insist on their participation, and seek agreement from them on all decisions that may affect them. Involving the system users facilitates the definition of the new system requirements.
- Review and Approval Process Management: include the procedures by which project deliverables will be reviewed and accepted. The review process produces comments that should be documented and analyzed to be considered in making changes to the reviewed deliverables. The review and approval procedures may be iterated till reach to an approved deliverable.
- Systems Development Management: The project manager must select an appropriate development methodology and manage it effectively.
- Feasibility Study Management: The project manager must make attention to the project feasibility throughout the project phases to decide whether to continue, redirect, or abandon the project. Feasibility study may include the following categories: financial, technical, operational, legal, political, and schedule.

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3- Proposed List of Quality Steps for SPM Activities

SPM phases are achieved throughout steps. Appendix (A) includes a set of proposed quality steps for achieving the activities of the planning project (as example). These steps were supported by opinions and visions of many textbooks, papers, web sites, international standards, CMM and CMMI, consultants, World Bank projects, experience, and technical reports.

4- Proposed Quality Assurance Model

Based on the proposed steps, the researcher can build a proposed quality assurance model for evaluating the quality of achieving an SPM activity.

1. Select an SPM activity.
2. Input the actual data of the selected activity.
3. Calculate the quality of the selected activity.
4. Interpret the quality of the selected activity.

4-1 Select an SPM Activity

The SPM phases, activities, and steps should be identified and described before any work in the project. So, the first procedure in the proposed model is identifying the activity to be evaluated and defining its steps. The proposed model enables the project manager and quality reviewers to use any SPM life cycle on one condition: the selected SPM life cycle must consist of phases, each phase must consist of activities, and each activity can be achieved through a set of tasks or steps. The quality reviewers may use local or international steps. Also, they may define their steps. Sometimes, quality steps for achieving SPM activities may be imposed by

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higher level of management. Then, the quality reviewers inform and clarify these steps to the project manager. The project manager should use these steps as a guide for achieving the selected activity. The project manager should understand the proposed steps to apply them effectively for achieving the selected activity. The algorithm of this procedure includes the following steps:

1. Select an SPM phase.
2. Select an SPM activity related to the selected phase.
3. Recall the steps of the selected activity.
4. Inform and clarify the steps to the project manager.
5. Achieve the selected activity.

4-2 Input the Actual Data of the Selected Activity

The second procedure in the proposed model is entering the actual data of achieving the selected activity that can be used for calculating the quality. This step is reached after executing the identified activity by the project manager. The quality reviewers collect the actual data of achieving the activity and input them to the model for computing the activity quality. For achieving the purpose of the proposed model, the proposed steps are organized in a table as in table (1). Table (1) presents a sample for this organization. We propose a rating scale for measuring the implementation of the steps of each activity. The proposed scale is based on that each step has a five-point rating scale. The midpoint of the scale is an average (AV) implementation of the step. The lower end of the scale is a poor (P) implementation of the steps, with the bottom of the scale being very poor (VP). The ratings on the upper end of the scale are good (G) and very good (VG). During computing the quality, the values 1,2,3,4, and 5 are corresponding to the ratings VP, P, AV, G, and VG respectively. The steps for achieving each activity are not having the same level of importance.

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So, each step must have a weight of 1, 2, or 3. The weight is a measure of the importance of each step. A weight 3 is used to show the step of the most importance or it is called a required step. A weight 1 is used to show the steps of the lowest importance or it is called an optional step. A weight 2 is used to show the step of the average importance or it is called a recommended step. Before evaluating any activity, the quality reviewers determine the weights of the steps. These weights are placed in the column titled "Importance Type". Also, some steps may be not applicable in some specific cases. So, there is a column titled "NA" in the table. During computing the quality, the not applicable steps are eliminated. The quality reviewers input the actual data for each step related to the selected activity. Table (1) presents a sample of the actual data for achieving the activity "Defining the project scope and deliverables" in the initiation phase.

Phases and Activities	Importance Type	NA	VP	P	AV	G	VG
Phase - Planning the Project							
Activity (1): Defining Project Scope and Deliverables							
1. Involve users in the process of defining project scope and deliverables.	2					√	
2. Define the project scope. The project scope should include functionality, business rules, procedures, interfaces to other systems, and the project deliverables.	3					√	
3. Define project deliverables. The project deliverables should be documented in a list, with brief description, of everything tangible that the project will produce.	3						√
4. Develop a written scope statement.	3				√		

Table 1. A sample of the actual data of achieving an IS-PM activity.

The proposed algorithm for entering the data of the activity includes the following steps:

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1. Identify the list of steps related to the selected activity.
2. Check the list of steps.
3. If it is not empty, continue, else end.
4. Select a step to be entered.
5. Identify the importance type of the selected step.
6. Identify the implementation value of the selected step (NA, VP, P, AV, G, or VG)
7. Go to step 2.

4-3 Calculate the Quality of the Selected Activity

The third procedure in the proposed model is calculating the quality of the selected activity. The not applicable steps and their weights are eliminated from calculations. We mentioned before that the steps don't have the same level of importance. So, the weighted mean is an appropriate statistical technique to measure the quality for the activity because it takes into consideration the impact of the weights of the steps. The weighted mean can be calculated using the formula:

$$\text{Weighted Mean} = (\sum Xi.Wi)/ \sum Wi$$

Where: Xi is the implementation value of each step i, Xi may take the value 1,2,3,4, or 5 that are correspondence to the ratings VP, P, AV, G, and VG respectively. Wi is the weight of each step i

Figure (1) illustrates a flowchart that presents the algorithm of this procedure. The algorithm includes the following steps:

1. Identify the list of entered steps related to the selected activity.

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2. Initialize the required variables. We will use four variables for calculating the quality. So, we initialize them by zero. Product=0, Sum-of-products=0, Sum-of-weights=0, Quality-value=0
3. Check the list of steps related to the selected activity.
4. If it is not empty, go to step 4,
   Else, compute Quality-value= Sum-of-products/Sum-of-weights,
   End.
5. Select a step.
6. Check the selected step. Is it a NA step?
   If it is not, go to step 6,
   Else, go to step 3.
7. Compute Product=Implementation value*Importance type.
8. Compute Sum-of-products= Sum-of-products + Product.
9. Compute Sum-of-weights=Sum-of-weights +Importance type.
10. Go to step 3.

To test this algorithm, we can compute the quality value for the selected activity "Defining the project scope and deliverables" according to the actual data presented in Table (1).

Quality value= (4x2 + 4x3 + 5x3 + 3x3)/(2 + 3 + 3 + 3) = 4/5

According to the actual data and calculations, the quality of the selected activity is 4. Based on the used statistical technique and rating scale, the quality value will range from 1 to 5.

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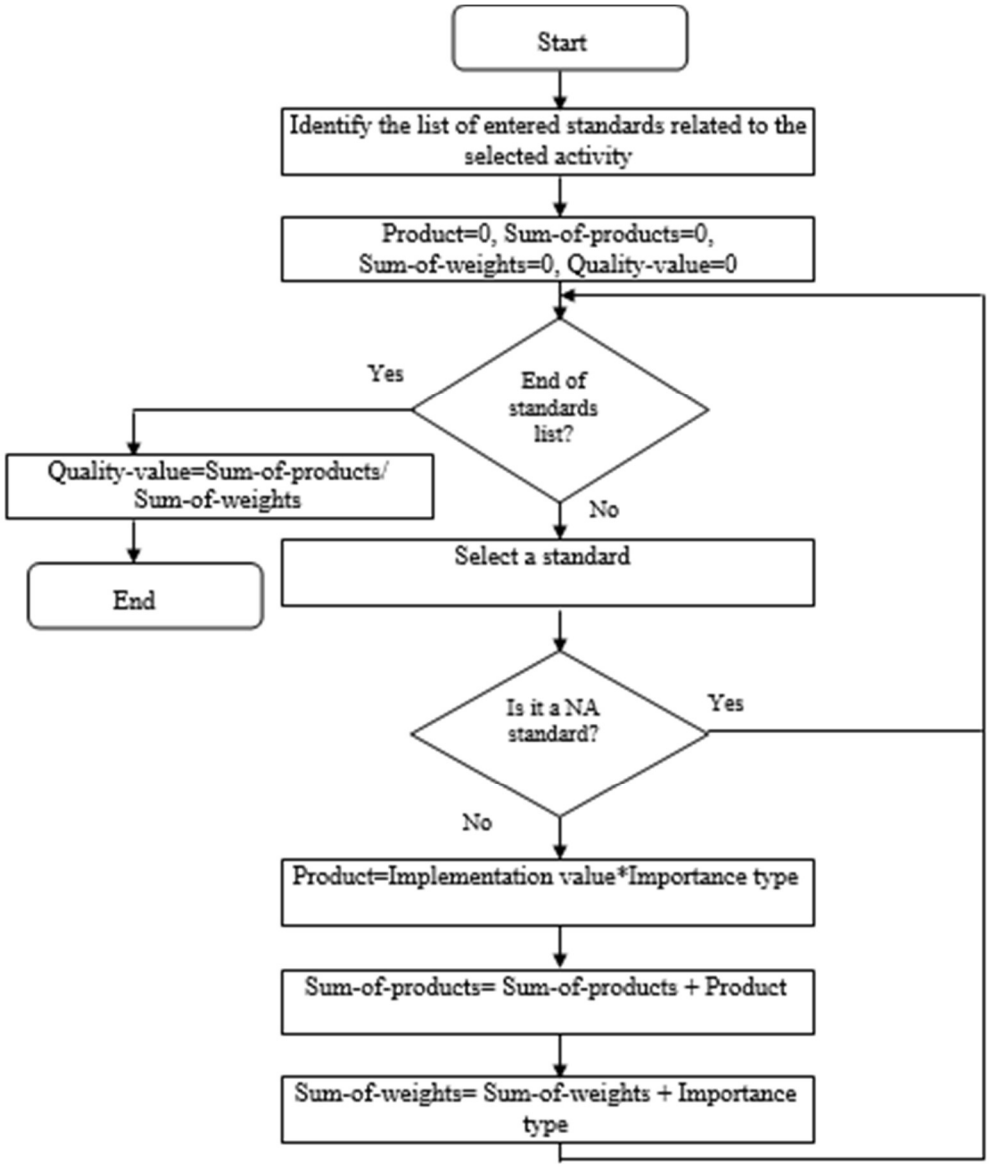

Figure (1): The algorithm of Calculating the quality of the selected activity.

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4-4 Interpret the Quality of the Selected Activity

The final procedure in the proposed model is interpreting the quality value of the selected activity. The quality reviewers should report their interpretation to their top management. Also, they may inform the project manager to increase the maturity of the implementation of this activity. If the quality value is not accepted, top management may take corrective actions or inform the project manager to take corrective actions. The acceptable level of quality is different from company to another or from project type to another.

The quality reviewers can determine a specific value in the range from 1 to 5 for judging and interpreting the quality value. The algorithm of this procedure includes the following steps:

1. Identify the interpretation table.
2. Input the quality value of the selected activity.
3. Compare the quality value with the values of the interpretation ranges.
4. Check the quality value.
   If it is accepted, go to step 6,
   Else continue.
5. Produce a report.
6. End.

5- Proposed Database Schema for Building an Automated Software Tool

Many facts can be used as business rules for building the proposed automated software tool for evaluating the quality of an SPM activity. These business rules include:

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1. The tool must be easy in use. It must include instructions for completing the forms.
2. The tool must have the ability to run as an on-line web site or as an off-line application.
3. The tool must check the data of signing in or up for the user.
4. SPM life cycle must include phases.
5. The tool must enable the user to use an existing SPM life cycle or to define his SPM cycle.
6. The tool user input the data of his project. The other users cannot modify or read these data.
7. The tool must enable to evaluate the quality of a specific activity, phase, or project.
8. The tool must enable the user to use an existing interpretation table or to input his interpretation table.

Figure (2) illustrates the database schema of the proposed tool. It takes the impacts of web technology into consideration such sign in, sign up, sign out, and data security. The database schema includes the tables:

- Country: aims to handle codes of countries that will be used in sign up form.
- Occupation: aims to handle codes of occupations that will be used in sign up form.
- User_Sign: aims to handle the data of users. This data will be used in sign in and sign-up forms. It will determine the authority of the user for accessing the data of the project and steps.
- SDLC_Style: aims to handle the data of ISPM life cycle. It will be used in the forms of quality steps.

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- Phase: aims to handle the data of ISPM phases.
- Activity: aims to handle the data of ISPM activities.
- Standard: aims to handle the data of ISPM steps. This data will be used in the forms of entering or using the quality steps.
- Project: aims to handle the data of the project. This data will be used in the form of evaluating the quality.
- Actual_ step: aims to handle the actual data of evaluating the quality of project activities.
- Interpretation_Style: aims to handle the data of interpretation styles that may be used for interpreting the quality value.
- Interpretation_Range: aims to handle the data of interpretation ranges that may be used for interpreting the quality value.

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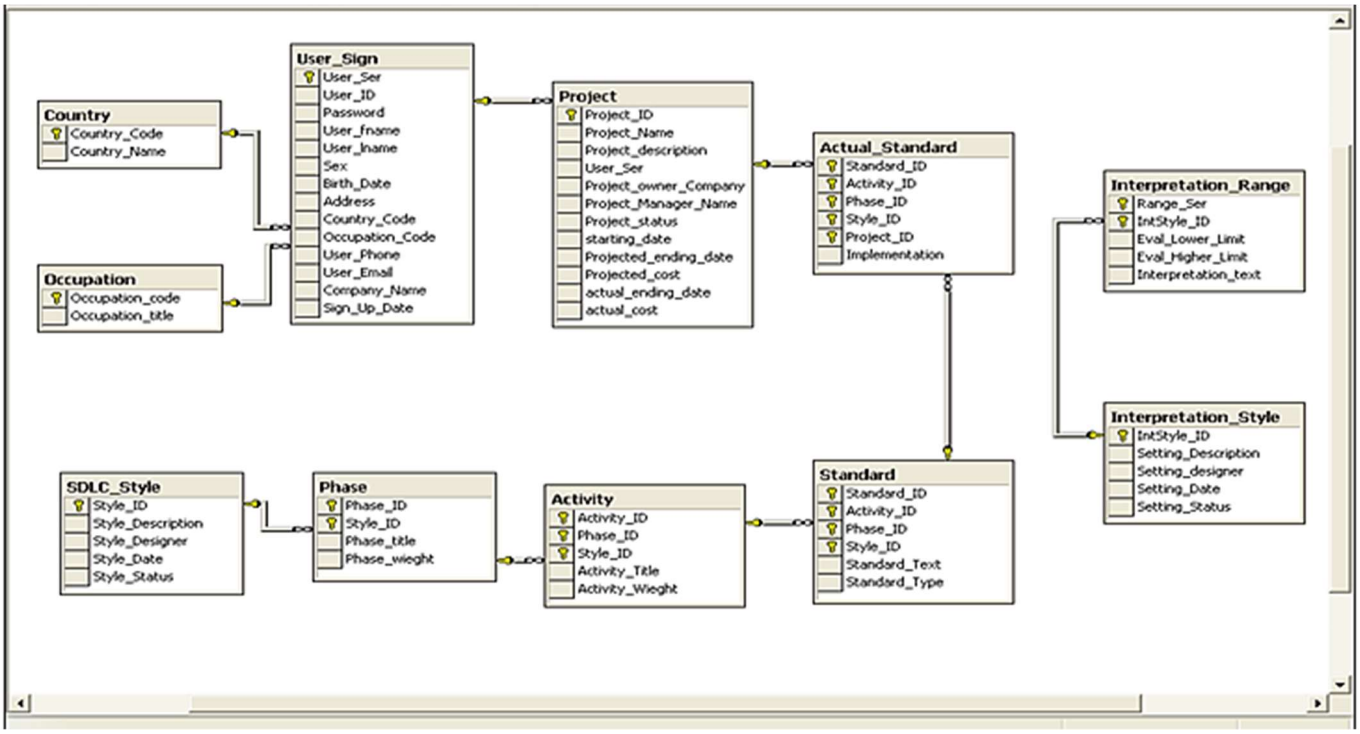

Figure (2): The database schema of the proposed automated tool.

6- Conclusion

The objective of this paper was to propose a quality assurance model for SPM. So, we presented a set of proposed steps for achieving the activities of planning ISs projects as a sample of quality steps that can be elaborated for SPM activities. The IS project manager and the quality reviewers can use these quality steps as a guide for achieving SPM activities. Based on the proposed steps and a combination of statistical techniques, we built a proposed model for evaluating the quality of SPM activities. The proposed model includes the main procedures: selecting an SPM

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activity, entering the actual data of the selected activity, calculating the quality of the selected activity, and interpreting the quality of the selected activity.

We conclude that quality reviewers are essential to be found within the SPM practices. Also, we found that special emphasis must be given to quality assurance for ISs projects in a trial to reduce the failure rate of ISs projects and increase the quality of achieving the SPM activities. Also, we found that it is important to build an automated software tool for evaluating the quality of the SPM activities. This paper presented a proposed database schema for building such a tool.

For future work, the following points are expected to be focused:

- Expanding the work to build an automated tool for evaluating the quality of SPM activities.
- Searching in more detail in quality and performance metrics.
- Expanding the work to build a model for evaluating the performance indicators of SPM domains.
- Expanding the work to build an automated tool for evaluating the performance indicators of SPM domains.
- Searching in more detail some critical issues in SPM such as risk management, subcontracting management, scope management, and configuration management.
- Elaborating critical success factors of IS projects.

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