HOW TO SUPPORT PROJECT MANAGEMENT BY USING SOFTWARE TO INCREASE THE EFFICIENCY AND PERFORMANCE OF SELECTED PROJECT STAGES

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HOW TO SUPPORT PROJECT MANAGEMENT BY USING SOFTWARE TO INCREASE THE EFFICIENCY AND PERFORMANCE OF SELECTED PROJECT STAGES

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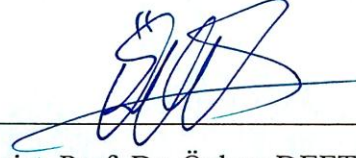
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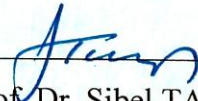
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ABSTRACT

HOW TO SUPPORT PROJECT MANAGEMENT BY USING SOFTWARE TO INCREASE THE EFFICIENCY AND PERFORMANCE OF SELECTED PROJECT STAGES

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Project management software is an application which has the capability to help with project planning, organizing, scheduling, managing, developing resource allocation and estimates management. It provides the project manager and his staff the ability to manage and cover most project activities and facilitate the project. Many organizations and enterprises have problems in choosing the appropriate tool in implementing their projects. Wherefore, this research tries to discover some important tools that can benefit projects implementation and investigates the ability of the project management software to enhance important project factors such as productivity, usability, flexibility and performance. Therefore, the objectives of this research include investigating the capabilities of available tools and techniques to provide a guideline to project management decision makers of the most efficient tools and techniques in their field. In addition, to show how project management software applications, for example (Teamwork), can make managers and team members cooperate and share information, activities within it. The findings of this study from different sources that there is wide acceptance about the benefits of project management software applications. Furthermore, there are some factors such as; usability, productivity, flexibility, and performance play very important role to achieve the promoting target of project management.

Keywords: Project management software, Teamwork software.

ÖZ

YAZILIM KULLANARAK SEÇİLEN PROJE EVRELERİNİN VERİMLİLİĞİNİ VE PERFORMANSINI ARTIRMAK İÇİN PROJE YÖNETİMİNİ NASIL DESTEKLERİZ

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Proje yönetim yazılımı; proje planlaması, organizasyonu, çizelgelendirilmesi, yönetilmesi, kaynak paylaştırmasının geliştirilmesi ile yardımcı olma kabiliyetinde ve yönetimi değerlendiren bir uygulamadır. Proje yöneticisine ve onun çalışanlarına yönetme yeteneği ve bir çok proje aktivitelerini içerme yeteneğini sağlar ve projeyi kolaylaştırır. Bir çok organizasyon ve işletme projelerini uygularken, uygun araç seçme problemlerine sahiptir. Bundan dolayı, bu araştırma; proje uygulamasına yararlı olabilecek bazı önemli araçları keşfetmeye çalışır ve verimlilik, kullanılabilirlik, esneklik, ve performans gibi önemli proje faktörlerini iyileştirmek için proje yönetim yazılımı yeteneğini araştırır. Bu nedenle, bu araştırmanın amacı mevcut araç ve tekniklerin kabiliyetini, proje yönetim karar vericilerine bu alanda en etkili araç ve teknikleri bir yolgösterimi sağlayarak araştırmayı içerir. Bununla beraber, Teamwork gibi, proje yönetim yazılımı uygulamalarının yöneticileri ve takım üyelerinin nasıl işbirliği yapabildiğini ve uygulma içerisindeki bilgileri, aktiviteleri nasıl paylaşabildiğini gösterir. Bu çalışmanın farklı kaynaklardan bulguları, proje yönetim yazılım uygulamalarının yararları hakkında geniş kabul olduğudur. Buna ek olarak; verimlilik, kullanılabilirlik, esneklik, ve performans gibi bazı faktörler vardır, proje yönetiminin hedeflerini başarmasını teşvik etmek için çok önemli rol oynamaktadırlar.

Keywords: Proje yönetim yazılımı, Teamwork yazılımı.

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I would like to dedicate this humble work with a bouquet of flowers' fragrance to all those I mentioned, and begging Allah, the most Generous, the most merciful to protect and grant them more much than their hopes and goals, both in this world and in the hereafter.

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LIST OF ABBREVIATIONS

CPM	Critical Path Method
GSS	Group Support Systems
IT	Information Technology
PM	Project Management
PMS	Project Management Software
PMBOK	Project Management Body Of Knowledge
WBS	Work Breakdown Structure

CHAPTER 1

INTRODUCTION

1.1 Background

Project Management (PM) Software is a tool which provides users with the ability to collaborate processes and activities as well as enhance other factors such as tracking of finances, schedules, resources, and quality [1]. Nowadays, the nature of project management has changed and the manner in which projects is implemented by managers as well. These complications can be attributed to the fact that projects have become more complex or multidisciplinary, which involves more than one field or may be implemented in many countries concurrently [2]. Moreover, the way of project management tasks for example: planning, managing and developing resource management and enhancing decision-making have been obviously evolved and supported [3].

The necessity of keeping pace with new development imposes the use of information technology and techniques, which can facilitate the implementation of the projects and help to get the desired result. Due to this aspect, so many developers have create software applications which can deal with all project processes, create activities, establish communication between team members and control the overall work [4]. In other word, these software applications are considered as a single platform (standalone tool) which can cover all activities.

There are many types of PM software applications which are used to achieve different goals such as web based PM software (which will be the focus of this research). The web based PM software allows the team manager and other team members to communicate in real time inside or outside the office from anywhere and at any time [5]. The options that are provided by these PM software applications vary from one software to another and in relation to the subscription fees, which make it flexible and able to achieve project objectives. This type of software applications can lead to improved projects efficiency and quality by changing the human individual's tasks and responsibilities with computerized assistance by the software life cycle. The challenge in managing projects (without using PM software applications) is the

collaboration between people working in different places, different times and in different divisions [1].

1.2 Research motivation

Project management in recent days has become more competitive nationally and internationally for companies and organizations which are competing locally and internationally (in the public and private sector). Consequently, there is an urgent necessity to involve new information technology ideas in managing projects. In the last decades, the term "Project" was referred to some identified activities. Therefore, the managing and monitoring of the project activities was straightforward and possible. On the other hand with the scientific revolution, project nature has become more complex and it is important to use tools to help in managing process.

Consequently, the accurate information about project management tools and techniques must be provided to people who work with these tools in implementing and guiding projects, which will further help in sharing project information. Information sharing will be much easier with the use of project management tools and techniques because it will provide a single platform, which all the actors will be able to communicate effectively. The last point that motivates this research work on project management software application is the increasing of some vital factors. These factors are important for any successful project such as Usability, Efficiency, and Productivity among other important factors.

1.3 Problem statement

Over the global development of technology, project management companies and agencies introduced new project tools and techniques to facilitate their tasks and processes. Throughout the implementation of complex and multidisciplinary projects, the non-use of automated tools and techniques can affect the overall performance and decrease the project management productivity. Additionally, there is a lack in identifying and allocating suitable tools and techniques to achieve the promoting target of project management.

The key problems that this research tries to solve are:

- There is insufficient information about the nature of project tools and techniques that can help project managers.
- The project manager may not know clearly the efficient tools and techniques which are suitable for his work.
- The need to work with single software application which can be a platform to deal with all project activities.
- Lack in some factors such as Productivity, Usability and Efficiency during project implementation because of use traditional ways during project processes.

1.4 Research objectives

The main purpose of this research will be achieved by satisfying the following objectives;

- To investigate the capabilities of available project management software's tools and techniques. This will include conducting a comprehensive literature review.
- To provide guidelines to project management decision makers of the most efficient tools and techniques in their field.
- To show how project management software applications for example (Teamwork) can make managers and team members cooperate and share information and activities within it.
- Discuss the role of project management software to support the chosen four management factors, which are namely: usability, productivity, flexibility, and performance.

1.5 Research questions

Based on the above objectives of this research, the research questions are:

1. What tools and techniques that provide the ability of the project management software to enhance management capabilities for the project team manager and other team members?

2. How to collect useful and valuable data based on efficient tools and techniques of project management to provide software capabilities for the project team manager and other team members?

1.6 Research procedure strategy

The procedure strategy has been used in this research is divided into three stages. These strategy stages are the conceptual development stage, the experimentation data collection stage and the analysis stage to validate the research objectives. The complete procedure of discovering knowledge in this research is utilized by following the track defined by this section.

The conceptual development stage of this research is based on reviewing a comprehensive literature on project management, its tools, types, roles and nature. This stage provides strength to enhance important factors for any successful project such as; usability, productivity, performance and so on. The conceptual development stage of this research will contain six steps as the following:

1- Review current project management topics.
2- Conduct a literature review.
3- Review project management software role.
4- Conducting an investigation on the current issues.
5- Identify the related problems clearly.
6- Define the research objectives.

The experimentation and data collection stage of this research is based on collecting the considered data from the following resources:
1- Comprehensive literature review about project management software.
2- Experimentation of project management software (Teamwork PM Software).
3- Conducting of questionnaire survey about selected issues.

The analysis stage involves of exploration and analyzing the data collected from different resources defined in the experimentation and data collection stage to improve the knowledge discovery and its enhancement factors. Finally, provide a discussion for utilizing the knowledge discovered within this research context.

The overall study has been detailed in the research chapters and as shown in (Figure 1).

The conceptual development stage

Project management topics

Literature review

| Review PM Software role | Investigation of the current PM issues | Identify PM related problems clearly |

Research Objectives

The experimentation and data collection stage

| Literature review about project management software | Experimentation of (Teamwork PM Software) | Conducting of questionnaire survey |

The analysis stage

Exploration and analyzing the data collected from different resources

Discussion for utilizing the knowledge discovered

The discovered knowledge

Figure 1: Research procedure strategy.

1.7 Research significant

Based on the outcome of the research, it will serve as a guideline for managers to utilize or optimize project management software in order to give advantages for managers by planning and controlling all stages of project management process. Most of corporations are trying to adopt efficient tools for managing its projects to make sure that every single task is completed and accomplished on time and also to reduce its staff workload for getting the optimum time management. In addition, the importance of this research comes from the desire to increase vital factors within projects which can be responsible for achieving successful project.

1.8 Scope of research

This research will focus on the project management software with the analysis of its tools, nature, roles, expected benefits, and how can it enhance the project. The focus of this research will be on the IT (Information Technology) aspect of these tools and how they are to be used in an appropriate way. Therefore, the research will not go beyond all aspects of the project such as HR acquisition, procurement and others.

1.9 Research limitations

There are some limitations and boundaries may be existent in any research study such as the environment culture, lack of the data reliability, the size of data sample, etc. [6]. In this research, the experimentation study is exploited by using the (Teamwork) project management software, which is proved its proficiency in managing projects. However, the (Teamwork) project management software still in the perimeter of the commercial software, which has its advantages and weaknesses. Therefore, this is considered as a limitation of the research because this software cannot be treated as a standard for project management to get the appropriate result.

CHAPTER 2

LITERATURE REVIEW

2.1 Introduction

This chapter of the literature review focuses on the definition and nature of the project management, its processes, tools and techniques. These tools and techniques involve enhancing and optimizing project results. In addition, this chapter describes how these tools and techniques enhance important factors within project activities such as usability, productivity, efficiency and others.

2.2 Project management definition and nature

According to the (PMBOK Guide), the definition of project is that it is a provisional efforts adopted toward creating an adorable product, service, or result [6]. The natural projects applications show that the project has a certain start and completion. The completion is gotten while the objectives of the project have been reached or once the project is terminated because its objectives cannot be reached, or as soon as the project necessity is not being existent anymore [7]. Another study presented by (Turner and others) defines the project as a work which aims to use and organize staff, tools, equipment and financial resources and arrange it in appropriate form, to achieve and met the scope, and taking into account the constraints of time and cost so as to achieve desired goals [8].

Another definition of the project by (Tatnall and Shackleton), that it is an activity, which aims to create unique outcomes, assures beginning and ending times, and fix resource budget [9]. Furthermore, they mention that there is a quite different between managing projects and managing an organization [10]. This is because the projects have specific things to do in a specific time by following certain procedure. Whereas most traditional organizations management has additional tasks to ensure more than guiding frequent activities. Moreover, the project is a complete set of actions specified with functions and time which are interacting with a politico-socio-economic environment, looking towards an objective normally realized by the interaction between the project plan strategy and the reality [8]. Another definition

for the project is it's a set of complex activities which use resources to get the required benefit [11].

Prabhakar and Guru Prakash identified some characteristics which normally exist in most of projects [7], which are:

- Starting point and finishing point for each task.
- A time frame for project completion plan.
- Participation of individuals in the basis of ad-hoc manner.
- A fixed set of resources.
- Arranging in a particular order of actions and stages.

The main objectives must take in consideration, which are the performance, cost, and time goals [1], as clarified in the (Figure 2).
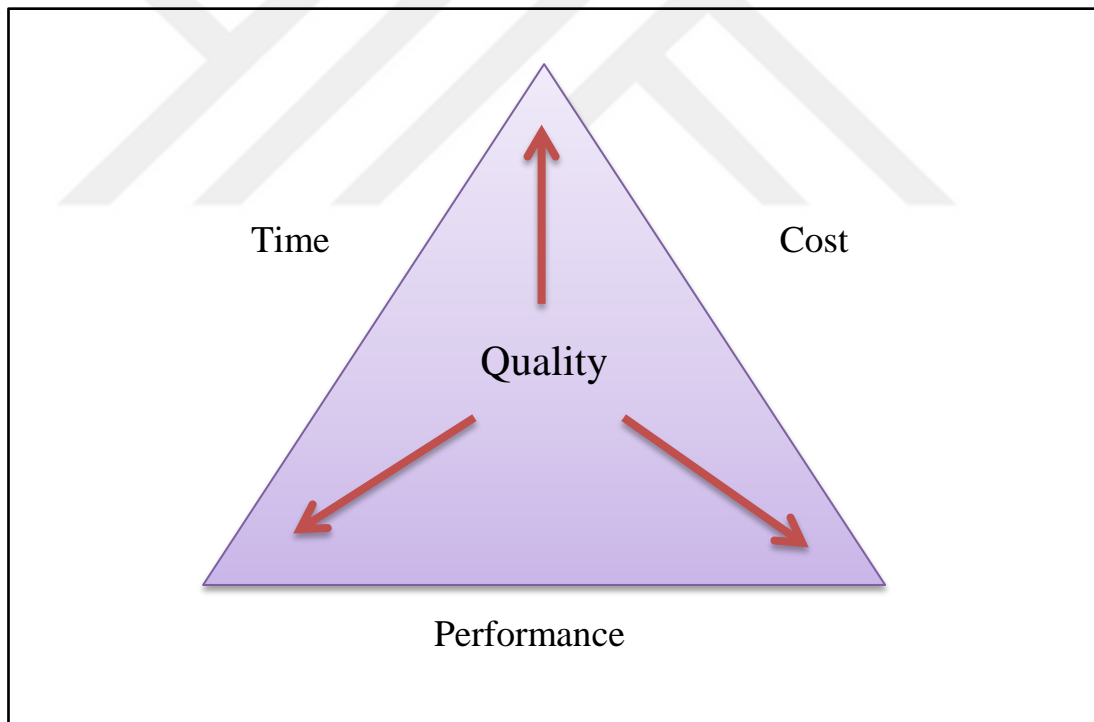
Figure 2: Project management triangle [12].

With the intention of performing a successful project management, it is essential to include some checking and testing processes during the projects implementation. These processes are responsible for differentiating between activities that add value and others that do not add value [13]. While the weak management maybe decrease

the software productivity swiftly more than any other factor [14]. Furthermore, there are some factors affect the project management success, which are depicted in the (Figure 3) [8]:

Aim	Features	Pressures	Processes
To deliver Beneficial Change	Unique Novel Transient	Uncertainty Integration Transience	Flexible Goal Oriented Staged

Figure 3: Features and other project factors [8].

Prabhakar and Guru Prakash classified projects into categories as well as sub-categories as shown below [7]:

- Project size.
- Project difficulty.
- External or internal customer.
- Level of customer participation in the project.
- Risk level in the project.
- Major and minor tasks within each project.

2.3 Project management phases

The total required phases for the project life cycle are influenced by many factors such as project environment, types of key input and output, size of the project and others [7]. The Project management usually involves processes such as planning, development, applying methods, and controlling of project schedules to reach project goals and objectives [4]. Moreover, projects and Knowledge managements have been expressed by the way of combining between three components, which are people individuals, processes practice and applied technology [15].

The term *project management* can be defined as the implementation of knowledge, expertise, tools, and methods towards project tasks to bring together with the project objectives and requirements [6]. Therefore, the project management is characterized to five Process phases as describes below:

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2.3.1 Initiating

The project initiating process is identified as an essential task or stage that the project staff will start the project with it and they are committed to do so. This phase involves developing and defining the project potentials as well as analyzing and validating feasibility to complete project goals [16]. According to (PMBOK® Guide), initiating process refers to those processes implemented to create and establish a project or even a phase within an existent project and get the authorization to begin with this project or phase [6].

2.3.2 Planning

Planning is a "Guidelines and criteria for tailoring the organization's set of standard processes and procedures to satisfy the specific needs of the project" [6]. The main aim of the Planning Phase is to prepare and set basic guidelines for the new project and create a clear and comprehensive strategy and timetable. The project structure and requirements that determined and allocated in the planning phase is critical, this is because it efficiently accomplish the project's success [17].

Generally, planning process during the project execution states the requirements and goals of the project in terms of:

- Project scope
- Resource requirement analysis
- Project risk management
- Overall cost estimation
- Project value and quality
- Project timetable

2.3.3 Executing

Executing is the processes and practices that are implementing organization standards, rules, strategies, and techniques or any instructions adapted by the project management [18]. Furthermore, Executing tasks implement mechanisms and rules, which are determined in the planning phase of project management.

With the intention of achieving project objectives, several adjustments could take place in the project management plan during the executing tasks practices. This is according to many modifications are possibly to arise, for example: resource unavailability, change tasks durations, risks occurrence and so on. Usually, project baseline and setting the plan are totally changed in this process [11].

2.3.4 Monitoring and Controlling

Project monitoring is the actions of gathering, recording, and sharing the information [19]. These actions are associated with the project implementation and performance to be monitored and controlled by the project manager and administrators [20]. Monitoring also involves the process of tracking the status of the projects. It makes a comparison between estimated values and actual values, which are gathered during the implementation process. The Gantt charts are the most common tool used for such analyses [19]. Typically, monitoring and controlling are classified as an important tool for optimizing the quality and characteristic of project management [21].

2.3.5 Closing

Closing is the process to get finishing the tasks altogether among all project phases to formally end the project [6]. It is accomplished in the last stage which ensures the selection process produces results [22]. Moreover, the project closing process ensures the project formalizing and its acceptance level in order to reach the desired achievement. Typically, it involves the tasks of contract closeout, procurement close out, the lessons learned documentation, and administrative closure [16].

The following (Figure 4) explains clearly the five Project management phases and the relationship between it with the project knowledge area:

Initiating	Planning	Executing	Monitoring and Controlling	Closing
•Integration	•Integration	•Integration	•Integration	•Integration
•Scope	•Scope	•Scope	•Scope	•Scope
•Time	•Time	•Time	•Time	•Time
•Cost	•Cost	•Cost	•Cost	•Cost
•Quality	•Quality	•Quality	•Quality	•Quality
•Communication	•Communication	•Communication	•Communication	•Communication
•Human resources	•Human resources	•Human resources	•Human resources	•Human resources
•Risk	•Risk	•Risk	•Risk	•Risk
•Procurement	•Procurement	•Procurement	•Procurement	•Procurement

Figure 4: Integrating project tasks and project management knowledge area [16].

2.4 Project management software

Project management software is a tool which provides users with the ability to collaborate processes and activities as well as enhance other factors such as: tracking of finances, schedules, resources, and quality [1]. Since managing projects is not easy due to its complexity and sensitivity to faults and misjudgment, many researchers try to focus on software tools that can enhance project activities. As stated by Prabhakar and Prakash, the process of controlling and monitoring large project components needs to use toolkit of techniques, methodologies, and advanced software tools [7]. Furthermore, Merrill and Collofello, said that the project management software involves many activities and processes such as: planning, scheduling, tracking, and monitoring of project progress [23].

This type of software can lead to improve project efficiency and Quality by changing the human individual's tasks and responsibilities with computerized assistance by the software life cycle [14]. Project management software has been used before many years by project managers to support and help in achieving some tasks such as the designation of PERT and Gantt charts via CPM (critical path method) techniques [10]. Managing projects normally involved group of people who spent time for working on the project. However, by using project software leads to the adoption and implementation of graphical user interfaces. As a result, new opportunities are arising to make this software more useful and advantageous than

hand working. Merrill and Collofello said that, the project management software is very complicated, and it's frequently process needing much effort or skills to accomplish or understand [23]. Thus, there is an essential need for efficient and dynamic project management software.

As state by Romano, Chen and Nunamaker that the challenge in managing projects (without using PM software) is the collaboration between people working in different places, different times, and in different divisions [1]. Same authors claim that IT techniques like PM software can enhance the collaboration in distributed modes, and add more options such as Group Support Systems (GSS) and video conferencing. Moreover, these software packages responsible for creating Gantt charts, PERT charts, resource graphs, project status tracking and other tasks. These options make the project team able to collaborate and communicate within dispersed geographical areas [1]. Fabac, Radoševi and Pihir have also argued that "Contemporary project management has to be supported by using suitable software packages" [3].

2.5 Criteria to Consider in project management software

Some authors were focusing on effective factors such as coordination and consider it as "an important factors which differentiate between successful and un-successful projects" [24]. Currently, most of work assessments rely on manual steps, and normally it can lead to incorrect result from subjective assessment [25]. An evaluating of different project management software systems could be helpful to compare many types of software and take in consideration six different core criteria [17]. These criteria factors are needed to exist in any chosen software and they can be summarized as follows:

- **Flexibility:**

How can the project management software be adjusted to the organization users and make it able to implement and align with different work processes. Therefore, most developers take in to consideration the flexibility factors due to its importance.

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- **Ease of Use:**

  The degree of ease that allows people uses and practices the project management software without any excess of training. Different level of users normally is concerned with these factors because it allows them to use the software with minimal effort.

- **Category:**

  Identifying the category in which the project management software fits in, and does it match with the requirements of the business or not. Because there are many types of software which cover different areas and fields, the experts must know clearly which software fit the companies' requirements.

- **Responsiveness:**

  By identifying the level of responsiveness in the organization, the experts can decide which software can provide a specific level of responsiveness at a specific time.

- **Pricing:**

  The initial exploration for cost estimation supports defining causes of the wide variation of project productivity [26]. Therefore, the value provided by the project management software should be matching the requirements of the system users. In terms of pricing, the organization can classify the software packages into groups starting from high prices towards low prices. In addition, the software price is normally linked with the options and attributes that the software provides it to its users.

- **Features:**

  Project management software can be classified into many categories based on the system ability to provide the users with enough features they need to meet current and future objectives. Some software packages can provide different kind of options,

which may cover all project processes and activities. While other software packages just provide some specific features and options.

2.6 Types of Project Management Software

There are two categories of PM software, which are offered and can be used by project managers. Each type of PM software has its special use and characteristic. The two categories of PM software types consist of:

2.6.1 Desktop PM software

The project manager can manage and control the entire project by using this kind of software, for example of this PM software is Microsoft project [27]. The drawback of desktop PM software that it doesn't have the ability to share project documents between divisions and working team when collaboration is required [12]. In general, all updates happen by relevant divisions from time to time are considered as a limitation because all these updates must be kept regularly in one document through related directions. Correspondingly, desktop PM software has particular limitations that it needs additional staff in the direction of regularly maintain and update the system [28].

2.6.2 Web Based PM software

Merrill and Collofello state that there is a strong necessity of efficient software for project management [23]. The web based PM software can be used for arranging project management activities, such as; staff meeting, user portals, virtual office support interface, and collaborative work management tools [6]. The web based PM software is established to settle the limitation of desktop PM software. The user or manager can access the web interface application with the web based PM software and do all project activities and processes [29]. This is considered as a good way to distribute project across all team members and make stakeholders able to access and monitor project details. The exploration has recognized the efficient management as a significant factor; this is because it differentiates between successfully and unsuccessfully accomplished projects [24]. Moreover, in [17] has been identifying

some factors that distinguish this type of software from the normal desktop software, which are:

- The information is centralized, so the Document sharing process will be easy to do.

- Collaboration with team members in real-time, which means that multiple users can use and practice the system tools in the same time.

- Ability of monitoring the project budgets and costs.

- Efficiency in managing risks estimating and resources allocation.

- Efficient reporting capabilities.

For these reasons, this research will exclusively focus on the "web-based software" applications.

2.6.2.1 Main characteristic of web-based PM software

- **Collaboration:** The web-based PM software must enable the collaboration aspects during project processes which involve (team collaboration, stakeholder collaboration, and others).

- **Issue Tracking:** Throughout the project lifetime, there are a various matters that affect the whole project or a part of the project, which normally need instant tracking and solving. The software defects and failures are an example of this kind of issues.

- **Project Portfolio Management:** it is an important software feature for a company managing more than one project (Multi-projects). The company must be able to deal with all projects and monitor it in order to measure all project progresses. Nonetheless, it is no need to use Project Portfolio Management feature with companies which manage and deal with one or two projects, because this kind of features might be very costly for it.

- **Resource Management:** it is one of the outcomes from using project software in project implementation. Normally, the resource management includes many types of resources (workforce resources and other types). Moreover, "The project

management software has to present the procedure of all resources during the whole project life cycle" [12].

- **Scheduling:** this process is one of the most important options that the project management software has to offer. Typically, the project management software can be used to create Gantt charts under the scheduling process. Normally, scheduling process is utilized to organize tasks timetable along with the resources allocation in project development [30]. Moreover, activity dependencies can also be presented clearly by using scheduling tools, for instance, the PM software can calculate automatically the critical path and future modifications to the critical track of the projects. Similarly, the baseline is an important tool under scheduling processes family. The project baseline can be placed when requirements are identified. Correspondingly, if there any changes in the requirements, the project management staff can match and compare the new schedule timetable with the original baseline schedule for automatically realizing the project space and budget variation [12].

2.7 Tools and techniques in PM software

Tool rating is identified based on "the precision of the data-determined and expert-judged information" [14]. Typically, these tools help in decreasing the need for face-to-face human interaction [31]. During managing and implementation the project activities, companies and organizations usually use different types of base tools such as; Gantt charts and PERT/CPM network models [24]. In [3] has also argued that project management in developed economies enterprises is impossible without the assistant of specialized tools. Moreover, project management software tools are helpful in implementing project management lifecycle such as: Planning, scheduling, Controlling, and monitoring [11].

Through of these tools, many functionalities and factors are supported and enhanced such as; Identifying the path of real against planned process, Recording work performance, resource controlling, allocation proficiency, actions distributing, cost estimate, generate calendars, establishing charts, collaborative potentials, statistical analysis of project improvement and so on [32].

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In addition, the Project management software tools and techniques can be generally divided into three categories [33], which are:

- The project management tools (perform scheduling timetable and limited project tracking).
- The process management tools (perform project planning).
- The time accounting tools (allows pricing of hours spent on the project).

2.7.1 Scheduling and planning tools

Planning and tracking tools are very important activities that the project manager has to control its implementation in a proper way [34]. Potash identifies that "taking on a project without using project-planning tools are Foolhardy" [35]. In the same way, project scheduling has been supported by most of software packages for many years [28]. Moreover, there is a solid connection between success of the project and the period of time scheduled in planning stage of the project. According to [36], the roles of the project scheduling process can be as the following:

- Identifying and approving a strategic plan for the works implementation.
- Ordering and buying tactics into the strategic plan by project team members, workforces and the rest of key stakeholders.
- Assessing and estimating the degree of risk for achieving the required objectives.
- Detecting and evaluating deflections after the approved strategic plan and appropriate schedule rather than quickly, slowly, or on time execution.
- Putting realistic potentials in the minds of staff as the required performance of the project.
- Collaborating exist strategic plan to the project staff and the key stakeholders.
- Putting reasonable expectations in the minds of key stakeholders as finishing outcomes of the project.
- Extend a tool to the approved strategic plan that provides a re-planning opportunity to correct the lack or losses in the work for achieving required objectives.

- **Gantt chart (Bar Charts)**

Gantt Chart was provided in 1917 by Henry Gantt. Gantt charts are a representation of time scheduling for planned actions or tasks [37]. In [7] has argued that Gantt charts are used to plan, schedule and monitor progress during project implementation. These Gantt chart are used also to represent graphically the mutual relations of the project components and also deliver a demonstration of the demand in every task should be executed. These have been illustrated in the following (Figure 5).

Activity Identifier	Activity Description	Calendar units	Project Schedule Time Frame				
			Period 1	Period 2	Period 3	Period 4	Period 5
1.1.MB	Begin New Product Z	0					
1.1	Develop and Deliver Product Z	120					
1.1.1	Work Package 1: Component 1	67					
1.1.1.D	Design Component 1	20					
1.1.1.B	Build Component 1	33					
1.1.1.T	Test Component 1	14					
1.1.1.M1	Complete Component 1	0					
1.1.2	Work Package 2: Component 2	53					
1.1.2.D	Design Component 2	14					
1.1.2.B	Build Component 2	28					
1.1.2.T	Test Component 2	11					
1.1.2.M1	Complete Component 2	0					
1.1.3	Work Package 3: Integrated Components 1 and 2	53					
1.1.3.G	Integrate Components 1 and 2 as Product Z	14					
1.1.3.T	Complete Integration of Components 1 and 2	32					
1.1.3.M1	Test Integrated Components as Product Z	0					
1.1.3.P	Deliver Product Z	7					
1.1.3.MF	Finish New Product Z	0					

Figure 5: Gantt chart for Project Schedule Presentations [6].

In other word, the scheduling process can be achieved by using Gantt charts, which are used to identify the project actions, their sequence, their priorities, and the procedure that must be followed to keep the project on track [33]. All tasks have been arranged and recorded in the vertical axis. Moreover, Dates have been presented in the horizontal axis. The tasks periods have been presented as horizontal bars located in given starting and ending dates. Usually, the Bar charts are easily recognized and understood, and it is frequently operated in executive management [6]. Furthermore, The Gantt Charts as a scheduling tool are responsible for comparing the real tasks periods to the planned baseline tasks periods [37].

- **Forward Pass**

The forward pass is the process of routing activity within a fixed network starting with first action and ending to the last action and figures the early dates for all tasks and the accomplishment time of the project [20]. In particular, the forward pass during a task network shows the early start and early end of the task and the minimum time required for the total project duration [38]. Basically, by doing some of forward pass calculations, it will deliver the following and as shown in the (Figure 6):

- The early start (ES) for a task
- The early finish (EF) for a task
- The late start (LS) for a task
- The late finish (LF) for a task
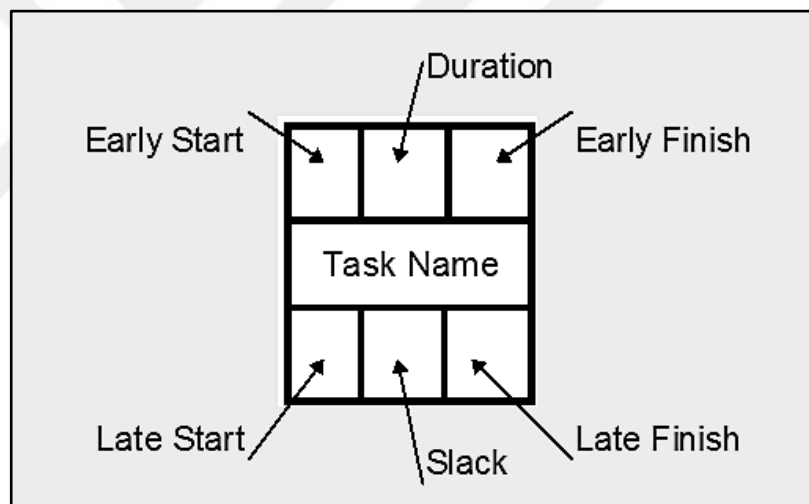
Figure 6: Basic Forward Pass Example [39].

- **Resource Leveling**

A successful project relies essentially on the effective operating, resources cost, equipment, labor efforts, and material supplies [40]. A resource loaded timetable shows the engagement among tasks and resources. When the project resources are utilized to the task, it has to be prepared by leveling these resources to enhance the task or activity qualifications, which leads to reduce costs. Typically, resource leveling reduces the severely changing in daily resource usage during the project

lifecycle by shifting non-critical activities within their available float [38]. This is clarified by the following resource leveling example in the (Figure 7).
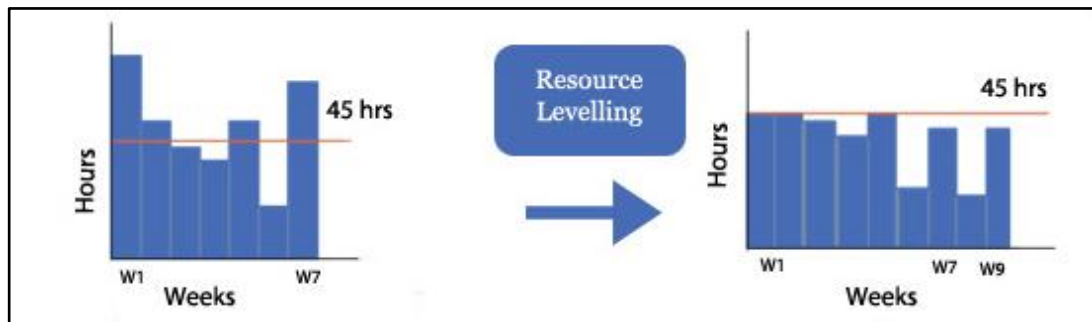
Figure 7: Resource leveling Example [38].

In general, resource leveling is a technique in which start and finish dates are customized according to resource limitations with the balancing demand for resources with the offered supply [6].

- **Critical Path**

The Critical Path Method (CPM) is a process planning technique of using a graphical representation for project management, which is known as "CPM diagram" or "Project Network" [41]. Typically, it is used in complicated project management plans with huge number of activities to depict in graphical way the mutual relations of the processes and activities and also for presenting how the order has to be performed in the activities operation [7]. The (PMBOK Guide) describes the critical path method as a technique utilized to evaluate the least possible time for project implementation and appoint the flexibility status of scheduling on the logical network paths within the schedule model [6]. Normally, this schedule network analysis method evaluates and depicts the early start, early finish, late start and late finish dates for each activity.

- **Work breakdown structure (WBS)**

Work breakdown structure (WBS) is a tool linked with planning and scheduling of the project implementation. Typically, it is a process of decomposition the tasks of the project into smaller elements. The main task of the work is broken down or

divided into the subtasks. It starts with the end objective required and successively subdividing it into manageable components in terms of size and complexity, such as: program, project, system, subsystem, components, tasks, subtasks, and work elements [7]. Although, PMBOK Guide describes it as a process of breakdown and subdividing project activities and processes into sub processes, which is easier to manage [6]. The key benefit of this process is that it provides a structured vision of what has to be delivered.
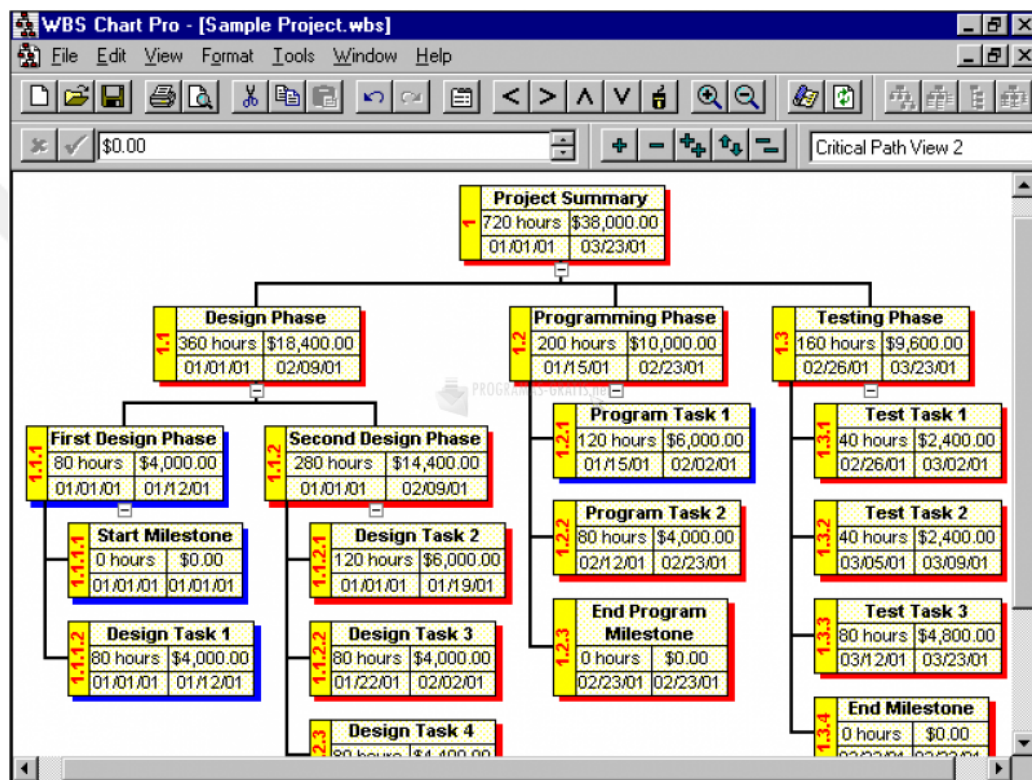
Figure 8: Work breakdown structure example [13].

WBS is a way to shape the project activities in a hierarchical manner that must be achieved to complete a project [4]. Each project has its own WBS hierarchy with the top level WBS element. Each WBS element may contain more detailed WBS levels, activities, or both [19]. In addition, WBS offers an opportunity to the members in the project to define the standard operating procedure to handle issues such as; estimating, costing, change management, and work completion review. In terms of responsibility, the assignment of responsibility to the work package managers should be based on a clear definition of the work content of the work package [13], which is including:

- Assigned deliverables and the delivery time of each.
- Required inputs to the work package (data, output from other work packages, and others).
- Resources needed to perform the work package.
- Required cost for performing work package.
- Tests and design reviews.

2.7.2 Other Popular Tools

Project management software normally offers a particular collection of tools and techniques. There are a number of features that project management software may provide it, which are:

- **Web-based Interface:** It's a feature that provides team members the ability to access to the entire settings of the software in anyplace and anytime using online Web hosting to set their accounts.

- **Personal Dashboard:** a software-based control panel can be exploited by every single team member, and it can be comparable to a personal home page to control and monitor their info. This information is regularly updated by the software and it can be covering information about activities and messages, etc.

- **Project Dashboard:** a feature provides comprehensive status reports which is cover all project aspects and it is usually managed by the project managers and administrators. Project Dashboard provides a graphical visualization about the condition and status of the project. The information is directly or in regular collected from all project parts and utilized to update the project dashboard to provide up to date information for the project managers and administrators.

- **Multiple Dashboards:** It's a feature that delivers support for individuals and the project teams, whose are working with several projects at the same time by providing them a service of retrieving information about their active projects over a particular user interface.

- **Restricted Access:** It's a feature that can select who has the admission access for selected features inside the software. For instance, it might not be required to

permit everyone in the project team to access information about the project budget and costs.

- **Budget Tracking:** It's a feature that can provide information about identifying and allocating all aspects of a project's budget and costs in an integrated site.

- **Time Tracking:** is the process of detecting how long exactly that a task or project part takes to finish and makes the comparison between the existing progression and planned schedule. Certain applications provide a collection of spreadsheets and presentations, which are exported from these reports.

- **Task Lists:** the project staff can select personal action lists, which are involving targeted actions deadline, and marking them when they are done.

- **Task Assignments:** the project managers can directly allocate actions or tasks by this feature to the staff members even they can call selected members to execute and complete a special task.

- **Resource Allocation:** by this tool, the project staff can order, manage and perform a full list of necessary resources for a certain project or task. It is also possible to define the worth and availability of each resource, while tracking which resources has been overbooked or under-allocated.

- **Centralized Document Store or Database:** a document management system that saves and keeps all project files in a particular easy access place. This kind of storage maybe used to backup other information related to the project as well.

- **Version Control and Tracking:** a tool of tracking and recording the full list of documents associated with the project, such as uploading attached documents, which are updated over time.

- **Risk Management:** a project management tool that allows the project staff to warn about certain risks which may possibly happen. This kind of risks will be observed and examined by the project development managers to decide if it will be admitted or not and classify it based on its threat level and category. Once a problem happens, the action of fixing and solving it will be allocated to the related project supporter.

- **Instant Messaging:** the project members can communicate with each other in real time by particular messages and e-mails. All communications are usually recorded and kept in the system until the receiver removes them.

- **Email and Messages Notifications:** the emails and Messages notification will be automatically sent out to particular individuals when modifications or changes are occurred to the project even if an email is received.

- **Templates:** project templates are created to be adapted as the groundwork figure for every new project. It may be utilized as the base format of reporting, scheduling, messaging, and dashboard customization as well.

- **Advanced Reporting:** it is a customized status reports which are including the essence of information, such as the project budget, risk controlling, schedules, and processing data. Reports can be gathered from the whole project or from specific performance evaluations.

- **Customizable Graphs and Charts:** Demonstration tool of all types of project information, such as project budget and schedules information, which are represented by dot charts, bar graphs, and pie charts.

- **Multilingual Support:** Several project systems can be provided by multiple languages.

- **Mobile Device Support:** the availability of accessing the project management software through a smartphone device by using an authorized application.

- **Professional Support:** the support representative can be responsible for initial training along with ongoing technical support.

- **Video chat / Group Meeting software / Conference lines:** A collection of tools which are providing the project staff in remote locations the opportunity of using these services to hold meetings.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 Introduction

This chapter is going to deliver an appropriate demonstration for the pathway of the methodology on behalf of this research. This is by adopting a multi-method approach [42], which is applied to address the research questions and attain the objectives of this research. Therefore, we will use an experimentation case study and a questionnaires survey, where the outcomes of the experimentation case study will also serve to enhance the input of the questionnaires survey.

The research method depends on collecting the data and information from many sources and analyzing gathered data and information from each source in order to identify the consistency level between them. All information will try to explain the importance of the project management software and its tools in enhancing four vital factors, which are productivity, usability, flexibility, and performance. Furthermore, how typically the efficiency of these factors can be increased by using appropriate tools in project implementation.

3.2 The proposed methodology architecture

The information sources have been used in this research are carried out by adopting a multi-method approach. Consequently, three information sources have been utilized in this research, as described in the following sections. The flow chart below explains the steps and procedures that were followed from start to end to conduct this research as seen in the (figure 9).
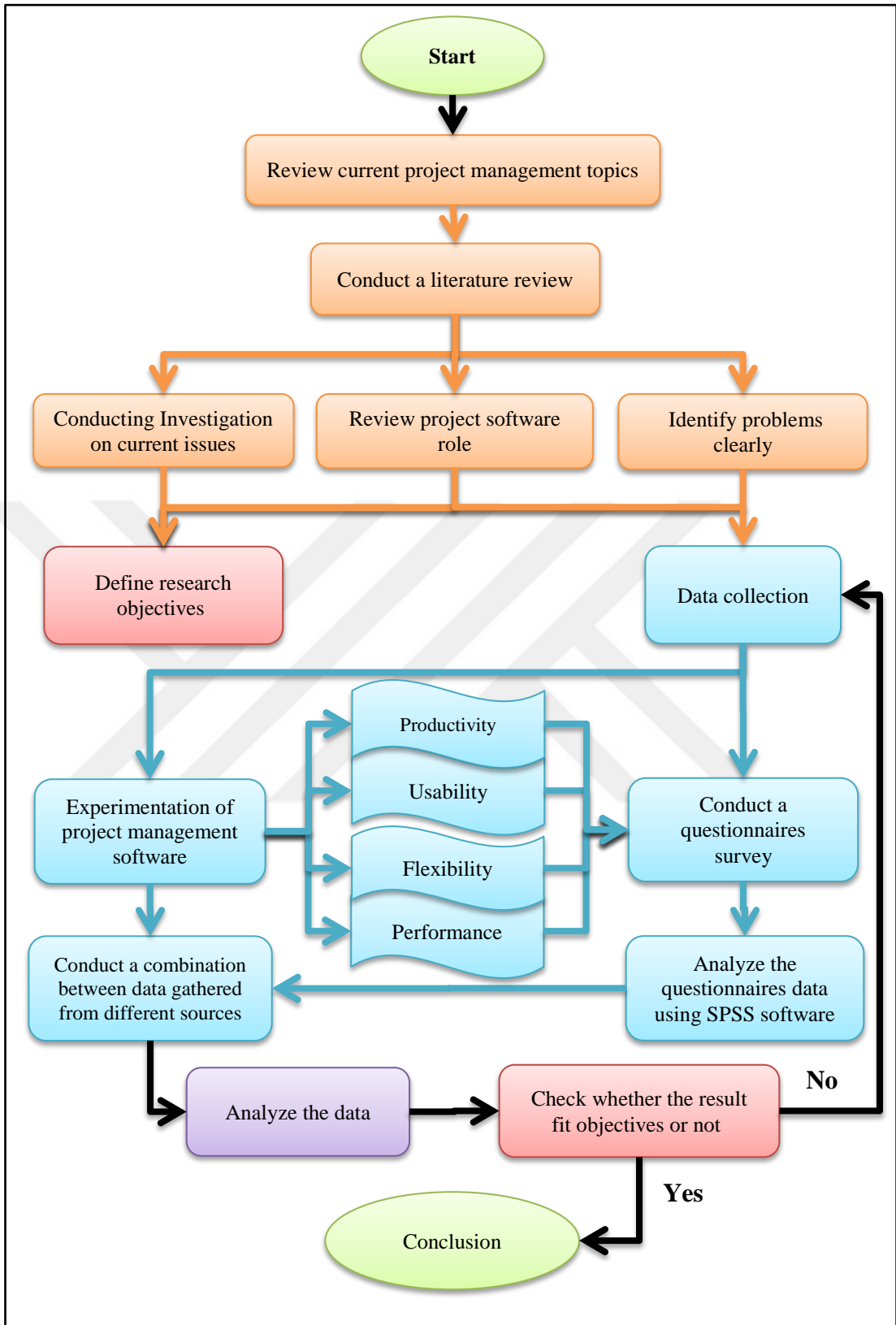
Figure 9: The methodology architecture flowchart.

3.2.1 Conducting a comprehensive literature study

These information sources start with conducting a comprehensive literature study about PM software and its appropriate tools. This is to provide the theoretical ground for developing the followed stages in this research.

3.2.2 Experimentation of project management software

The second source of the collected information is the experimentation of project management software. Whilst it is believed that the web based PM software is applicable to many uses of project management processes, the experimentation and testing of proposed project experience is mainly carried out using (Teamwork PM software).

The Teamwork PM software allows the team manager and other team members to communicate in real time inside or outside the office from anywhere and at any time. This is to demonstrate and show for the companies and managers, how can one platform manage and guide most project management processes. Furthermore, the outcomes of the experimentation case study will also provide a theoretical enhancement to determine the selected questions of the questionnaires survey. Moreover, it will help us to check and combine the extracted result of the questionnaire survey and result extracted from using (Teamwork PM Software). This is by providing the appropriate tools in project implementation to increase the efficiency of four vital factors, which are productivity, usability, flexibility, and performance.

3.2.3 Conducting the questionnaire survey

The survey is an important method that the researchers usually use to shed more light on research problems. This is by asking relevant stakeholders to the project some systematically arranged questions with a view to get their both tacit and passive knowledge regarding to the research problem. In this research, a questionnaire survey has been conducted to investigate current project management techniques and tools in order to meet the research objectives.

3.2.3.1 Sampling

A total of 50 questionnaires were self-administered randomly to different respondents. The respondents are including teachers, students and employees in the environment of project management field. These questionnaires are done in order to check and combine the extracted result of the survey and the result extracted from utilizing (Teamwork PM Software).

3.2.3.2 Instrument

A self-administered questionnaire with two sections has been used for the survey, as the following:

- **Section A:** contain demographics such as (gender, and position).
- **Section B:** contained 25 constructs for every respondent, in which the respondents have been expected to state their level of consent to the points mentioned in the survey. The level of agreement is weighted to a five-point based on the Likert scale, which are (Strongly Disagree, Disagree, Neutral, Agree and Strongly Agree). Finally, the respondents have been expected to mention if they use any project software before, and give suggestions on what should do to improve usage of project tools. The Data collected will be analyzed using SPSS to draw results based on the hypothesis.

3.2.3.3 Statistical Analysis Techniques (SPSS Analysis)

The Statistical Package for the Social Sciences (SPSS) is a software package that includes tools and techniques, which are designed for statistical analysis [43]. The entire 50 questionnaire have been returned and analyzed for discovering further knowledge. The data collected by the questionnaire survey has been ordered into SPSS software for further analysis to check the relationships between variables using descriptive statistics. Moreover, these data have been measured in terms of mean and standard deviation score and other significant factors.

3.2.4 Combine and analyze gathered data

The data has been gathered from different sources and use SPSS to get the result from the questionnaire survey, and classify gathered data into categories in order to simplify it. The results have been assembled from analyzing data on the 4 vital factors for any successful project which is (Usability, Productivity, Flexibility and Performance)

CHAPTER 4

DATA ANALYSIS

4.1 Introduction

This research depends on gathering data from more than one source, which are a comprehensive literature study, the project management software experimentation and the questionnaire survey. Therefore, it is necessary to analyze extracted data from each source and study it carefully. The data have been gathered from the experimentation case study by utilizing the Teamwork PM Software. These data will provide advanced supporting for conducting the questionnaire survey to keep track with the methodology and meet the research objectives.

4.2 Establish a flexible project by using (Teamwork PM Software)

Teamwork PM Software is a platform which a user can manage important project management processes and activities. Hundreds of project management software applications exist presently such as (Freshdesk, JIRA, Zoho Projects, Wrike) and others, with focus on project implementation. These software applications are different from each other in terms of specification, usage, and outcomes. This research will use well-known project management software, which is called "Teamwork". The Teamwork PM Software is used by many famous companies such as "PayPal", "eBay", "Pepsi", "Lenovo", "hp", "HONDA" and others. The (Figure 10) below shows the user interface of (Teamwork PM Software).

Figure 10: The user interface of (Teamwork PM Software).

4.3 Teamwork PM Software for enhancing vital factors

One of the important reasons which make managers prefer to use well-known project management software such as (Teamwork) is its ability to achieve work processes in an effective way. This is by providing the appropriate tools in project implementation to increase the proficiency of four vital factors, which are productivity, usability, flexibility, and performance. As a result, enhancing these factors may support the implementation of successful projects.

Consequently, there are many project aspects which have been involved to affect these factors, such as:

- Establish a project environment.
- Identify requirement.
- Assigning project team.
- Identify objectives.
- Communicate easily between the project team.
- Identify project period and monitor work progress.
- Establish periodically reports to show work performance.

4.4 The experimentation of (Teamwork PM Software)

The Teamwork PM Software can be accessed using the Google search engine, and the (Figure 10) above shows the teamwork user interface. The Teamwork PM Software implements most of project management functionalities. Also, most popular companies and agencies make use of this project management software, which indicates to the success level of this software.
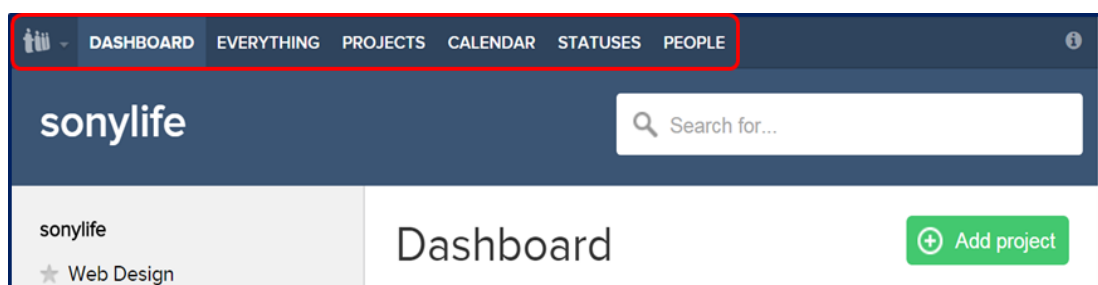
Figure 11: The main interface in (Teamwork PM Software).

The main user interface contains several windows that allow the project manager to deal with main and sub tasks easily, such as:

- The "DASHBOARD" window shows the latest activity from your last 10 active projects. We can also view Upcoming Tasks, Milestones, Calendar Events, Tasks due today, and late Tasks & Milestones.

- Within the "EVERYTHING" window, we can view all project activities.

- The "PROJECTS" window can help manager to control and monitor the project activities, add new projects, its include options such as: generate activity report and export data to (PDF, Excel, and CSV).

- The "CALENDAR" window allows Administrator and his staff to edit event and view this event in any time.

- The "STATUSES" window provides the last updates of what the users are currently working on or doing. This is a great way to update people on last actions without spend more efforts to create a task or writing a message.

- The "PEOPLE" window can help manager to add user, add contact. its include options like: import users, import contacts, send invites, view deleted users, export to Excel.

- Adjusting the other options from the "SETTINGS" window such as: General, logo, Templates, Color theme, Integrations, Import, Export, Email, Web hooks, Tags, and Subscription.

After the brief introduction on (Teamwork PM Software) user interface, there are some fundamental steps to start working with the (Teamwork) projects, which are described as the following:

4.4.1 Create new project

To create a new project, the (Teamwork PM Software) allows managers to:

- Add project name.
- Identify project for company or client.
- Identifying project features.
- Add Category.
- Identify start and finish date.

After applying the above steps, we have created a new project in our experimentation of this research, which is called (Web Design) as shown in the following (Figure 12) and (Figure 13).
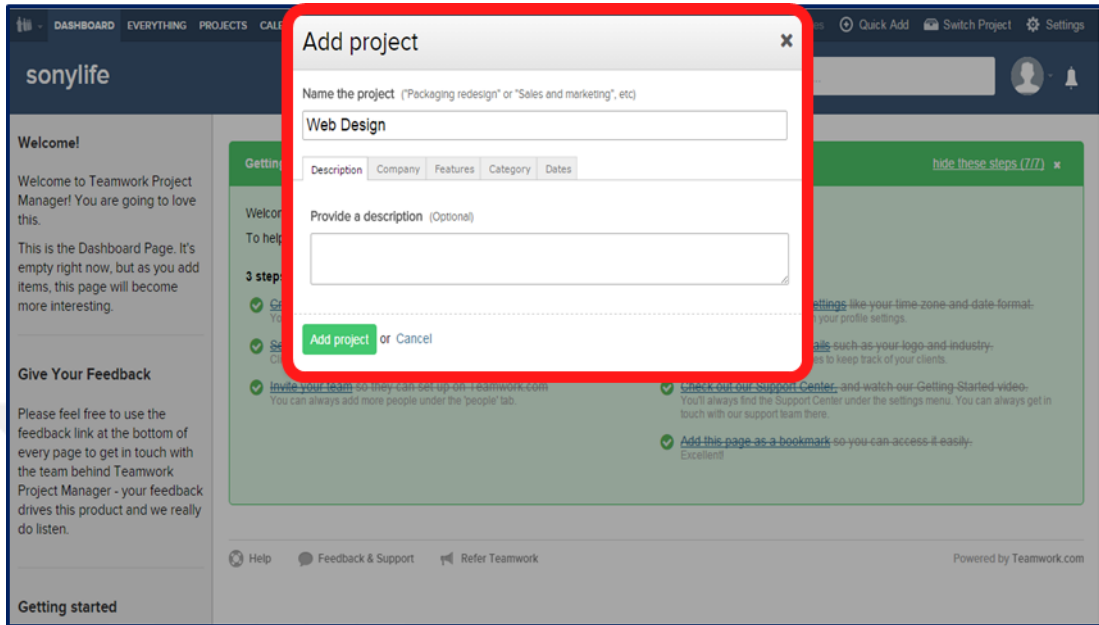
Figure 12: Create new project
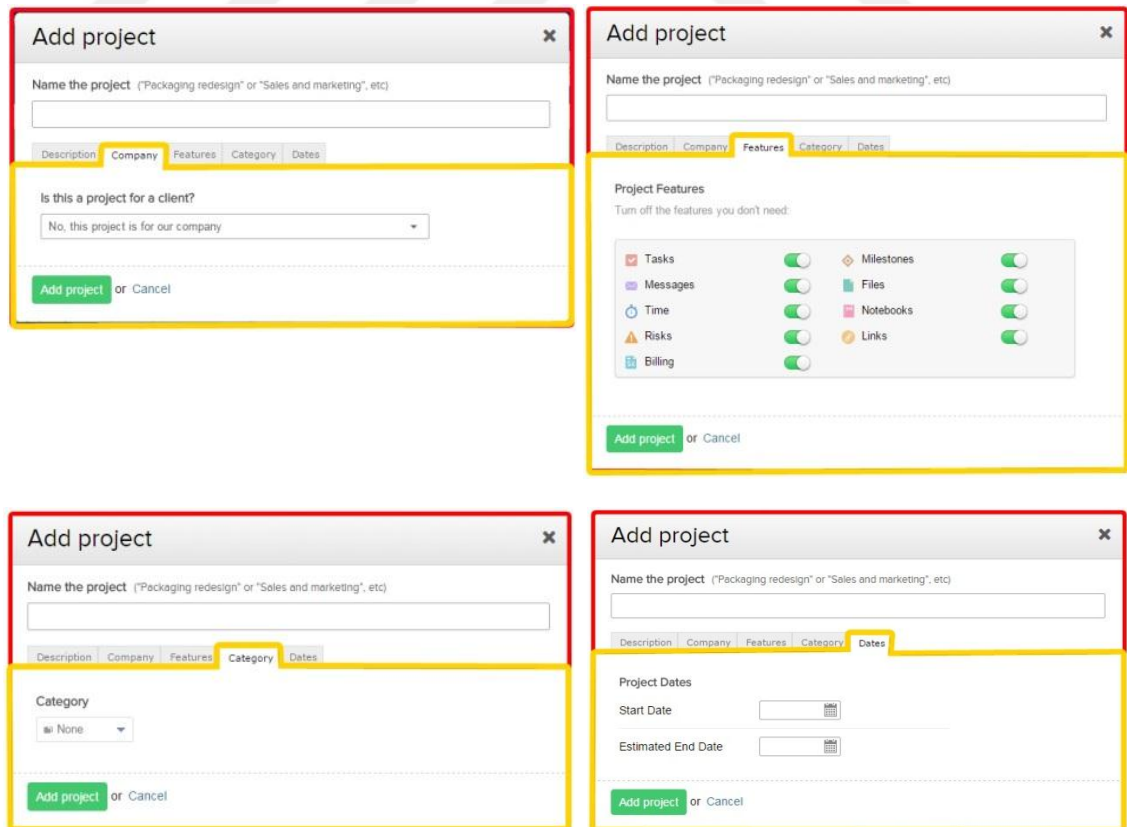
Figure 13: Create other fields

4.4.2 Set up profile

This step allows us to set up the project profile, which contains several fields such as (Essentials, Account, Details, Address, Profile, Social, Localization, Permissions, Preference, and API & Mobile). The following (Figure 14) shows how to set up profile.
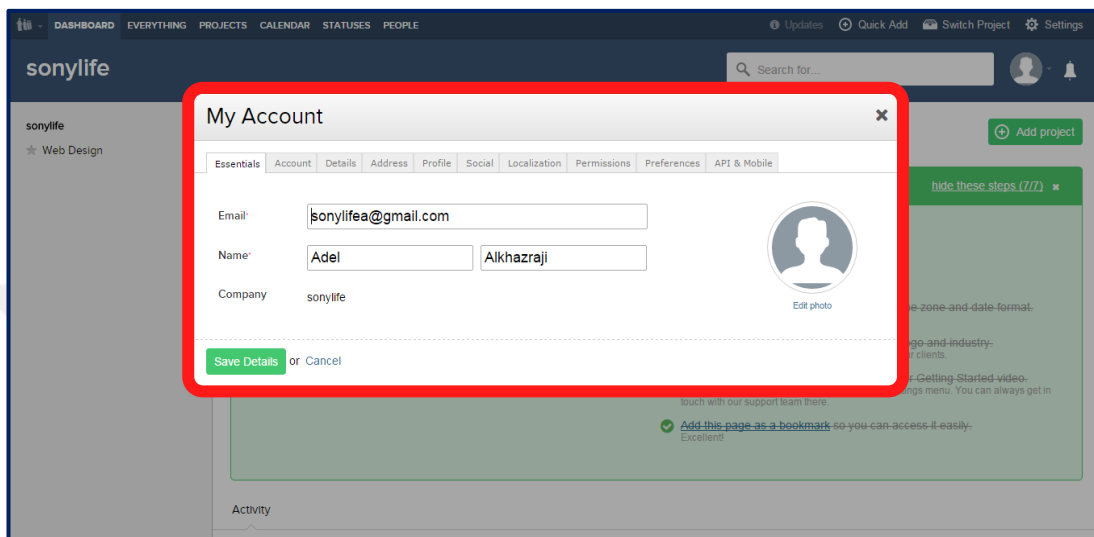
Figure 14: Set up profile

4.4.3 Invite team
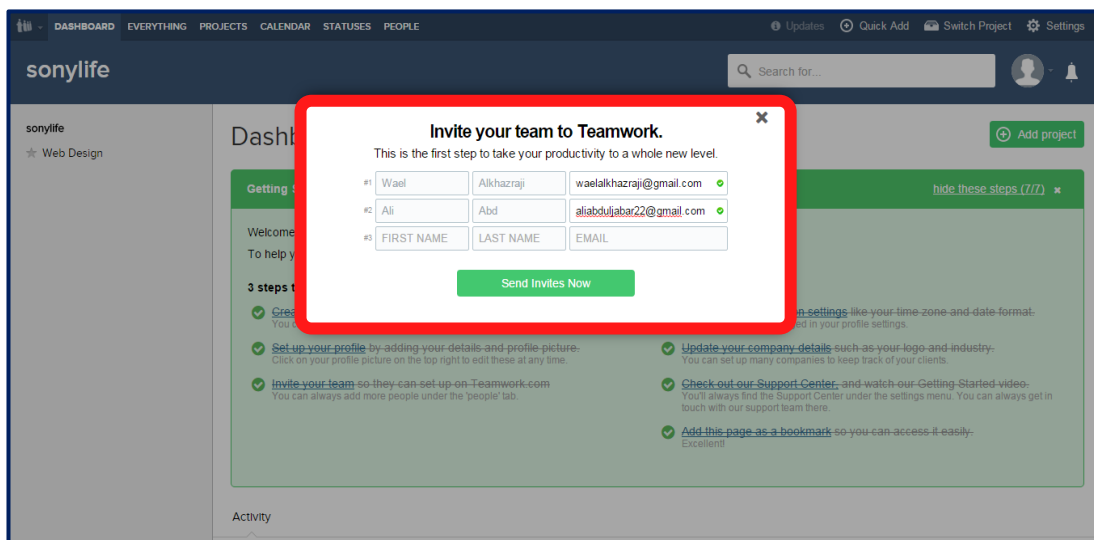
Figure 15: Invite team

The window above in the (Figure 15) allows us to invite the established project team. So, we can assign project team from other way which is (Assigning project team). This process can happen by two steps. The first step is clicking on (people)

icon and the second step clicking on (add user) icon to assign project team members. Usually, the manager needs to assign his project team clearly in order to link the tasks with them.
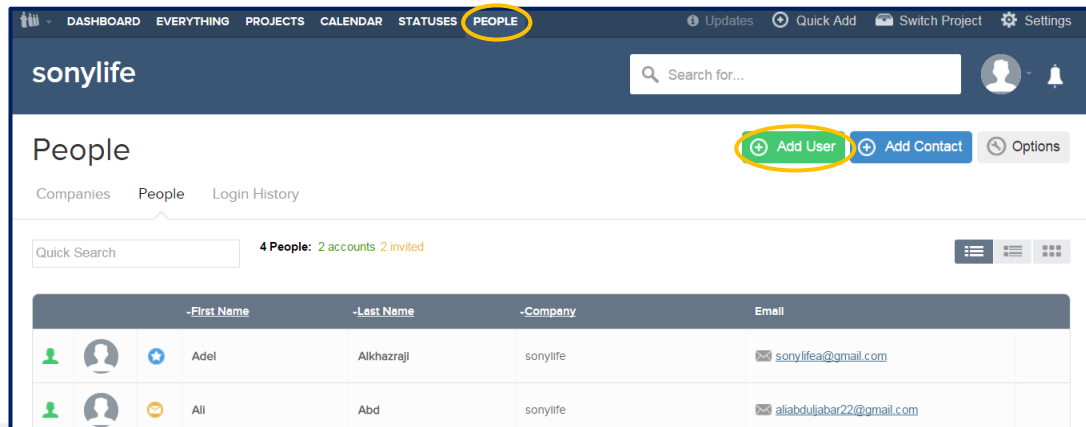
Figure 16: Assigning project team

The team members will be responsible for managing, controlling and monitoring all project processes and activities. Therefore, there is assigned roles for each team member and the administrator is responsible for assigning these roles. The project manager can establish a direct communication with different project clients and by doing so the process of information exchange and trace will be happening in a flexible way, and data update will not be a dilemma.

4.4.4 Creating different project tasks

Any main project has its own tasks which focus on different project aspects, and the following (Figure 17) shows the way to create the first task:
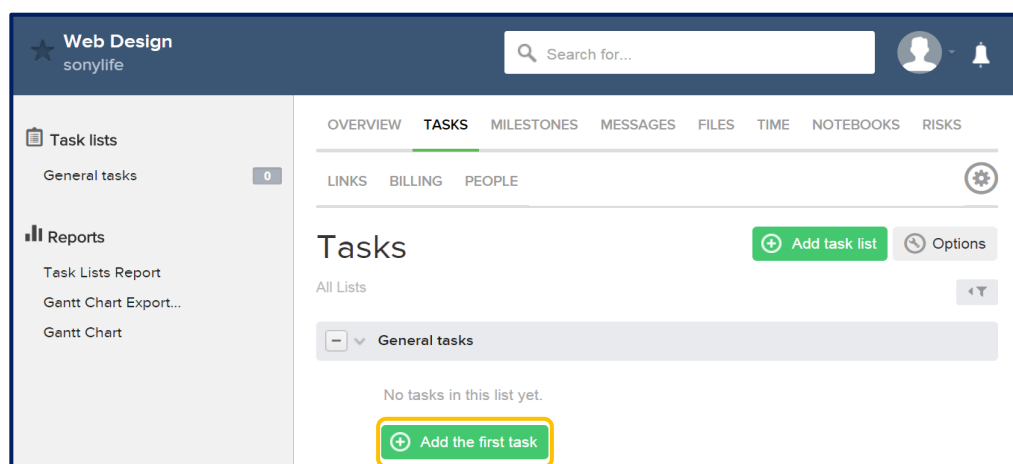
Figure 17: Add the first task to the new project

By using the (Teamwork PM Software), the manager has the option to create one task or multiple tasks with one click, which is a flexible way to do the work and arrange it.
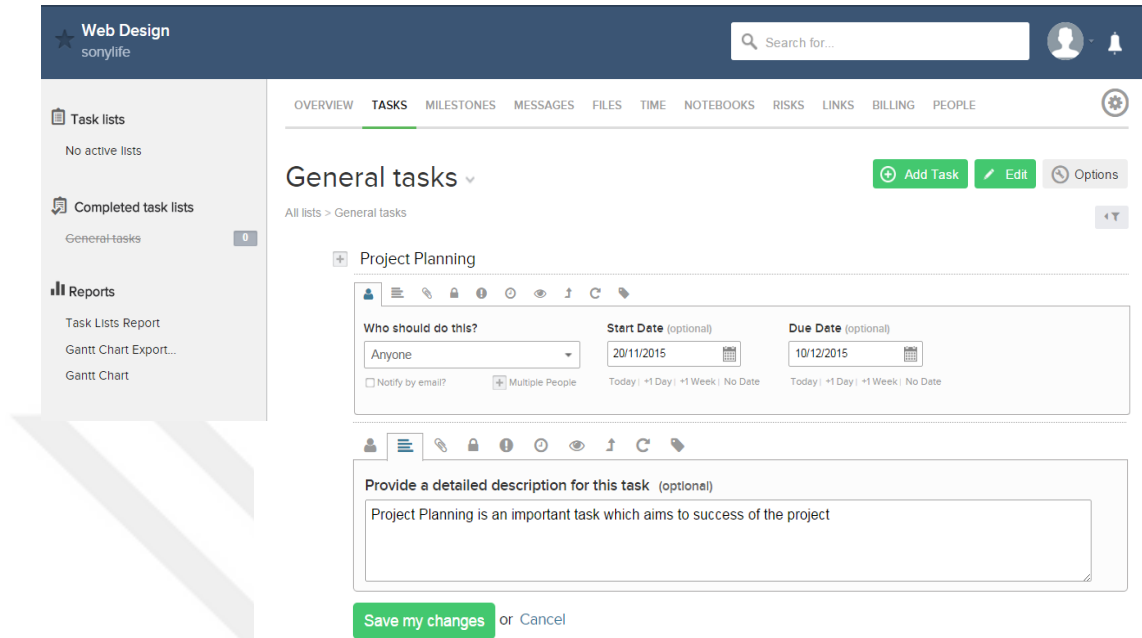
Figure 18: Add general task to the new project

By clicking on (save my changes), a new task will be created which is called Project Planning, and this new task can be adjusted by adding start and finish date, participating members and other options. In addition, after creating any task the manager can easily create sub tasks and controlling in more options.

In our case, under Project Planning there are sub-tasks which serve different aspects such as for example:

- Accounting
- Designing
- Marketing
- Logistics

Therefore, the (Teamwork PM Software) must be able to manage and arrange with these sub tasks and generate another sub task under the above tasks, as shown in the (Figure 19) below:
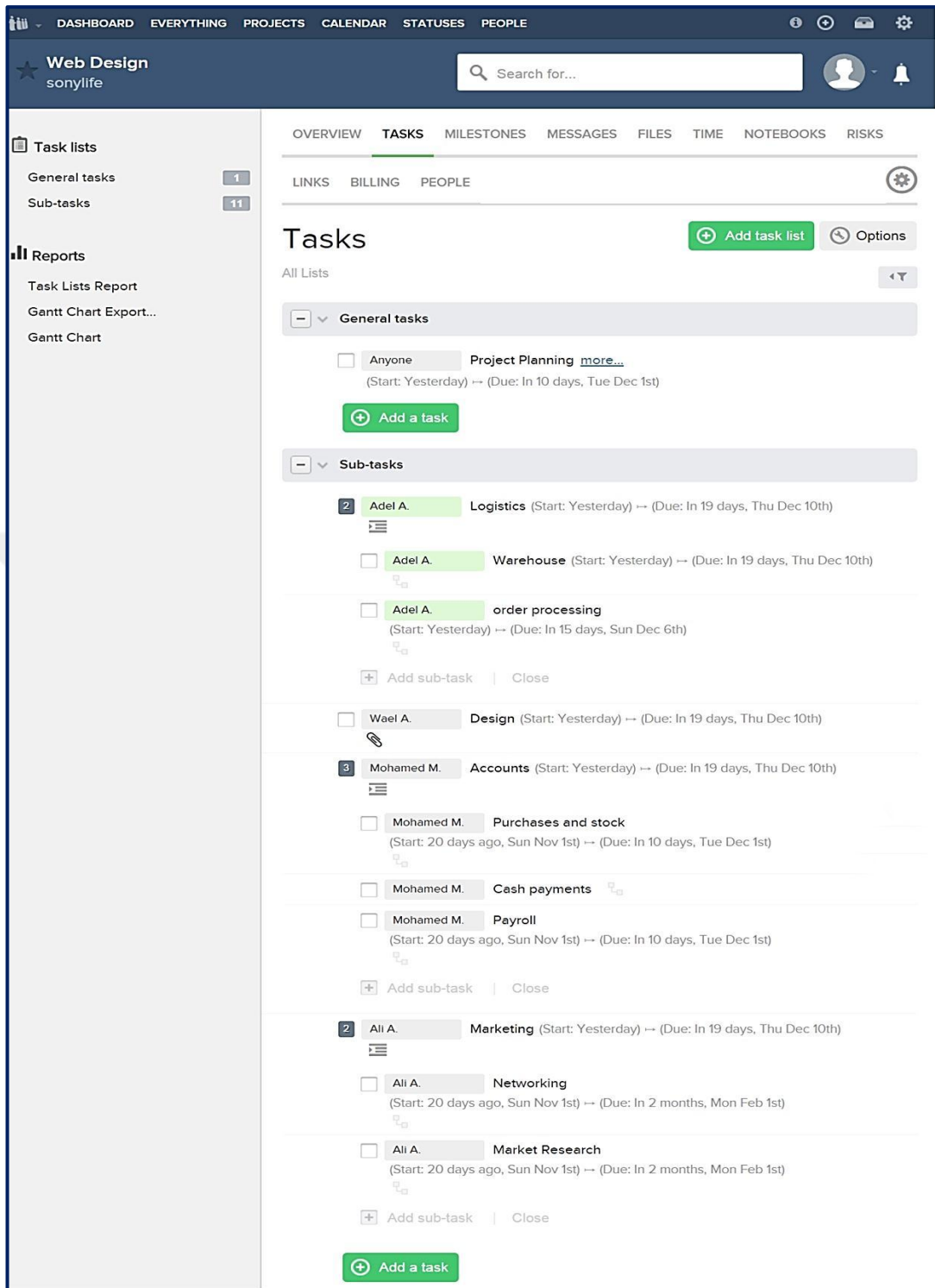
Figure 19: Task lists (General tasks, Sub- tasks)

As we can see in the above figure:

- A new task lists created that called (General tasks, Sub- tasks)

- Project task established

- Project users assigned to the tasks.

4.4.5 Manage communication process

Normally project managers prefer to use an easy way to establish and arrange communication process to get an efficient result. Therefore, by using the (Teamwork PM Software), the communication process will be conducted in an efficient way.

The user must know that the project interface contains:

- Project name and owner company
- People on this Project
- Other options in the project

Basically, the project details can be seen as shown in the following window in (Figure 20).
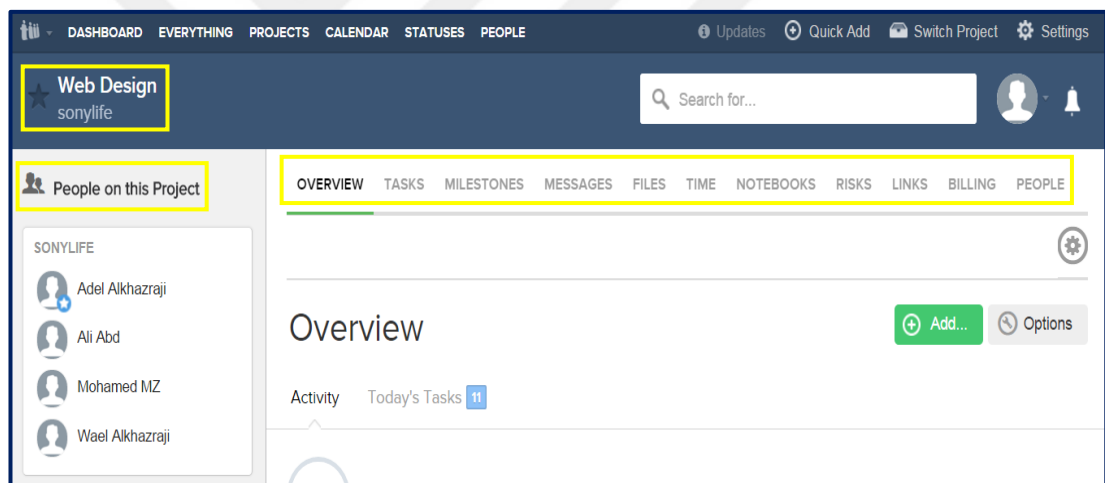
Figure 20: Project details

When we want to view all details of the task, it's simply by clicking on any task or subtask for example "networking". All its details will appear in the left column such as (Task list, Parent task, Assigned to, Start date, Due date, Assigned by, Date assigned, Last updated, and Task Id), as shown in the (Figure 21) below:
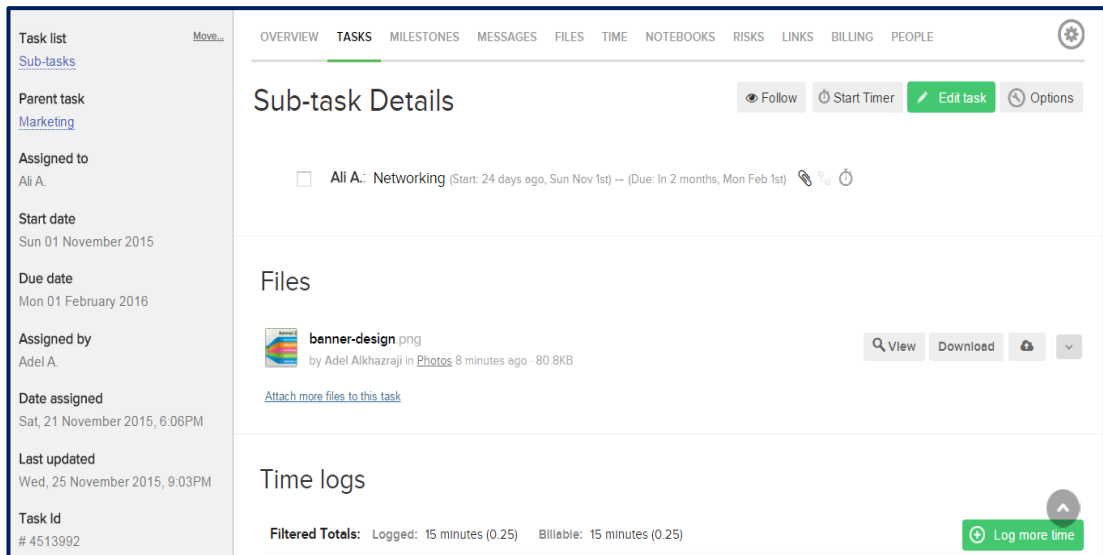
Figure 21: Tasks details

The project manager and Team members by add Milestones can use this feature to create specific points in time that mark when a significant part of a project is reached, Milestone has a due date, as shown in the (Figure 22) below:
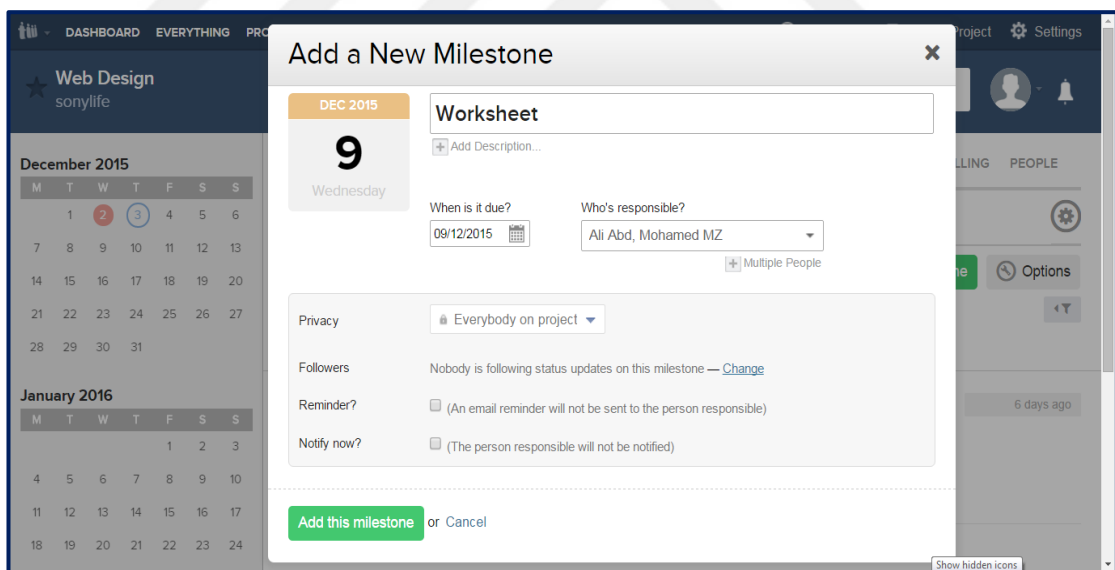
Figure 22: Add a Milestone

In addition, a member who manages and control any activity can establish his own messages about his task work progress and have the choice to make it secret or available to other members, and in this way other members can easily open the message and see the content and reply if need, as shown in the following (Figure 23):
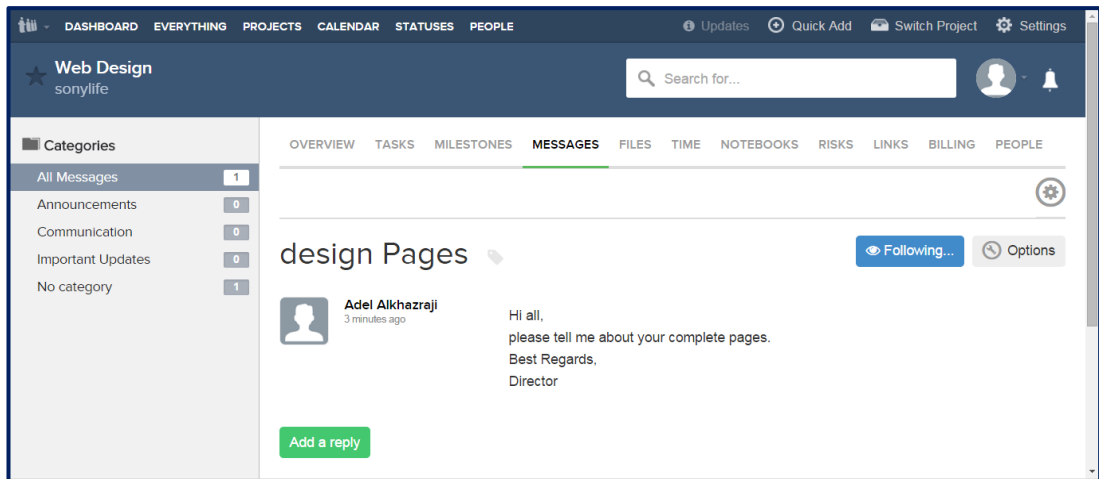
Figure 23: Create messages between members

The (Teamwork PM Software) provides 20 Gigabyte of cloud storage for free and can increase it according to the subscription status. Therefore, the project members can also use the cloud storage to upload files, which are related to their work and use it in a time of need, as shown in the (Figure 24) below:
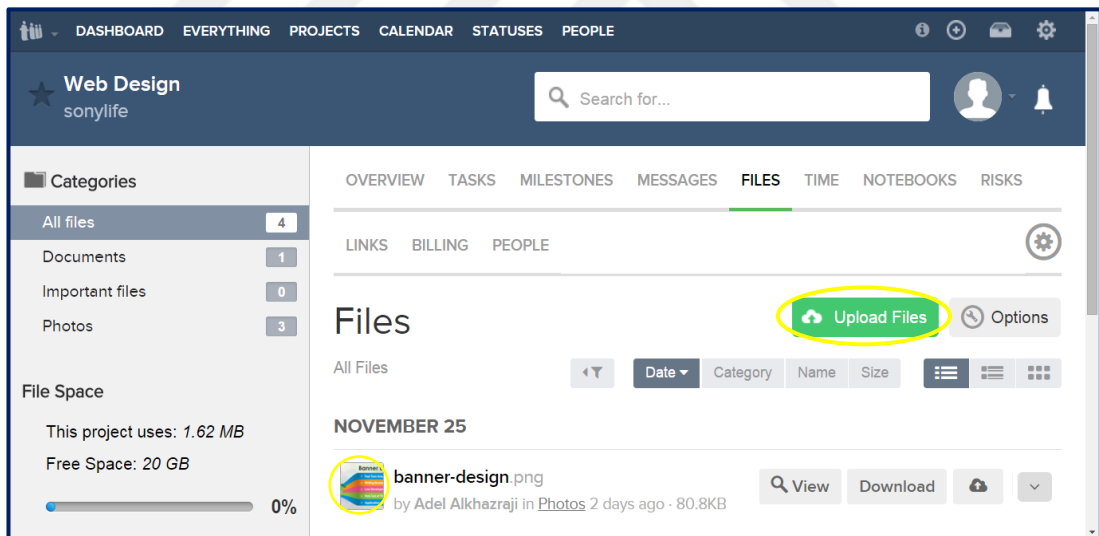
Figure 24: Upload files feature

Another functionality that this software provides is increase in usability and productivity factors by creating progress note for tasks. This option informs other members about task status and the percentage of completed work. Consequently, the manager can easily access his project tasks and check the work progress and put some comments to the person in charge, as shown in following (Figure 25):

41
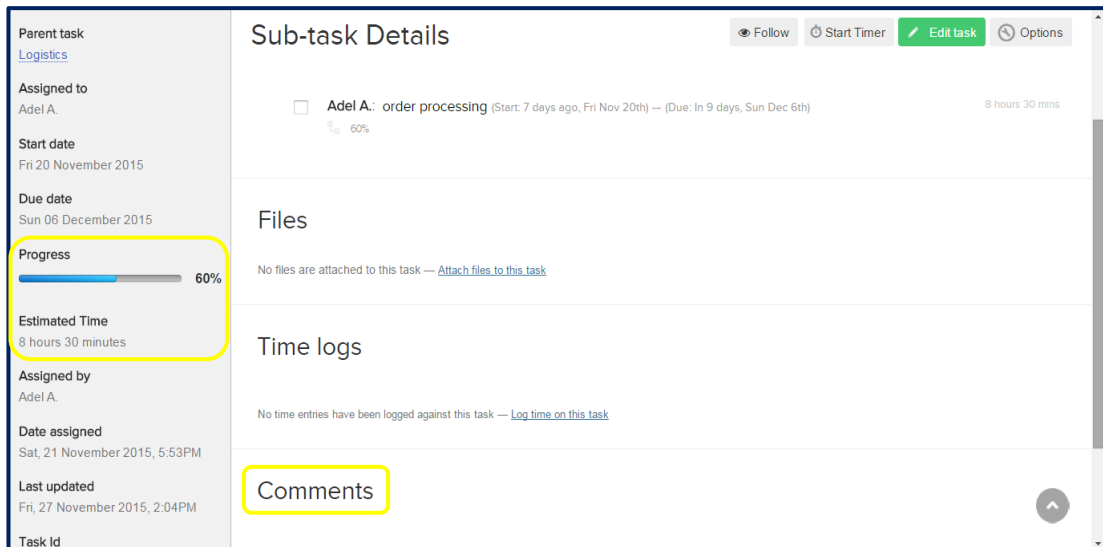
Figure 25: Creating progress note for tasks

Furthermore, there are documents called (Notebooks). The manager and Team members by add a Notebook can use it to keep notes on a project, store login details or project information. In addition, there are register called (Risks) that is a central repository where all identified risks on a project are recorded. It includes information such as:

- The source of the risk Source.
- The probability the risk will materialize into an issue.
- The potential impact of this issue on (Cost, Schedule, and Performance).
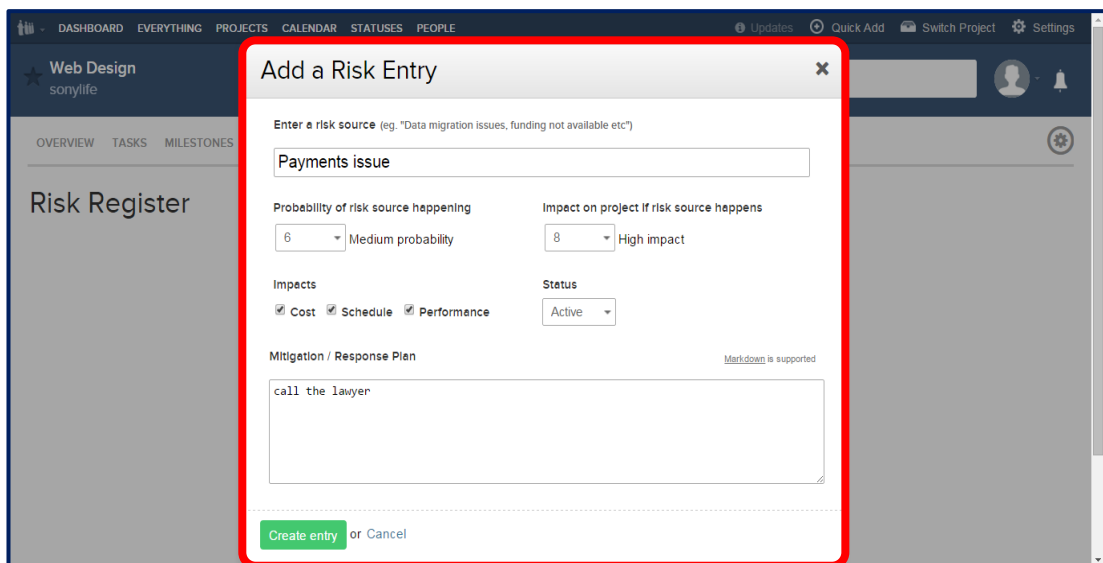
Figure 26: Add a risks

In addition, the (Teamwork PM Software) has important chat rooms called (Teamwork chat). Which are built for better Teamwork, and it has other feature as shown below:

- The chat rooms allow users to be in constant contact, so each team member has enough knowledge about the project.

- The manager is instantly connected with team members to get information about the tasks status. Constant collaboration ensures the details to get taken care of the delicate intricacies within the project.

- When the conversations are over and decisions are made, the (Teamwork Chat) integrates directly with (Teamwork) Projects, allowing the manager to turn decisions into tasks without leaving the chat environment.
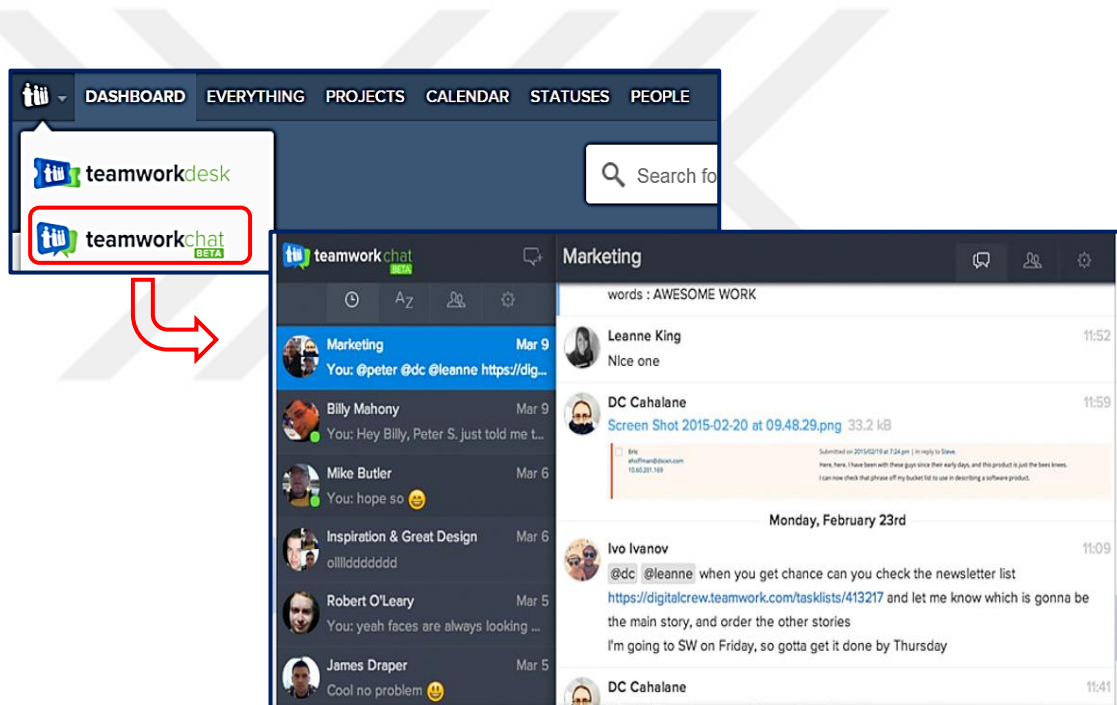
Figure 27: Teamwork chat

4.4.6 Creating performance reports

The (Teamwork PM Software) allows managers for creating regular reports to assess their projects. The task lists report contains three lists called (Which Tasks, Format, and Include) and each list includes other options, as shown in the (Figure 28) below:
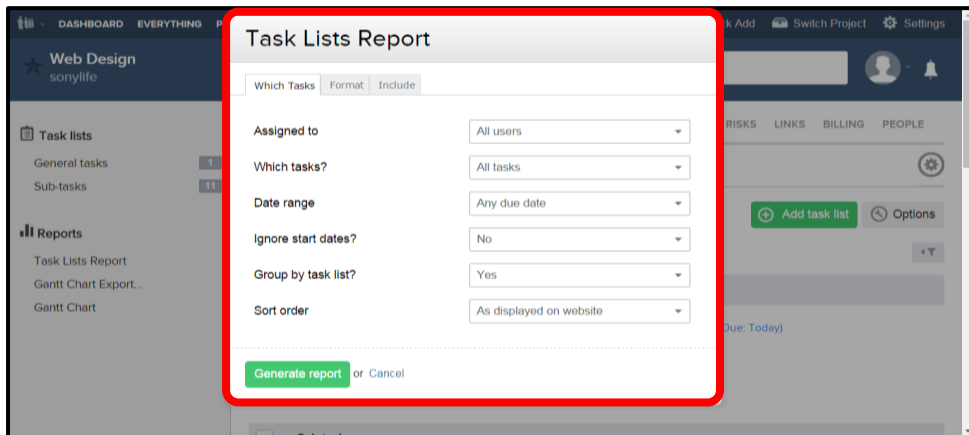
Figure 28: Create reports

The user of the software can easily adjust some options, and then press the (Generate report) icon to create a new report. During report creation, the user can choose whether to make it hidden, open report, or to make it visible to some selected members. The created report can be exported in two forms (PDF, Excel) and it can be printed.

4.4.7 Some other features and tools

After talking about the above measure functions, it is also necessary to outline some salient tools that help in project management.

1- Teamwork Timer App:

This is a small application that can be run on the user's computer desktop. This tiny application can open all the time in full view or switch to a more discreet compact view. Its easily import all member's upcoming tasks from Teamwork Projects such as timers and work on what's due next.
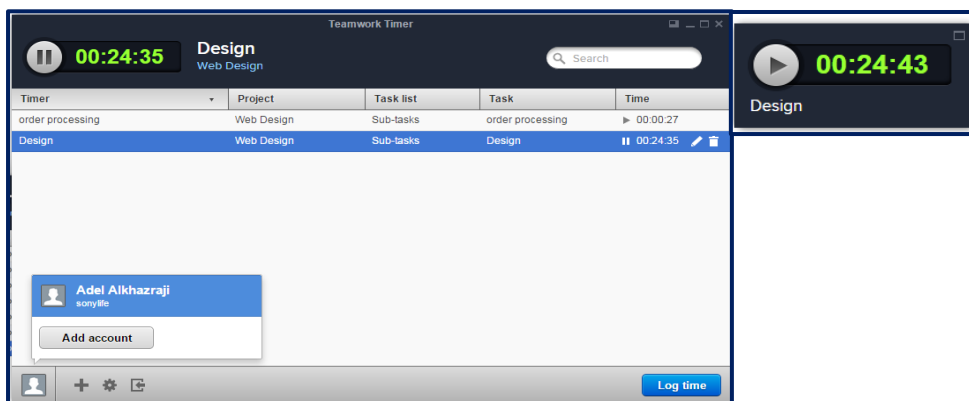
Figure 29: Teamwork Timer App

2- Teamwork mobile edition:

This application links the (Teamwork PM Software) with mobile devices, which allows users to manage and control their tasks by using their mobile devices. The users can also synchronize their projects to receive reports and notifications on their mobiles.
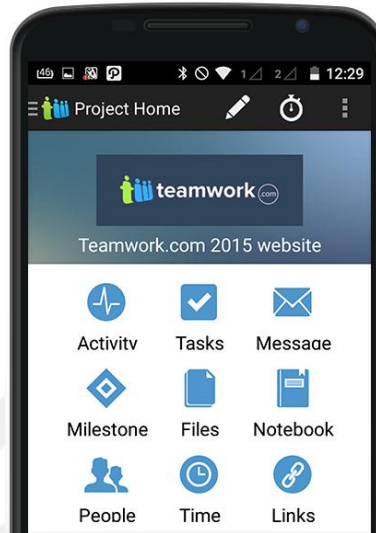
Figure 30: Teamwork mobile edition

3- Integration feature:

The projects that implemented using the (Teamwork PM Software) is built and designed to work seamlessly with tools used by project manager and his team. Therefore, the project team can integrate their projects with a growing number of applications and platforms such as (Dropbox, HubSpot, Excel, Gmail, and others) and make the work easier than ever.

4- Gantt charts:

This tool allows the project users to arrange their tasks in the form of charts, which means that each task will have a specific accomplishment period, and Gantt charts which make the works easier. The project users can easily extend or shorten the charts by using some editing options. This tool shows the start and finish date, percentage of completed work for each task, show Gantt charts in different forms, and modify the project tasks. Some Gantt charts also show the dependency (i.e. precedence network) relationships between activities, as shown in the following (Figure 31):
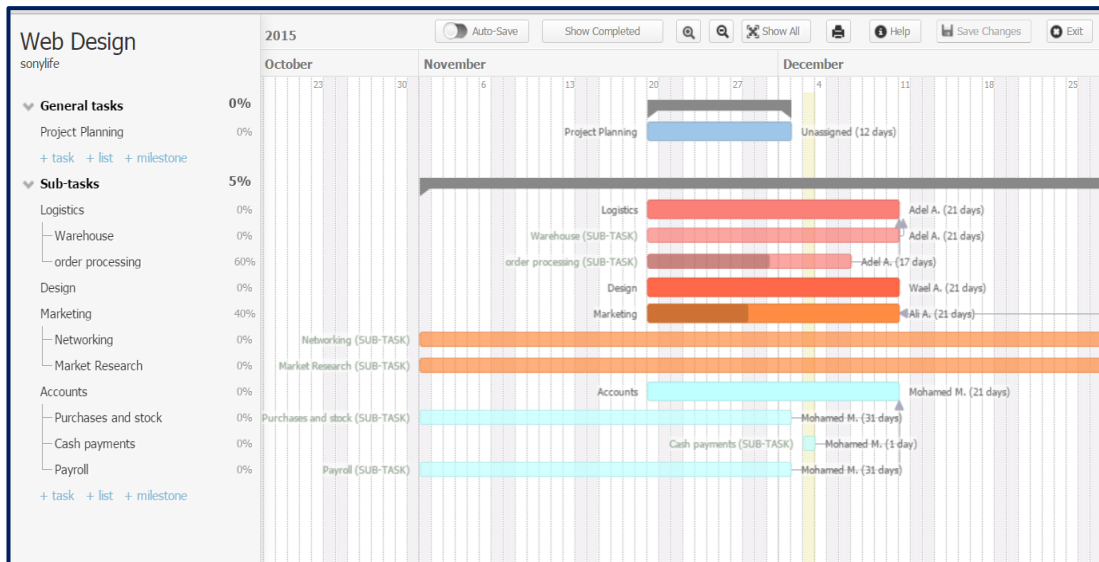
Figure 31: Task and process Gantt charts

5- Universal Importer:

This tool has used to import projects data from other project software applications for example (Basecamp).
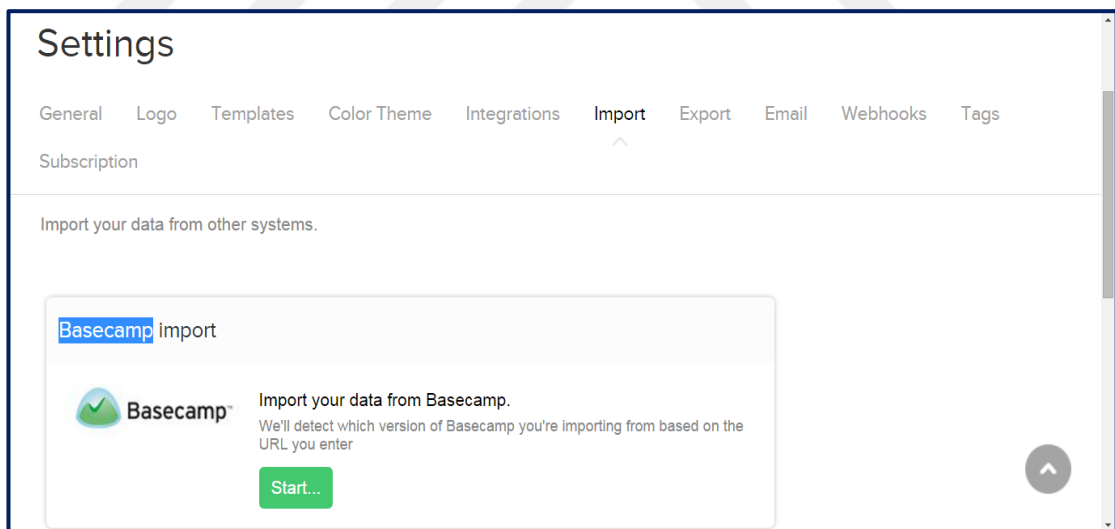
Figure 32: Import projects data feature.

6- Export data:

This feature provides Backup for entire projects database to a SQL file format that can be used to recreate the database locally. This feature give complete peace of mind to the project manager in control of own data.
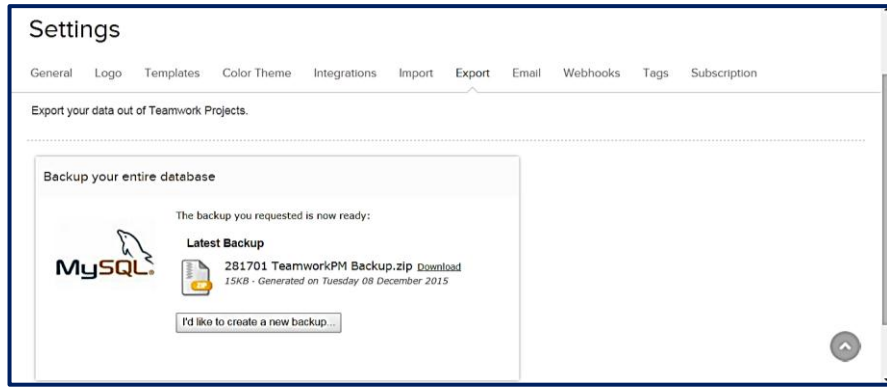
Figure 33: Export data

From the above experimentation, we can notice that how friendly this software is, and how it can positively affect important factors in implementing projects such as productivity, usability, flexibility and performance as well as save time and effort.

4.5 The questionnaire survey analysis

This section contains the profile of the respondents. The demographic items for respondents profile are: Gender, Employment Type, PM Software Experience and the name of Project Management Software (PMS) used (which are mentioned in the table 4.1). The tables and figures in the following sections show the analysis of the SPSS software output. The percentage of each group is shown in following (Figure 34):
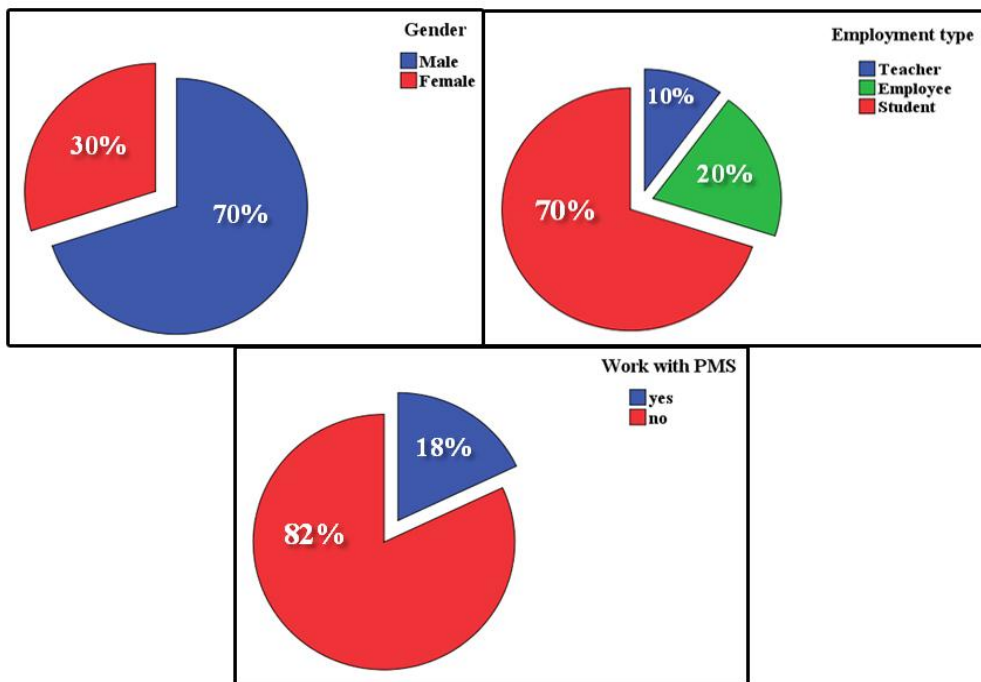
Figure 34: Demographic profiles of the respondents (PMS) Experience.

70% of the respondents were males, while, the remaining 30% were females. With regard to employment types, 10 percent were teachers, with 20 percent who were employees and 70 percent were students. In terms of working previously with Project Management Software, it was: Yes 18 percent and No 82 percent.

The following (Table 1) shows the name of the project management software used and the number of respondents for each of it.

Table 1: Name of the project management software used

	Name of PMS	Frequency	Percent
Valid	5pm	2	4
	Freshdesk	1	2
	MS project	3	6
	Primavera	2	4
	Wrike	1	2
	Total	9	18
Missing	System	41	82
Total		50	100

4.5.1 Descriptive Statistics

Quintet Likert scale statistics have been categorized by the way of the ordinal data. Therefore, it's possible to analyze these data in the same way of numeric data [44]. The five probable answers are (highly disagree, disagree, neutral, agree, and highly agree). However, these answers are typically represented by the numbers (1, 2, 3, 4, 5) in the analysis. Naturally, if the value is close to 3, that's mean the response is closer to neutral. The way the responses are understood depends largely on the average value. Here we will review some of the variables with a view to explaining their trends:

- **Descriptive Statistics for productivity factor**

Considering that was used Quintet Likert scale in the questionnaire, the first section of the questions was about Productivity and below in (Table 2) is the statistics for answers:

Table 2: Descriptive Statistics for Productivity factor

Productivity	Mean	Std. Deviation	Percent (%)				
			SD	D	N	A	SA
Dealing with suitable tool to use can increase project productivity.	3.66	1.099	4	10	28	32	26
Project tools allow companies to manage the knowledge areas in project management.	3.70	1.129	4	12	22	34	28
Triple constraints (time, cost, resources) can be managed effectively with software tools.	3.73	1.086	4	10	18	40	24
Utilize calendars and Gantt chart can reduce the project delay.	3.60	.984	4	6	30	40	16
Some project features like (Advanced Reporting) can early detect future risk.	3.67	1.038	4	6	30	34	22
Accessibility to project management software will enhance work progression.	3.52	1.111	8	6	26	40	16
Project tools help companies to adopt with globalization trend.	3.58	1.028	6	6	24	46	14
Project software can support the stakeholders throughout the project implementation period.	3.58	1.069	6	4	34	32	20
Project software enabled project managers to focus on the organization's core business.	3.58	1.028	6	2	36	34	18

Note: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly Agree.

As shown in the above table there is an agreement with the respondent answers, for example, about 28% of people strongly agree with second question. Furthermore, the highest percentage of strongly disagree is 8% for the sixth question. However, the mean is still more than 3 in 3.52. Moreover, the above productivity table of the PMS system shows that the distribution of answers is Gaussian for all the nine questions, and it refers to a lot of agreeing with the respondent answers.

- **Descriptive Statistics for usability factor**

The second section of questions is about usability of the project management software (PMS). As shown in the (Table 3), we found tendencies to agree with all the questions contained. However, but these tendencies change differently at some questions; for instance, in the question that asked about the (Use the project tools can increase project execution), the percentage of agree and strongly agree combined to 66%. In addition, the mean range is between 3.46 for third and fourth question and 3.67 for Seventh one.

Table 3: Descriptive Statistics for Usability factor

Usability	Mean	Std. Deviation	Percent (%)				
			SD	D	N	A	SA
Use the project tools can increase project execution.	3.64	1.005	4	10	20	50	16
Project software can enhance the communication process.	3.65	1.071	4	10	24	38	22
Project tools can simplify complex processes.	3.46	1.031	4	14	24	42	12
Automated tools like (mail notification) can increase project update.	3.46	1.051	6	8	32	36	14
Multiple Dashboards can make information and data easier to understand.	3.65	1.101	6	6	26	36	22
Task Lists and assignments can arrange duties and show clearly Interdependence between tasks.	3.56	1.029	6	6	26	44	14
Mobile Device Support can enhance project performance.	3.67	1.078	6	6	22	42	20

Note: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly Agree.

- **Descriptive Statistics for flexibility factor**

The third section of questions is about for flexibility factor. There is agreement with the concept that PMS can make the project process more flexible as shown in the following (Table 4) presents:

Table 4: Descriptive Statistics for Flexibility factor

Flexibility	Mean	Std. Deviation	Percent (%)				
			SD	D	N	A	SA
Project tools can Allows Communicate easily between the project team.	3.65	1.158	8	8	14	46	20
Charts and Graphs can support workflow and make it more flexible.	3.64	1.169	8	8	14	44	20
Software tools can determine project period and monitor work progress.	3.50	1.092	8	8	20	48	12

Note: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly Agree.

- **Descriptive Statistics for performance factor**

The following table contains the frequencies of answers for each question regarding the performance and the execution of the PMS program. We found inclinations to agree and strongly agree combined to more than 60% with most the questions. In addition the averages are higher than 3 as shown in the (Table 5) below:

Table 5: Descriptive Statistics for Performance factor

Performance	Mean	Std. Deviation	Percent (%)				
			SD	D	N	A	SA
Centralized Document Database support project performance factor.	3.71	1.184	6	10	18	34	28
Template creator can reduce the required time to accomplish documentation tasks.	3.71	1.148	6	10	14	42	24
Personal Dashboard can allow to project's team to control and display the information.	3.69	1.170	6	10	18	36	26
Resource leveling feature in project management software can effectively support resource allocation.	3.65	1.101	6	8	20	42	20
Charts and Graphs support project workflow, reporting and visibility.	3.67	1.117	6	8	20	40	22

Automated tools such as instant messaging can increase project performance.	3.58	1.127	6	10	22	38	20

Note: SD = Strongly Disagree, D = Disagree, N = Neutral, A = Agree, SA = Strongly Agree.

4.5.2 Checking the Reliability of a scale

When we are selecting scales to be included in the study, it is important to find scales that are reliable. There are a number of different aspects of reliability. One of the main issues concerning the scale is internal consistency [45]. One of the most commonly used indicators of internal consistency is Cronbach's alpha coefficient [46, 47]. Ideally, the Cronbach alpha coefficient of a scale should be above 0.7 [48]. However, Cronbach alpha value is quite sensitive to the number of items in the scale. The reliability of the scale can vary depending on the sample that it is used with. Therefore, it is necessary to check that each of scales is reliable with the particular sample.

The output generated from this procedure is shown in the (Table 6) below:

Table 6: Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	N of Items
0.979	25

In terms of reliability, the most important factor is the Alpha value. This is Cronbach's alpha coefficient which in this case is 0.979, this value is above 0.7. As a result, the scale can be considered reliable with our sample.

4.5.3 One Sample Statistical T-Test for each group

One Sample T-Test is used to test the mean for every sample and the samples have been compared with the value of 3 as regards of Quintet Likert scale [44].

Moreover, the SPSS statistics custom is 95% confidence intervals. This equates to the statistical significance that have to be at level of the Sig < 0.05 [49].

The tables below present the results of one sample statistical T-Test for each factor group and the terms included in each table are defined as following:

- Test Value: is the number that has been decided to be the test value for each factor group as regards of Quintet Likert scale.
- (t): is the term of test statistics of the one-sample t test. It is calculated by dividing the (mean difference) by the standard error mean (from the One-Sample Statistics box).
- Sig. (2-tailed): is the rate of two-tailed p-value equivalent to the one sample T-Test statistic.
- Mean Difference: is the variance among the "experiential" sample mean with the "expected" mean.
- Confidence Interval for the Difference: is the confidence interval for the variance among the indicated test value with the value of sample mean.

- **One Sample T-Test for productivity factor**

For first Section of the questionnaire, which is Productivity, we find that the answers to all questions close to the number 3 and all sig values are lower than 0.05, which reflects the status of neutrality. As shown in the following (Table 7):

Table 7: One Sample T-Test for productivity factor

One-Sample Test					
	Test Value = 3				
Productivity	t	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Dealing with suitable tool to use can increase project productivity	4.245	.000	.660	.35	.97
Project tools allow companies to manage the knowledge areas in project management	4.383	.000	.700	.38	1.02

Triple constraints (time, cost, resources) can be managed effectively with software tools	4.650	.000	.729	.41	1.04
Utilize calendars and Gantt chart can reduce the project delay	4.255	.000	.604	.32	.89
Some project features like (Advanced Reporting) can early detect future risk	4.449	.000	.667	.37	.97
Accessibility to project management software will enhance work progression	3.249	.002	.521	.20	.84
Project tools help companies to adopt with globalization trend	3.931	.000	.583	.28	.88
Project software can support the stakeholders Throughout the project implementation period	3.782	.000	.583	.27	.89
Project software enabled project managers to focus on the organization's core business	3.931	.000	.583	.28	.88

- **One Sample T-Test for usability factor**

    For usability, there is an agreement on items. The statistics for the test are in the following (Table 8):

Table 8: One Sample T-Test for usability factor

One-Sample Test					
	Test Value = 3				
Usability	t	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Use the project tools can increase project execution.	4.502	.000	.640	.35	.93
Project software can enhance the communication process.	4.267	.000	.653	.35	.96

Project tools can simplify complex processes.	3.081	.003	.458	.16	.76
Automated tools like (mail notification) can increase project update.	3.021	.004	.458	.15	.76
Multiple Dashboards can make information and data easier to understand.	4.064	.000	.646	.33	.97
Task Lists and assignments can arrange duties and show clearly Interdependence between tasks.	3.785	.000	.563	.26	.86
Mobile Device Support can enhance project performance.	4.283	.000	.667	.35	.98

- **One Sample T-Test for flexibility factor**

For the flexibility factor, all sig values are lower than 0.05 and that refer to no big difference between means and 3. As the following (Table 9):

Table 9: One Sample T-Test for flexibility factor

One-Sample Test					
	Test Value = 3				
Flexibility	t	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Project tools can Allow Communicate easily between the project team.	3.865	.000	.646	.31	.98
Charts and Graphs can support workflow and make it more flexible.	3.744	.001	.638	.30	.98
Software tools can determine project period and monitor work progress.	3.174	.003	.500	.18	.82

- **One Sample T-Test for performance factor**

Similarly, for the performance factor all sig values are lower than 0.05 and that refer to no big difference between means and 3. As follow (Table 10):

Table 10: One Sample T-Test for Performance factor

One-Sample Test					
	Test Value = 3				
Performance	t	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Centralized Document Database support project performance factor.	4.144	.000	.708	.36	1.05
Template creator can reduce the required time to accomplish documentation tasks.	4.276	.000	.708	.38	1.04
Personal Dashboard can allow to project's team to control and display the information.	4.072	.000	.688	.35	1.03
Resource leveling feature in project management software can effectively support resource allocation.	4.064	.000	.646	.33	.97
Charts and Graphs support project workflow, reporting and visibility.	4.134	.000	.667	.34	.99
Automated tools such as instant messaging can increase project performance.	3.587	.001	.583	.26	.91

4.5.4 One-way analysis of variance (ANOVA)

One-way ANOVA will tell us whether there are significant differences in the mean scores on the independent variable. It analyses the contrast between the variables for one independent variable and the difference between this test and T-test is containing more than one variable here.

Here we take for example the usability factor and study the effects of job type on it, and the output generated from this procedure is shown below in the Table 11:

Table 11: ANOVA Test for Usability factor

Usability	Job Type	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Use the project tools can increase project execution.	Teacher	3.80	.447	.200	3	4
	Employee	4.10	.738	.233	3	5
	Student	3.49	1.095	.185	1	5
	Total	3.64	1.005	.142	1	5
Project software can enhance the communication process.	Teacher	3.20	.837	.374	2	4
	Employee	4.20	.789	.249	3	5
	Student	3.56	1.133	.194	1	5
	Total	3.65	1.071	.153	1	5
Project tools can simplify complex processes.	Teacher	3.25	.957	.479	2	4
	Employee	4.00	.667	.211	3	5
	Student	3.32	1.093	.187	1	5
	Total	3.46	1.031	.149	1	5
Automated tools like (mail notification) can increase project update.	Teacher	3.25	.957	.479	2	4
	Employee	4.20	.632	.200	3	5
	Student	3.26	1.082	.186	1	5
	Total	3.46	1.051	.152	1	5
Multiple Dashboards can make information and data easier to understand.	Teacher	3.25	.957	.479	2	4
	Employee	4.60	.516	.163	4	5
	Student	3.41	1.104	.189	1	5
	Total	3.65	1.101	.159	1	5
Task Lists and assignments can arrange duties and show clearly Interdependence between tasks.	Teacher	3.50	.577	.289	3	4
	Employee	4.10	.568	.180	3	5
	Student	3.41	1.131	.194	1	5
	Total	3.56	1.029	.149	1	5
Mobile Device Support can enhance project performance.	Teacher	3.50	1.291	.645	2	5
	Employee	4.40	.516	.163	4	5
	Student	3.47	1.107	.190	1	5
	Total	3.67	1.078	.156	1	5

CHAPTER 5

RESULTS AND DISCUSSION

5.1 Introduction

This research relies on three different sources which are a comprehensive literature study about PM software and its appropriate tools, Teamwork PM Software experimentation, and conducting of questionnaire survey. The important contribution once getting the above findings is to compare and determine the compatibility level between gathered data.

5.2 Discussion of (Teamwork PM Software) experimentation

The important achievements have been gotten by the experimentation are:

- Ability to establish different projects at one time, manage it, and assign team members for each of them.

- Show how to use the PM software to increase flexibility factor in terms of the breaking down the main tasks into small sub-tasks, which are easier to implement and manage.

- Create an efficient communication between manager, staff, clients and stakeholders. This is by providing efficient communication tools, such as; Teamwork chat rooms, the regular performance reports, etc.

- Create performance reports, which make monitoring process more efficient and reduce risk factors.

Therefore, it can be noticed that the project management software tools play a vital role to support the Productivity, Usability, Flexibility and Performance factors within the project processes and activities.

5.3 Discussion of the questionnaire survey

Through analyzing the collected data with SPSS software, some factors were combined with others in order to get the benefits of information available. This may help to understand the perspective of the participants towards our topic. Therefore, to

achieve these advantages, (Gender, Employment type, and working experience) had been combined together in one figure as shown below in the (Figure 35):
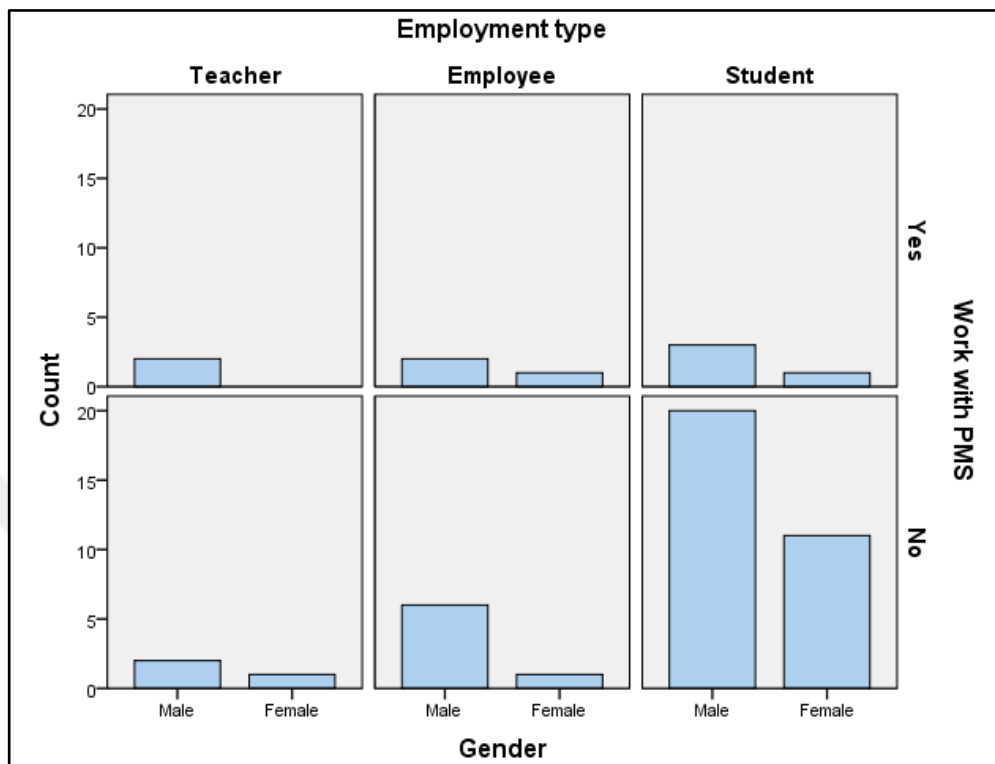
Figure 35: The three demographic variables

The figure above shows the relationship between the three demographic variables. It shows a noticeable disparity between number of students (males and females) who don't work with PMS program and employment type (teacher, employee, student). Also, the number of female teachers who works with PMS is zero. Moreover, it can be seen that the number of respondents who have not worked with any type of project management software is higher than those who have worked in the three fields (Teacher, Employee, and Student). Therefore, there is an urgent need to provide them a clear image about the expected benefits from using PM software applications in their assignments and duties.

5.3.1 Descriptive tables

There is an agreement in the rest of responded answers that the four factors are vital in the implementation process of project management software applications, and the histograms below are examples on it.

In the following histogram in (Figure 36), there is an example of the variables about the productivity factor and the form of distributed answers for them:
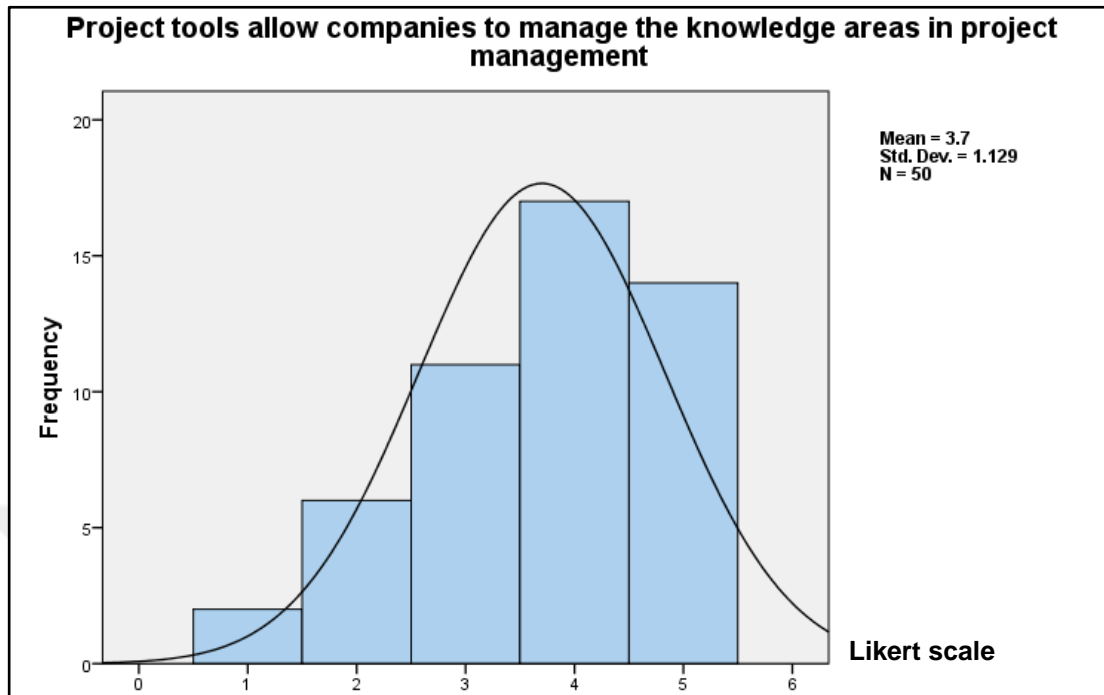
Figure 36: mean value example for the second row in Productivity factor

The next histogram in the (Figure 37) shows the perception of an example for usability factor:
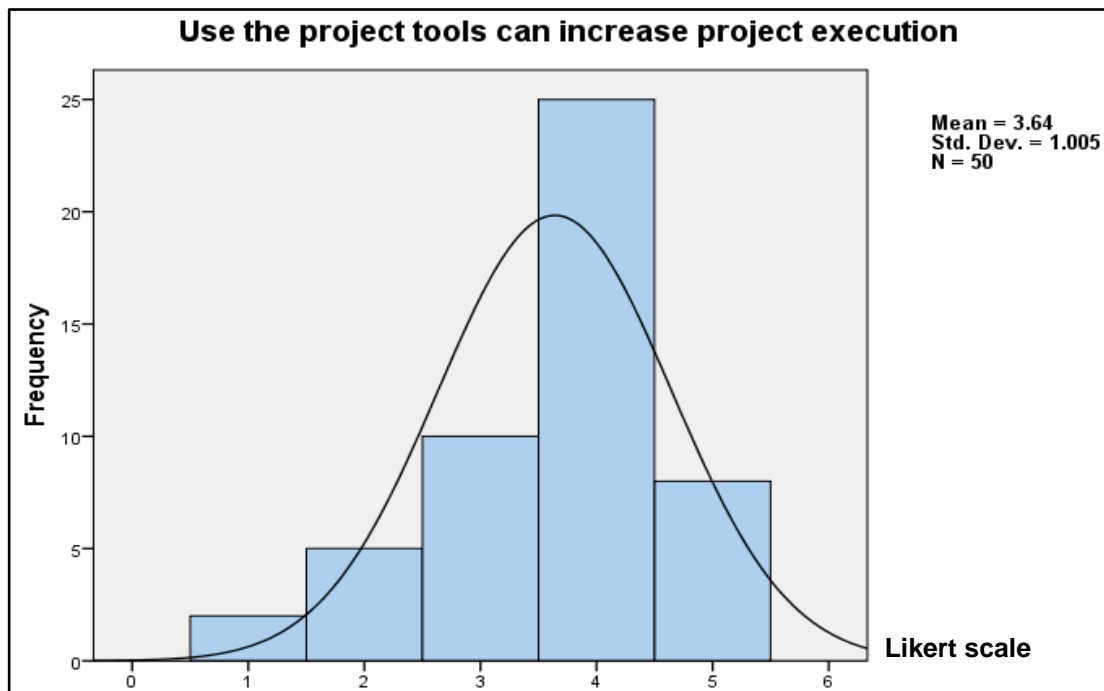
Figure 37: mean value example for one row in usability factor

The histogram below in the (Figure 38) refers to the agreement of respondents with the flexibility factor.

Project tools can Allow Communicate easily between the project team

Mean = 3.65
Std. Dev. = 1.158
N = 48
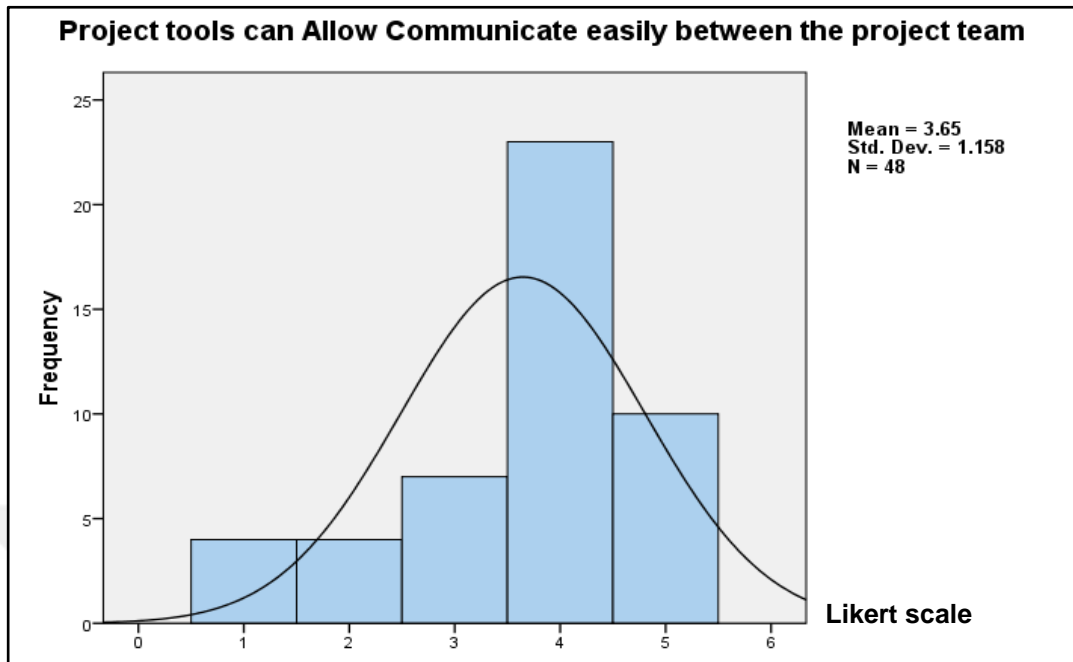
Figure 38: mean value example for one row in flexibility factor

Finally, the histogram below in the (Figure 39) shows an example of the Performance factor:

Centralized Document Database support project performance factor

Mean = 3.71
Std. Dev. = 1.184
N = 48
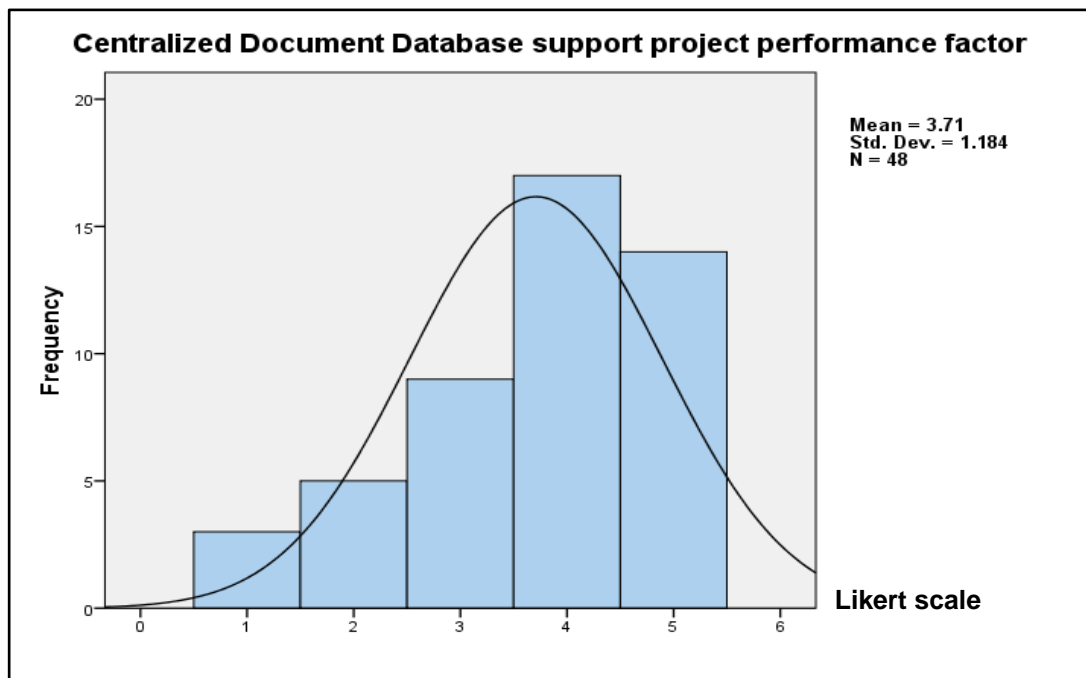
Figure 39: mean value example for one row in performance factor

From the (mean) value, it can be noticed that most answers agreed with the question's content, so that the mean value were among 3 to 3.7 values.

5.3.2 Reliability

Table 12: Reliability Statistics

Reliability Statistics	
Cronbach's Alpha	N of Items
0.979	25

In terms of reliability the most important factor is the Alpha value. This is Cronbanch's alpha coefficient, which in this case is 0.979. Hence the value of Cronbanch's alpha coefficient is above 0.7, so the scale can be considered reliable with our sample.

5.3.3 One Sample T-Test

T-Test is used to test the mean for one sample, and these samples are compared with the value of 3 based on Quintet Likert scale. For example: in first Section of the questionnaire, which is Productivity, it is found that the answers for all questions close to the number 3. Furthermore, depending on the value (Sig= 0.05), it is noticed that all sig value is lower than 0.05 value. Therefore, there is no big difference between means and the value of 3, which reflects the status of neutrality, as shown in the following (Table 13):

Table 13: One Sample T-Test for Productivity factor

One-Sample Test					
	Test Value = 3				
Productivity	t	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
				Lower	Upper
Dealing with suitable tool to use can increase project productivity	4.245	.000	.660	.35	.97
Project tools allow companies to manage the knowledge areas in project management	4.383	.000	.700	.38	1.02
Triple constraints (time, cost, resources) can be managed effectively with software tools	4.650	.000	.729	.41	1.04

Utilize calendars and Gantt chart can reduce the project delay	4.255	.000	.604	.32	.89
Some project features like (Advanced Reporting) can early detect future risk	4.449	.000	.667	.37	.97
Accessibility to project management software will enhance work progression	3.249	.002	.521	.20	.84
Project tools help companies to adopt with globalization trend	3.931	.000	.583	.28	.88
Project software can support the stakeholders Throughout the project implementation period	3.782	.000	.583	.27	.89
Project software enabled project managers to focus on the organization's core business	3.931	.000	.583	.28	.88

5.3.4 One-way analysis of variance (ANOVA)

In One-way ANOVA, Subjects were divided into three groups according to their job type (Group 1: Teachers; Group 2: Employees; Group 3: students) and we take some answers from Usability as example to the another factors and show the impacts of job type on it. In the last statement (Mobile Device Support can enhance project performance) there is a difference in the means between employees, teachers and students. Also in previous one the means have difference. The output generated from this procedure is shown in the following (Table 14):

Table 14: ANOVA Test for Usability factor

Usability	Job Type	Mean	Std. Deviation	Std. Error	Minimum	Maximum
Project software can enhance the communication process.	Teacher	3.20	.837	.374	2	4
	Employee	4.20	.789	.249	3	5
	Student	3.56	1.133	.194	1	5
	Total	3.65	1.071	.153	1	5
Project tools can simplify complex processes.	Teacher	3.25	.957	.479	2	4
	Employee	4.00	.667	.211	3	5
	Student	3.32	1.093	.187	1	5
	Total	3.46	1.031	.149	1	5
Automated tools like (mail notification) can increase project update.	Teacher	3.25	.957	.479	2	4
	Employee	4.20	.632	.200	3	5
	Student	3.26	1.082	.186	1	5
	Total	3.46	1.051	.152	1	5
Multiple Dashboards can make information and data easier to understand.	Teacher	3.25	.957	.479	2	4
	Employee	**4.60**	.516	.163	4	5
	Student	3.41	1.104	.189	1	5
	Total	3.65	1.101	.159	1	5
Mobile Device Support can enhance project performance.	Teacher	3.50	1.291	.645	2	5
	Employee	**4.40**	.516	.163	4	5
	Student	3.47	1.107	.190	1	5
	Total	3.67	1.078	.156	1	5

5.4 Information correlation

From the findings of three different sources we can see that it support each other. For example, conducting a comprehensive literature study clarify many roles that the project management software play it, as well as the most important tools that are provided. This affects supporting and reinforcing the extracted result from the questionnaire survey and the teamwork software experimentation. Therefore, the questionnaire result was in the normal limits.

In the terms of hypothesis, the extracted result is compatible with the research hypothesis, and of course this compatibility varies increase and decrease between our four factors. However, there is no essential conflict between the extracted data.

5.5 Recommendation for using PM software

After conducting the research and realizing some important features and tools which are provided by project management software, and to link this information with the research objective we can extract and highlight the following points:

1. All business projects must include these basic features, which are:
- Charts and graphs
- Calendar
- Daily reporting tools
- Timeline tools

These features are provided by the (Teamwork PM software) and other software applications such as, project manager and Genius software.

2. There are advanced features which may be needed by some companies, such as:
- Cloud computing (with high capacity)
- Video conference
- Budget tracking
- Multi-Dashboard

3. Critical projects, for example; (Economic projects) need to periodic reports to inform high level executives about the changes in the demand and market, so using this software (teamwork) can provide them this feature.

4. Selection of software depends on chosen package, such as (team size factor, active projects and file storage, and other features), for example the price of monthly package for 5 Projects is 12$ with Unlimited users and 1GB file storage. The (Figure 40) below give more details on available packages.
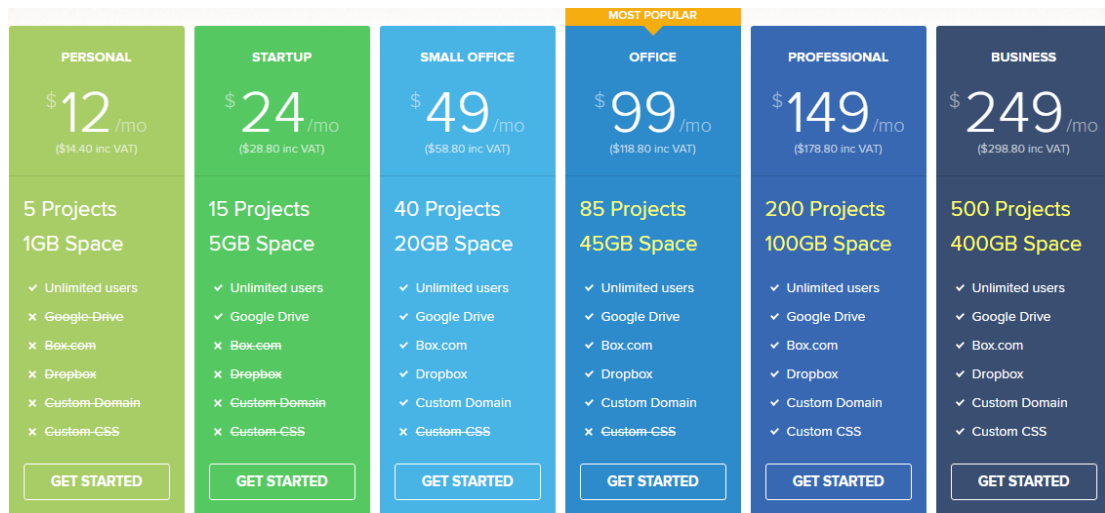
Figure 40: Available teamwork packages

Also these features give the companies the choice to choose the suitable package, and save cost as a result.

5. Companies that have a lot of outlets need to collaborate between their outlets\ branches. In other word, companies similar to Pepsi, Lenovo, hp, and HONDA implemented the teamwork due to such capabilities of the software.

6. Major projects (construction projects) normally need a large number of workers, so the package that was explained in chapter four will not cover their complex requirement, so they need another package which can accommodate the large number of staff and achieve the most complex processes. And of course the price will increase, but the outcome will be better (as described in figure 40).

7. Projects that depend on time like (Investment projects) need timeline tool, which can facilitate the task representation and make it more flexible.

8. Companies that implement and manage many projects same time (multiple projects) can use this software to facilitate their work, create many work groups and classify these groups according to certain criteria and priorities. While, Companies that implement individual projects can use other software applications which are normally cheaper.

9. Managers who usually collaborate with outside managers, parties and companies need to work with software applications, which are compatible with information and charts from other software applications (Support import data feature), and (teamwork) support this feature.

CHAPTER 6

CONCLUSION AND FUTURE WORKS

6.1 Conclusion

Famous companies are striving to attain the international standard in implementing its projects with the purpose of reaching a unique result. In order to achieve that, the companies need to focus more on a new and modern ways to conduct, manage and implement project activities. Nowadays, Information Technology contributed much to support and create new software and tools to facilitate project management field. Some issues have been faced during the research process, which are the difficulty of choosing appropriate software, and some difficulty during questionnaires distribution and analyzing the data using SPSS software. This study tried to make a comprehensive literature review about most important tools needed by project managers, as well as, the criteria that needed to consider before working with any project management software. This study also shows that these software applications can be used by firms and companies to establish projects from start to end. Furthermore, how the activities and sub activities can be done in a flexible way. The finding from different sources shows that there is acceptance about the benefits of these software applications and tools despite the presence of some disagree answers. Therefore, these findings answer the research questions which are stated earlier. This is by identifying and recognizing the most efficient tools and techniques that will help the project aspects, such as; collaboration, issue tracking, project portfolio management, resource management, and scheduling. Consequently, this will affect four vital factors, which are productivity, usability, flexibility, and performance to enhance management capabilities for the project team manager and other team members.

6.2 Future works

Evaluating project management software can boast the industry and create a sound industrial environment. This can be happen by the following suggested future work ideas:

1. Adding more features and tools to the PM software applications to cover more project aspects. For example: link PM software applications with famous industry standards in order to increase quality aspect.

2. Developing project management associations for sharing experience between different organizations and industries. This is through constructing local or international categories and clusters to share the top ideas or mistakes have been happened during the outdated projects to overtake it within emerging industries.

3. More research is desirable about the modernization of project management. Modern management tactics for the project management will provide promising research innovation aspects.

6.3 Recommendation & Suggestion

Project needs are growing rapidly, so companies need to take urgent action to invest and include new project management software in its agenda. Today, the market is filled with many types of project management software, so companies need to study the requirements carefully in order to choose the suitable software which fits the company's need. This research shows some important criteria that must exist in any chosen software. Furthermore, the project manager must ensure that the software price is commensurate with the quality and features of the software. In other words, the pricing of the software must match the value that will be obtained from using it. Finally, choosing project management software before was a choice but today is an urgent need.

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APPENDIX

A. QUESTIONNAIRE SURVEY

1. Purpose of questionnaire

These two questionnaires are aimed at studying the ability of the project management software to support important factors for any successful project like productivity, Usability, Flexibility and Performance.

2. The approved copy of the questionnaire

Questionnaire about project management software

Research Objective is investigating the ability of the Project management software to enhance important project factors like productivity, usability, flexibility and performance. And this type of software has the capacity to help plan, organize, and manage resource tools and develop resource estimates. it can manage estimation and planning, scheduling, cost control and budget management, resource allocation, collaboration software, communication, decision-making, quality management and documentation.

Section I - Respondent Demographic Profiles

1. Please state your gender.

○ Male

○ Female

2. Please state your employment type.

○ Teacher

○ Employee

○ Student

3. Work with project management software before?

○ Yes

○ No

4. Name of it (If yes).

Your answer _____

Section II - Project Management Factors

* Please fill out this Section to the best of your ability

First factor: Productivity

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
1. Dealing with suitable tool to use can increase project productivity.	○	○	○	○	○
2. Project tools allow companies to manage the knowledge areas in project management.	○	○	○	○	○
3. Triple constraints (time, cost, resources) can be managed effectively with software tools.	○	○	○	○	○
4. Utilize calendars and Gantt chart can reduce the project delay.	○	○	○	○	○
5. Some project features like (Advanced Reporting) can early detect future risk.	○	○	○	○	○
6. Accessibility to project management software will enhance work progression.	○	○	○	○	○
7. Project tools help companies to adopt with globalization trend.	○	○	○	○	○

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
8. Project software can support the stakeholders Throughout the project implementation period.	O	O	O	O	O
9. Project software enabled project managers to focus on the organization's core business.	O	O	O	O	O

Second factor: Usability

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
10. Use the project tools can increase project execution.	O	O	O	O	O
11. Project software can enhance the communication process.	O	O	O	O	O
12. Project tools can simplify complex processes.	O	O	O	O	O
13. Automated tools like (mail notification) can increase project update.	O	O	O	O	O
14. Multiple Dashboards can make information and data easier to understand.	O	O	O	O	O
15. Task Lists and assignments can arrange duties and show clearly Interdependence between tasks.	O	O	O	O	O
16. Mobile Device Support can enhance project performance.	O	O	O	O	O

Third factor: Flexibility

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
17. Project tools can Allow Communicate easily between the project team.	O	O	O	O	O
18. Charts and Graphs can support workflow and make it more flexible.	O	O	O	O	O
19. Software tools can determine project period and monitor work progress.	O	O	O	O	O

Fourth factor: Performance

	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
20. Centralized Document Database support project performance factor.	O	O	O	O	O
21. Template creator can reduce the required time to accomplish documentation tasks.	O	O	O	O	O
22. Personal Dashboard can allow to project's team to control and display the information.	O	O	O	O	O
23. Resource leveling feature in project management software can effectively support resource allocation.	O	O	O	O	O
24. Charts and Graphs support project workflow, reporting and visibility.	O	O	O	O	O
25. Automated tools such as instant messaging can increase project performance.	O	O	O	O	O

B. SPSS OUTPUT

Frequency Table

1. Please state your gender.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	35	70.0	70.0	70.0
	Female	15	30.0	30.0	100.0
	Total	50	100.0	100.0	

2. Please state your employment type.

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Teacher	5	10.0	10.0	10.0
	Employee	10	20.0	20.0	30.0
	Student	35	70.0	70.0	100.0
	Total	50	100.0	100.0	

3. Work with project management software before?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	9	18.0	18.0	18.0
	No	41	82.0	82.0	100.0
	Total	50	100.0	100.0	

Pie Chart

3. Work with project management software before?

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Yes	9	18.0	18.0	18.0
	No	41	82.0	82.0	100.0
	Total	50	100.0	100.0	

Pie Chart

1. Please state your gender.

Male
Female

File   Edit   View   Data   Transform   Insert   Format   Analyze   Direct Marketing   Graphs   Utilities   Add-ons   Window   Help

Statistics

		[1. Dealing with suitable tool to use can increase project productivity.]	[2. Project tools allow companies to manage the knowledge areas in project management.]	[3. Triple constraints (time, cost, resources) can be managed effectively with software tools.]	[4. Utilize calendars and Gantt chart can reduce the project delay.]	[5. Some project features like (Advanced Reporting) can early detect future risk.]	[6. Accessibility to project management software will enhance work progression.]	[7. Project tools help companies to adopt with globalization trend.]	[8. Project software can support the stakeholders Throughout the project implementation period.]	[9. Project software enabled project managers to focus on the organization's core business.]
N	Valid	50	50	48	48	48	48	48	48	48
	Missing	0	0	2	2	2	2	2	2	2
Mean		3.66	3.70	3.73	3.60	3.67	3.52	3.58	3.58	3.58
Std. Deviation		1.099	1.129	1.086	.984	1.038	1.111	1.028	1.069	1.028

Frequency Table

[1. Dealing with suitable tool to use can increase project productivity.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	4.0	4.0	4.0
	Disagree	5	10.0	10.0	14.0
	Neutral	14	28.0	28.0	42.0
	Agree	16	32.0	32.0	74.0
	Strongly Agree	13	26.0	26.0	100.0
	Total	50	100.0	100.0	

[2. Project tools allow companies to manage the knowledge areas in project management.]

		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Strongly Disagree	2	4.0	4.0	4.0

PASW Statistics Processor is ready

File   Edit   View   Data   Transform   Insert   Format   Analyze   Direct Marketing   Graphs   Utilities   Add-ons   Window   Help

@7.Projecttoolshelpcompaniestoadoptwithglobalizationtrend @8.Projectsoftwarecansupportthestakeholdersinroughoutttheprojecti @9.Projectso:
@13.Automatedtoolslikemailnotificationcanincreaseprojectupdate @14.MultipleDashboardscanmakeinformationanddataeasiertounderstan @15.Tas}
@17.ProjecttoolscanAllowCommunicateeasilybetweentheprojectteam @18.ChartsandGraphscansupportworkflowandmakeitmoreflexible @19.Softwaretc
@21.Templatecreatorcanreducetherequiredtimetoaccomplishdocumenta @22.PersonalDashboardcanallowtoprojectsteamtocontrolanddisplayth @23.Re
@24.ChartsandGraphssupportprojectworkflowreportingandvisibility @25.Automatedtoolssuchasinstantmessagingcanincreaseprojectperfor
  /SCALE('ALL VARIABLES') ALL
  /MODEL=ALPHA.

Reliability

[DataSet1] D:\البحث بحثي\Survey Adel Alkhazraji\Untitled2.sav

Scale: ALL VARIABLES

Case Processing Summary

		N	%
Cases	Valid	46	92.0
	Excluded[a]	4	8.0
	Total	50	100.0

a. Listwise deletion based on all variables in the procedure.

Reliability Statistics

Cronbach's Alpha	N of Items
.979	25

PASW Statistics Processor is ready

One-Sample Test

	Test Value = 3				95% Confidence Interval of the Difference	
	t	df	Sig. (2-tailed)	Mean Difference	Lower	Upper
[1. Dealing with suitable tool to use can increase project productivity.]	4.245	49	.000	.660	.35	.97
[2. Project tools allow companies to manage the knowledge areas in project management.]	4.383	49	.000	.700	.38	1.02
[3. Triple constraints (time, cost, resources) can be managed effectively with software tools.]	4.650	47	.000	.729	.41	1.04
[4. Utilize calendars and Gantt chart can reduce the project delay.]	4.255	47	.000	.604	.32	.89
[5. Some project features like (Advanced Reporting) can early detect future risk.]	4.449	47	.000	.667	.37	.97
[6. Accessibility to project management software will enhance work progression.]	3.249	47	.002	.521	.20	.84
[7. Project tools help companies to adopt with globalization trend.]	3.931	47	.000	.583	.28	.88
[8. Project software can support the stakeholders Throughout the project implementation period.]	3.782	47	.000	.583	.27	.89
[9. Project software enabled project managers to focus on the organization's core	3.931	47	.000	.583	.28	.88

Oneway

ANOVA

		N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean		Minimum	Maximum
						Lower Bound	Upper Bound		
[10. Use the project tools can increase project execution.]	Teacher	5	3.80	.447	.200	3.24	4.36	3	4
	Employee	10	4.10	.738	.233	3.57	4.63	3	5
	Student	35	3.49	1.095	.185	3.11	3.86	1	5
	Total	50	3.64	1.005	.142	3.35	3.93	1	5
[11. Project software can enhance the communication process.]	Teacher	5	3.20	.837	.374	2.16	4.24	2	4
	Employee	10	4.20	.789	.249	3.64	4.76	3	5
	Student	34	3.56	1.133	.194	3.16	3.95	1	5
	Total	49	3.65	1.071	.153	3.35	3.96	1	5
[12. Project tools can simplify complex processes.]	Teacher	4	3.25	.957	.479	1.73	4.77	2	4
	Employee	10	4.00	.667	.211	3.52	4.48	3	5
	Student	34	3.32	1.093	.187	2.94	3.70	1	5
	Total	48	3.46	1.031	.149	3.16	3.76	1	5
[13. Automated tools like (mail notification) can increase project update.]	Teacher	4	3.25	.957	.479	1.73	4.77	2	4
	Employee	10	4.20	.632	.200	3.75	4.65	3	5
	Student	34	3.26	1.082	.186	2.89	3.64	1	5
	Total	48	3.46	1.051	.152	3.15	3.76	1	5
[14. Multiple Dashboards can make information and data easier to understand.]	Teacher	4	3.25	.957	.479	1.73	4.77	2	4
	Employee	10	4.60	.516	.163	4.23	4.97	4	5
	Student	34	3.41	1.104	.189	3.03	3.80	1	5
	Total	48	3.65	1.101	.159	3.33	3.97	1	5
[15. Task Lists and assignments can arrange	Teacher	4	3.50	.577	.289	2.58	4.42	3	4
	Employee	10	4.10	.668	.180	3.60	4.51		

A7

C. CURRICULUM VITAE

PERSONAL INFORMATION

Surname, Name: Al-khazraji, Adel

Date and Place of Birth: 01 July 1981, Iraq- Diyala

Marital Status: Married

Email: a_d_l_1981@yahoo.com

EDUCATION

Degree	Institution	Year of Graduation
M.Sc.	Turkey- Çankaya Univ., Information Technology	2016
B.Sc.	Iraq- Mustansiriya Univ., Computer Science	2004
High School	Iraq- Sharif Razi High School	2000

WORK EXPERIENCE

Year	Place	Occupation
2009- Present	Iraq- Diyala Univ. Central printing	Programmer

FOREIN LANGUAGES:

English Language

HOBBIES:

Travel, football