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Agile Project Management Practices in Palestinian IT Companies: A Managerial Framework

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Dedication

First of all, I dedicate this thesis to my parents, who endured all pains to make my dreams come true, and helped me to be here.

To my supervisor Dr.Ayham Jaaron, who gave me all his efforts to complete this work.

To my best friends everywhere. To my brothers and sisters.

To all my teachers in my life.

Love you all.

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Love you all.

الإقرار

أنا الموقع أدناه، مقدم الرسالة التي تحمل عنوان:

Agile Project Management Practices in Palestinian IT Companies: A Managerial Framework

أقر بأن ما اشتملت عليه هذه الرسالة هو نتاج جهدي الخاص, باستثناء ما تمت الاشارة اليه حيثما ورد, وأن هذه الرسالة كاملة, أو أي جزء منها لم يقدم من قبل لنيل أي درجة او لقب علمي أو بحثي لدى اي مؤسسة تعليمية او بحثية أخرى.

Declaration

The work provided in this thesis, unless otherwise referenced, is the researcher's own work, and has not been submitted elsewhere for any other degree or qualification.

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Date: التاريخ: 2016/3/3

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List of Abbreviations and Definition of Terms.

Abbreviation	Description
APM	Agile project management
XP	Extreme programing
ICT	Information and communication Technology
PITA	Palestine Information Technology Association
QA	Quality assurance
PECDAR	Palestinian Economic council for Development and Reconstruction
IT	Information Technology.
SW	Software.
DSDM	Dynamic systems development method.
ASD	Adaptive software development.
PMI	Project management institution.
PMBOK	Project management body of knowledge.
XM	eXtreme Manufacturing.
FDD	Feature-driven development.
MoSCoW	Must, should, could, and won't.
SPSS	Statistical Package for Social Sciences
CEO	Chief executive officer.
GM	General manager.
CTO	Chief Technology Officer
R&D	Research and development.
SAL	Service level agreement
KM	Knowledge management

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Abstract

Palestinian software sector is directly affected by global trends of technology. Palestinian IT companies try to stay in the arena of competition. Agile project management (APM) is an emerging approach in software engineering, initially proposed and promoted by a group of sixteen software professionals who practice a set of methods, and share a common set of values of software development. They consolidated their thoughts, and defined these methods as “agile.

This research aims at assessing the APM practices in Palestinian IT companies. This study aims at investigating the possibility of achieving the benefits of agile project management in software development through using agile project management practices.

This study explored related topics to APM. Based on what the researcher had got from the literature, he assessed the APM in software development sector by analyzing the readiness of APM implementation including changes required, challenges and risks in addition to testing the 12 agile principles and agile success factors by using mixed methods methodology, qualitative and quantitative research tools, and all of these 12 principles and success factors were found in literature.

A questionnaire was the quantitative tool, whereas, the qualitative one was conducting interviews in Palestinian IT companies. Quantitative data was analyzed by the SPSS program to generate descriptive statistics required and to test a number of related hypothesis. However, the qualitative data was analyzed using the thematic analysis approach. The questionnaire was designed to simulate the project's success factors and agile project management practices in software development and information technology sector. The interview questions have been formed in accordance with the questionnaire which examines the hypotheses of the study, where it supports the research results through the answers provided by experts in the field of agile project management practices through their answers to the questions asked in interviews Protocol, and distributed to the sampled companies.

Palestinian Information Technology Association (PITA) is considered as the official body which include all IT and software development Palestinian companies. According to PITA, the population size is 80 companies that are working in SW development sector according to many activities. The sample size was 67 based on population size, confidence level is 95%, and confidence interval is 5%.

The results show that there are indicators that prove that the Palestinian IT companies have a high degree of agile implementation process in most aspects such as dealing with the change required, welcoming to change, focusing on customer centric, giving high attention to the team and its characteristics, and daily administrative procedures. However, the results show that Palestinian IT companies are lacking required level of ability to

deal with challenges and risks of the APM processes and people characteristics readiness. The study indicates that eight of the nine hypothesis have statistically significant relationship with success.

A framework was developed by the researcher as the main output to enable Palestinian IT companies to properly adopt the principles and the practices of agile project management that can enhance APM processes implementation. The value of this research is the introduction of an APM enhancement framework that can help the Palestinian IT companies to facilitate SW development process, and encounter the daily obstacles that to be solved, and to get rid of the suffering of IT sector, which opens the door for more creativity in Palestinian IT sector.

Chapter One

Introduction

CHAPTER ONE

Introduction

1.1 Introduction

Information Technology companies face significant challenges to stay in the arena of competition. These challenges such as Customer service, human resource, productivity, complexity, budget, marketing, and multinational operations affect directly on work environment.

Daily operations such as management, technical, organizational, customer relationship management, and other process have a direct relationship with these challenges, and companies must give great importance in order to be able to survive and maintain a competitive advantage.

One of the serious challenges for companies is dealing with a volatile regulatory environment, which threatens the survival of a company in the business environment. One of the reasons that leads to the results of volatiles is the life of the product because of the large development of information technology (Truex et al., 1999).

Lack of commitment in the implementation of all necessary daily process to finish the project is one of the most common reasons that leads to failure of software (SW) projects, where senior management often takes into consideration the team needs that support the main goals without engaging the unit directly in day-to-day operations because of the pressures of work and the acceleration to produce the product to be marketed or delivered to the customers (Kent, 1999; Gharmisch, 2004; Bola, 2011).

Agile project management (APM) is an iterative style of management, which builds engineering activities, information technology projects, and develops new products and services. And it requires capable individuals with customers and suppliers as an input in relevant business (Oosterhout, 2014). APM focused on the need for all parties of the project owner and the customer, thus, they all must enjoy full activity either at the beginning, at the end, or in the stages of sustainable development. APM also contributes easier and smoother to regulation and command between the project team and focuses on providing solutions that benefit all parties concerned (Oosterhout, 2014; Kent, 1999; Bola, 2011).

The IT industry is one of the main sectors that have a direct effect on the economy, supporting the Palestinian national economy and society. According to the Palestine Information Technology Association (PITA), the Palestinian Information and communication Technology (ICT) sector holds a great potential for growth and is considered to be a potentially large employer and contributor to the Palestinian economic development (PITA, 2013).

ICT sectors employs 3% of the workforce- about 5000 employees. This percentage is 8% of the output of the overall of the Palestinian economy.

On the other hand, the human capital in ICT sectors provides service with high quality soft skills including management, language and other communication skills.

With increasing of demand on technical skills that related directly to ICT, the APM practices are the ideal solution to deal with this demand and meet

the future expectations because it is founded to deal with projects that have a lot of changes. And ICT sector develop quickly and need to manage the changes all time.

According to Bloch et al (2012), 50% of large IT projects fail below their budget. Goatham (2009) defines that the success rate of IT project raises questions that discuss the type of IT project and how it is different from civil engineering sector, and the success rate is just a reflection of applying project management principles and environment factors.

Geneca (2010, 2011) conducted a research that showed that 75% of IT companies usually admit judges on the project results from the beginning according to requirements definition and software practices. Also, CEOs forecasting is important to judge on the projects.

To be flexible and agile, there are many success factors that help the companies to switch from traditional approaches to agile approaches. The main differences between agile and traditional will give a competitive advantage to agile approach such as people oriented, adaptive, conformance to actual, balancing flexibility and planning, empirical process, decentralized approach, simplicity, collaboration, and small self-organization team.

Being agile is not easy, but by applying all success factors mentioned in the previous studies, the companies can be agile.

According to Lindvall et al. (2002), culture, people, and communication paly strong role in the process that lead to a successful adoption of agile software development approach.

1.2 Problem of Study

Information Technology companies are facing challenges and barriers to meet project requirements and finish the project on time, cost and quality (Michael et al., 2012; Goatham, 2009; Geneca, 2010, 2011).

According to DingsÃyr et al. (2012), the Arab Word suffers from shortage of academic topics that are related to software development issues. Palestinian Economic council for Development and Reconstruction (PECDAR) describes the importance of software development sector, and drives us to consider that the software development sector meets the customer requirements (PECDAR, 2012). Then, the biggest problems faced by private companies for information technology in Palestine are not far from this problem: to complete and finish projects within time, cost and quality, and in line with the general objectives of the companies.

Researcher found that a large percentage of enterprise software may fail as they do not meet all purposes, and do not end within the scope of projects as mentioned above.

One of the reasons for problems that face the information technology sector, is that companies do not apply the principles of agile project management practices, where there is a large gap between what is universally applied and what is used in Palestine.

Palestinian software development sector also needs to expand its work outside Palestine, and with these problems in the process of completing the project, the Palestinian IT private sector companies would be unable to hold

the external contracts, and thus govern themselves out of the competition in the IT market.

1.3 Research Objectives

The research aims to achieve the following objectives:

1. To study and assess the current level of agile project management practices that are used in Palestinian IT companies.
2. To examine the benefits of adopting agile project management practices.
3. To identify the factors that encourage or prevent the adoption of agile project management practices in Palestinian companies.
4. The simplest objective is to find the way to increase the percentage of success and reduce the percentage of failure among SW development projects.
5. To motivate the Palestinian IT companies to apply agile project management practices.
6. To introduce a managerial framework in agile project management practices, to enhance the process of software development projects.

1.4 Research Questions

This research aims to answer the following questions:

Q1: What are the most important changes and challenges that face the Palestinian IT companies that want to adopt agile project management practices?

Q2: What are the most important success factors that have a strong influence on project success in the Palestinian IT companies that applied agile project management practices?

Q3: How can Palestinian IT companies navigate successfully through agile project management implementation?

1.5 Research Hypothesis

This research aims at testing the following set hypotheses:

Hypothesis 1: Change required vs Challenges and Risks.

H1: There is a statistical evidence confirms that there is correlation between change required and challenges at $\alpha = 0.05$ in Palestinian IT companies.

Hypothesis 2: Principles of APM vs Change required.

H1: There is a statistical evidence confirms that there is correlation between APM principles and change required at $\alpha = 0.05$ in Palestinian IT companies.

Hypothesis 3: Principles of APM vs Challenges and risks.

H1: There is a statistical evidence confirms that there is correlation between APM principles and challenges at $\alpha = 0.05$ in Palestinian IT companies.

Hypothesis 4: Principles of APM vs Customer Centric.

H1: There is a statistical evidence confirms that there is correlation between APM principles and customer centric (Satisfaction, Collaboration, and Commitment) at $\alpha = 0.05$ in Palestinian IT companies.

Hypothesis 5: Principles of APM vs Team Size and Distribution.

H1: There is a statistical evidence confirms that there is correlation between APM principles and Team size and distribution at $\alpha = 0.05$ in Palestinian IT companies.

Hypothesis 6: Principles of APM vs Process Factors.

H1: There is a statistical evidence confirms that there is correlation between APM principles and the process factors (Corporate culture, Planning, Control, Technical competency and Decision Time) at $\alpha = 0.05$ in Palestinian IT companies.

Hypothesis 7: Principles of APM vs Personal Factors.

H1: There is a statistical evidence confirms that there is correlation between APM principles and the personal factors (person characteristic, social Culture and Training) at $\alpha = 0.05$ in Palestinian IT companies.

Hypothesis 8: Principles of APM vs Number of the Employees in the Companies.

H1: There is a statistical evidence confirms that there is statistically significant differences between APM principles and number of the employees in the Palestinian IT companies.

Hypothesis 9: Principles of APM vs the Companies Using APM All Time or Sometime.

H1: There is a statistical evidence confirms that there is statistically significant differences between APM principles and the degree of the Companies Using APM all time or Sometime.

1.5 Structure of the Thesis

The study consists six chapters.

Chapter One is an introductory chapter that covers and includes the aim of the study, problem of the study, research objectives, research questions and the structures of the thesis.

Chapter Two covers the literature review about agile project management and software development, definition of agility, agile principle, agile methods, success factors of agile project management, changes and challenges, agile tools, agile project management in Palestine and a summary.

Chapter Three covers all the tools that are used in data collection and methodologies, data collection procedures, interviews, interview objectives, interview protocol, questionnaire, questionnaire objectives, questionnaire design, validity, research population and sample, Palestinian IT companies and sample selection and data analysis procedures.

Chapter Four covers methods of analysis of data that were collected from the survey and interviews, the results of the hypothesis testing, and answering all the research questions and explaining the analysis procedures.

Chapter Five covers the findings and discussion, and construction work for explored framework.

Chapter Six covers the conclusions and recommendations of the research, limitations of the study and future research work.

Chapter Two

LITERATURE REVIEW

Chapter Two

Literature Review

2.1 Background

Agile project management and software development are considered to be a variety of methods that meet the requirements and provide solutions through collaboration between self-organizing and cross-functional teams.

Agile software development promotes adaptive planning, rapid response to changes through project life cycle, and continuous improvement and early delivery (Oosterhout, 2014; Agile Alliance).

This section focuses on the evolution of agile manifesto and agile project management and software development. It also presents the main events that led to adoption of agile manifesto, and how the term agile was introduced in the context of software development in 2001. Table 1 shows these events.

Table 1: Agile Project Management Preceding Events.

The year	The Event	The References
1957	Incremental software development methods	*(Geral* et al.2001).
1974	Paper introduces an adaptive SW development process, the ideas of this paper presented in London in 1970, and submitted to the Journal Computer Aided Design, and it was rejected with bad comments.	(Edminds, 1974)
1970	The concepts of evolutionary project management were published by Tom Gilb, and after that, during 1970 Dan Gielan lectured throughout the U.S about the practices and the benefits of this methodology.	(Gilb, 2015).
1990	Collection of lightweight software development methods evolved as a reaction to Waterfall methods.	(Geral et al.2003).
1994	Unified process and dynamic systems development method (DSDM).	(Larman and Craig, 2004)
1995	Scrum.	(Larman and Craig, 2004)
1996	Crystal clear and eXtreme programming.	(Larman and Craig, 2004)
1997	Adaptive Software Development " ASD ".	(Larman and Craig, 2004)
2001	Manifesto for Agile Software Development.	(Beck, Kent et al.2001).

The Agile Manifesto

In February 2001, Kent Beck and another 16 software developers met to discuss lightweight development methods. They published the agile Manifesto in Software Development industry (Beck, Kent et al.2001).

Manifesto for Agile Software Development

"We are uncovering better ways of developing software by doing it and helping others do it.

Through this work we have come to value:

Individuals and interactions over Processes and tools

Working software over Comprehensive documentation

Customer collaboration over Contract negotiation

Responding to change over following a plan

That is, while there is value in the items on the right, we value the items on the left more".

(Agilemanifesto, 2015)

Behind this manifesto there are many principles. To understand this, the principles should be discussed and explained deeply. The meanings of the manifesto items are:

- **Individuals and Interactions**: Any tools or processes encouraging the team spirit are very crucial in agile methodologies. Motivations or self-organizations are also important. The relationships between the team members in work environment, face-to-face communications, or the relationship between the developer and the business. All of these items are important; they are considered as a cornerstone in agile project management practices (Abrahamsson et al., 2002; Adkins, 2010; Agilemanifesto, 2015).
- **Working Software:** Working software and the mechanism of workflow and all daily procedures that meet the customer requirements are more useful than just presenting documents to clients in meetings (Sheuly, 2013; Ambler, 2011; Adkins, 2010).
- **Customer Collaboration**: The top priority is customer satisfaction which is achieved by delivering the work on time, and keeping the high quality of the work. Therefore, we don't need heavy documentations. Besides, we should keep the customer online with the

team because the requirements cannot be fully collected at the beginning. That means the customer involvement is very important (Abrahamsson et al., 2002; Sheuly, 2013; Sone, 2008; Ambler, 2011).

- **Responding to Change**: One of the most important things in agile methods is the ability to adapt the changes through the project schedule or life cycle. Agile methods focused on quick responses to change and continuous development to meet the customer requirements, because the highest priority is customer satisfaction (Sheuly, 2013; Sone, 2008; Adkins, 2010; Ambler, 2011).

Evolutions: According to Anderson and David (2005), to achieve agile manifesto methods, after 2001, Kent and the 16 developers met to publish the agile manifesto in Software Development industry. In 2005 a group of 15 developers headed by Alisttair Cockburn and Jim Highsmith met to write or observe what the management principles required to achieve agile manifesto. They published the Declarations of interdependence to guide software project management according to agile software development.

In 2009, Certified Scrum Master Programs were created after founding of Scrum Alliance by Ken Schwaber and others, and Schwaber Founded the Scrum.org after he had left the Scrum Alliance in the same year. And in this year, Robert C Martin wrote an extension of software development principles: “Software Craftsmanship Manifesto “to guide agile software development. In 2011, the original Agile Alliance was created to guide the agile practices.

2.2 Agile Project Management

Agile project management is an iterative style of management, which builds engineering activities, information technology projects, and develops new products and services. And it requires capable individuals with customers and suppliers as an input in relevant business (Oosterhout, 2014).

The iterative approach and agile techniques or eXtreme project management were developed as a result or reaction to obstacles that were appeared in sequential forms of project organization. The main difference among them is that the agile completed a small release in each delivery cycle, but the iteration approach completed them at the end of the project (Sone, 2008).

According to Richet (2013), agile methodologies can be leveraged effectively for project management in general and non-software products. This approach enables the companies to achieve gains earlier than traditional approaches, by meeting the customer needs within the three scoop dimensions: Cost, Time and Quality.

According to Project Management Institution (PMI) (PMBOK, 5th Edition), in project management body of knowledge (PMBOK), agile methods are mentioned under the project life cycle, and they are known as change-driven, iterative and incremental approach. However, agile methods are various iterations which are very rapid, in addition to the fixed time and resource.

There are multiple project management methodologies under agile umbrella. These include: Scrum, Extreme Programming (XP), eXtreme Manufacturing (XM), Crystal Clear, Kanban, Scrum Ban: a mixed scrum and Kanban

approach, Lean project management which uses the principles from lean manufacturing, and Extreme project management.

Currently, in critical studies of project management, all kinds of management are expressed in terms of projects. And this study has mentioned that several Project Evaluation & Review Technique (PERT) based models are not well suited for the multi-project companies.

That means the firms must use complex models for the projects, in comparison with management principles of human interaction management and modeling processes.

2.2.1 Definition of Agility

Agile project management is an iterative approach to plan and guide project processes. It is a set of tools and methods that are used in the process of software development, which are required for collaboration and integration between all parties through self-organization, planning, development and early delivery of the project. It is also the response to change (Paul, 2014; Javed et al., 2010; Serena, 2007; Chen and Babar, 2014; Oosterhout, 2014). There are many definitions of agility. Table 2 shows these definitions:

Table 2: Definition of Agility

Term	Definition	Reference
Agility	The ability to enter global markets through achieving a competitive environment that seeks to address the continuous change and respond to this quickly and to get to the production system in the world depending on the demand for high quality, low cost. The integration of materials and the use of the best practices in the knowledge environment for flexibility and innovation that support this activity, quality and profitability, in a rapidly changing market environment. The continual readiness of an organization to rapid and embrace change, through high quality, simplistic, relationships with its environment and economy.	(Goldman et al., 1995; Ramasesh et al., 2001; Conboy and Fitzgerald, 2004)
Agility systems	The ability to reply for both reactive and proactive response needs and opportunities, which cannot be predicted or uncertain and there is a great possibility to change	(Dove, 2005)
Business Agility	Reduce the costs and risks and find business value through the use of scientific capabilities of information technology. The ability of an enterprise to develop and exploit its inter- and intra-organizational capabilities.	(Ross, 2008; Hooper et al., 2001)
Agile enterprise	A quick movement, adaptable business. It is capable of rapid adaptation in response to unexpected changes, opportunities, and customer requirements. Such as facilitated speed, and robustness that is capable of achieving competitive performance.	(Kidd, 2000)

2.2.2 Agile Project Management Principles

The overall objective of the agility in software development is to facilitate the process of establishing principles rather than the development process of the predefined.

According to Beck et al (2001), Sone (2008), Layton (2012), Warma (2012), agilealliance (2015), the agile manifesto is based on twelve principles which are in Table 3.

Table 3: Agile Project Management Principles

No	**Principle**	**Description**
1-	**Satisfaction**	The secret to success is to have a key factor customer satisfaction. This is a proven method to increase customer's satisfaction and loyalty.
2-	**Welcome Change**	Having a sense of accepting any developing ideas will create the opportunity to help in elaborating and achieving the plans which have been planned for.
3-	**Delivery frequently**	Delivering working software frequently to a few weeks or months, with a preference to the shorter timescale.
4-	**Partnership and communications**	Cooperation among individuals of the projects is very essential until they achieve the goal.
5-	**Environment**	Setting conditions around the members would give them the right atmosphere and encourage them to get a particular activity carried on.
6-	**Face-to-face**	Meeting face-to-face which involves close contact among members is the most effective and creative method in order to socialize and interact with one another.
7-	**Measuring progress**	Only thing that counts is completed and fully functional pieces of the required products.
8-	**Sustainability**	Agile processes encourage and promote sustainable development. The sponsors, developers, and end users should be able to maintain a constant pace.
9-	**Attention to details**	The state of applying attention and observation is the perfect way to improve agility.
10-	**The power of less**	Simplicity is the ultimate sophistication. Keep the work as simple as it required to reach perfection.
11-	**self-organizing team**	Self-organizing team is really important and effective in project to create the best architectures, requirements and designs.
12-	**Regular intervals**	Regular intervals are necessary for the team to refresh and become more effective and creative through the modification of their behaviors.

2.2.3 The Need for Agile Project Management

The greatest challenge for any manager of any software development project is to deal with increasing volatile organization (Coldewey et al., 2000; Cullen and D'Innocenzo, 1999).

Most real-world development efforts are much more likely to be conducted in more unstable environment, as organizations adapt to change technology, markets, and social conditions. Requirements for systems must be able to change with those organizations and environments at a high speed (Cullen and D'Innocenzo, 1999; Truex et al., 1999).

2.2.4 Benefits of Implementing Agile Project Management

Today, business processes are more complex and interconnected than before, so every project must have its own benefits that reflect scale of success especially in implementation stage that is considered as a critical phase.

According to Waters (2012), Layton (2012), Cullen and D'Innocenzo (1999), and Koch (2011), there are ten benefits for agile project management practices for organizations, team members and the products or services. These are listed below:

- **Better Quality:** agile methods have tried to make sure that the quality is high by preventing products problems by taking a proactive process. They make the product features more relevant to the requirements by defining project requirements in time. They also help the team to address the problems quickly by a contentious integration and a daily

testing. Finally they use the expression “Done“, that means developed, tested, integrated and documented.

- **Higher Customer Satisfaction:**
  - Agile project teams satisfy customers by keeping them online and engaging them to the project all time.
  - Responding quickly to change by keeping the product backlog updated.
  - Delivering the products to the market quickly.
- **Higher Team Morale:**
  - Allows people to be creative, innovative, and acknowledged by being part of a self-managing team.
  - Allows them to learn new skills when they are working cross-functionality, then they can teach each other.
- **Increased Collaboration and Ownership:**
  - Daily meeting lets the development team, product owner and team leader or scrum master be organized.
  - Team members can discuss the product directly with the stakeholders.
    - Agile project metrics make the project more accurate and relevant than **Customized Team Structures:** agile projects and self-management have opportunities to customize team structures and work processes based on the limited size of development team through agile projects.
    - **More Relevant Metrics:**
  - the traditional project.

- Agile projects provide metrics by determining the timelines, budgets and projects requirements based on development team's capabilities and performance.
- Using team capabilities and knowledge will provide relevant estimates rather than hours or days that helps the team to determine when to end the project by comparing the value of the future development with the cost of the future development.
    - **Improved Performance Visibility:** Based on daily meeting and visible progress charts and daily reviews, all team members know how the project is going at any time
    - **Increased Project Control:** agile projects allow all members to exercise control and create better products.
    - **Improved Project Predictability:** agile project management allows the team to know the cost and the performance of each sprint by using the information from daily meetings, charts, task boards and keeping the sprints and development team allocated the same throughout the project.
    - **Reduced Risk:**
- Agile techniques virtually eliminate the chance of absolute project failure through the continuous development.
- The short time that the team needs to determine whether the project will fail or continue to work within.

- It Provides feedback through the daily meetings, constant communication between team members and ongoing releases that help the team work to respond to the rapid changes regularly.

2.3 Agile Methods

Agile methods mean the ability to survive in transforming the challenges and changing to success. That means the ability to reflect the highest degree of flexibility and response (Anderson, 2004; Sheuly, 2013; Chen and Babar, 2014).

There are many of agile methods used in software development that are listed in literature, and they are viewed from different points. In general, the literature include : Scrum, eXtrem Programming (XP), Feature-Driven Development (FDD), Crystal, Adaptive Software Development (ASD), Dynamic System Development Method (DSDM). The following discussion addition more on these methods.

2.3.1 Scrum

The scrum approach has been developed for managing the system development process. It is an empirical approach applying the ideas of industrial process control theory to systems development resulting in an approach that reintroduces the ideas of flexibility, adaptability and productivity (Schwaber and Beedle 2002; Abrahamsson et al., 2002).

The main idea of the scrum is that systems development involves several environmental and technical variables such as time frame, resources and technology that are likely to change during the process. This makes the

development process unpredictable and complex, requiring flexibility of the systems development process that will be able to respond to the change (James, 2013; Abrahamsson et al., 2002).

Scrum process includes three phases: Pre-game, Development and Post-game. Figure 1 clarifies them:

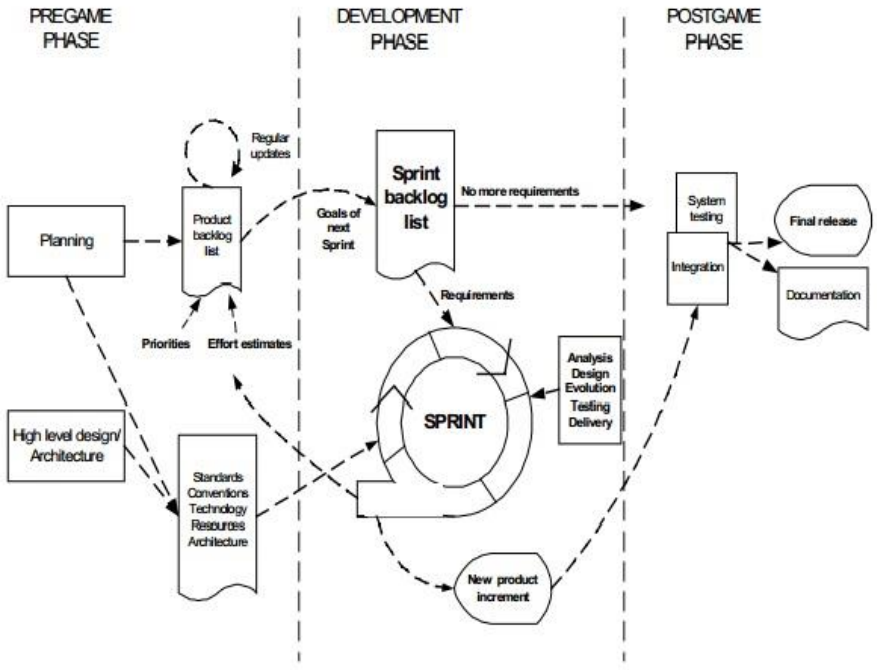

Figure 1: Scrum Method Process

Pre-game Phase includes two sub-phases. The first is planning, the second is architecture. The former includes the definition of the system being developed. And a product backlog list is created containing all the requirements that are currently known. The latter is based on the current items in the product Backlog. (James, 2013; Warma, 2012; Abrahamsson et al., 2002).

The Development Phase is the agile part of the scrum, the different environment and technical variables such as time frame, quality,

requirements, resources, technology and tools are identified in scrum. They are controlled through scrum practices. (Janoff, 2000; Schwaber and Beedle 2002. Abrahamsson et al., 2002).

The Post-game Phase includes the closure of the release. This phase is entered when all requirements are completed (James, 2013).

According to Schwabre and Beedle (2002), there are five roles in scrum that have different tasks during the process. These are : Scrum Master, Product owner, Scrum team, Customer and Management.

A key principle of Scrum is that the customers can change their minds about what they want and need (James, 2013; James, 2009; Janoff, 2000; Warma, 2012).

2.3.2 Extreme Programming (XP)

Extreme Programming (XP) is a software development methodology which is intended to improve software quality and responsiveness to changing customer requirements.

Extreme programming has received widespread attention. Since its inception, especially after the release of the first book at the beginning of the twentieth century, which was a cornerstone of extreme programming and still even these moments lead to achieve agility in managing projects in the technology sector (Kent, 1999).

Organizations and Companies have made high efforts to achieve Extreme programming through using systems that include extreme programming (Cao et al., 2004); in 2004, there were three conferences on the subject that

gave XP high importance in software development sector (Eckstein and Baumeister, 2004).

As a type of agile software development, Extreme Programming aims at improving productivity and introducing checkpoints, where the new requirements of the new customer can be adopted.

There are many roles in agile project management, with different names. The common agile roles include team lead, team member, product owner and stakeholder (Schwaber and Sutherland, 2013; Scott, 2012; Howard, 2014), as a team and Customer, Programmer, Coach, Tracker, Tester and consultant (Beck, 2000; Smith, 2001; Dudziak, 2000) as XP roles.

According to Ronald (2001), Nassif et al. (2002), and Javed et al. (2010), Extreme programming is based on twelve practices; which are:

1- **The Planning Game:** Planning and prioritizing the stages that give more value.
2- **Small Releases:** This practice takes feedback from the customer, and looks at what has been achieved.
3- **Metaphor:** A guide to the development process through simple story or an explanation how the whole system works.
4- **Simple Design:** system designs must be very simple.
5- **Testing:** Programmers continually write unit tests.
6- **Refactoring:** Programmers improve the system without changing the functionality of software.

7- **Pair Programming:** two developers, the first is the programmer, and the second is also a programmer, but review, follow-up and explore code on one machine.

8- **Collective Ownership:** all standards and criteria of the development process are identified.

9- **Continuous Integration:** Integrate when you merge any stage to whole system.

10- **Sustainable Pace:** how a developer can work with efficiency.

11- **On-site Customer**: Engaging the customer directly through the website.

12- **Coding Standards:** Programmers write all codes in accordance with rules emphasizing communication through the code.

2.3.3 Feature-Driven Development (FDD)

Feature-driven development (FDD) is an agile incremental software development process. It doesn't cover the entire process, it focuses on building and designing phases. FDD doesn't require a specific model to be used (Palmer and Flesing, 2002; Abrahamsson et al., 2002).

According to Palmer and Flesing (2002). FDD includes five sequential processes. Developing an overall model, Building a Features List, Planning by Feature, Designing by Feature and Building by Feature. As shown in Figure 2.

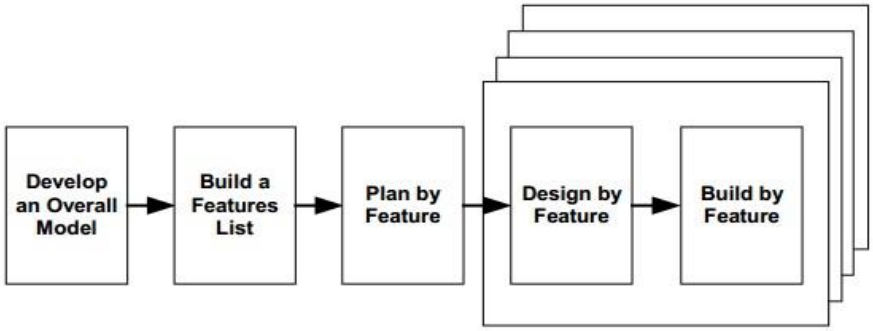

Figure 2: FDD Include Five Sequential Processes, Palmer and Flesing (2002)

The Roles in Feature-driven development could be classified into three categories: the first one is the key roles that includes Project Manager, Chief Architect, Development Manager, Chief Programmer, Class Owner and Domain Experts. The second is the supporting role which includes Release Manager, Language Lawyer, Build Engineer, Tool Smith and System Administrator. The last one is an additional role that includes Tester, Deplorers and Technical Writer (Palmer and Flesing, 2002; Abrahamsson et al., 2002).

2.3.4 Crystal

Crystal Group includes a number of different agile software development methodologies. It involves principles that fit the varying circumstances of the different projects.

The crystal group or family includes three crystal methods: Crystal Clear, Crystal Orang and Crystal orang Web (Cockburn, 2002a. Abrahamsson et al., 2002).

2.3.5 Adaptive Software Development (ASD)

Adaptive Software Development (ASD) was developed by Jim Highsmith and Sam Bayer in (1994) and published in Highsmith (2000). ASD focuses on the problems in the large system (Abrahamsson et al., 2002).

According to Highsmith (2000), Adaptive Software Development replaces the traditional cycle with a repeating process of speculate" Planning", collaborate" Teamwork", and "learn need knowledge and learn from the mistakes", see Figure 3.

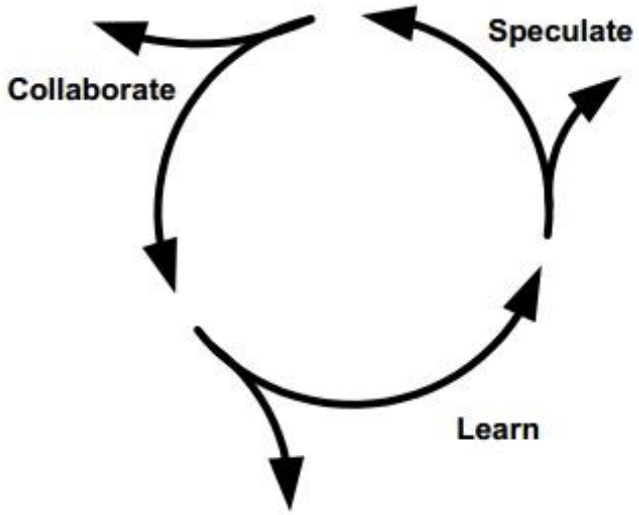

Figure 3: Adaptive Software Development (ASD) Process, Highsmith (2000).

2.3.6 Dynamic Systems Development Method (DSDM)

Dynamic systems development method (DSDM) is an agile project delivery framework.

It has become the number one framework for rapid application development (RAD) in United Kingdom. It came in 1994 (Stapleton, 1997).

DSDM is that before fixing the amount of functionality of the product, it is preferred to fix the time and the resources of the product, then adjust and fix the amount of functionality (Abrahamsson et al., 2002).

According to Stapleton (1997), Dynamic systems development method (DSDM) includes five stages: feasibility study, business study, functional model iteration, design and build iteration, and implementation. Figure 4 illustrates the DSDM.

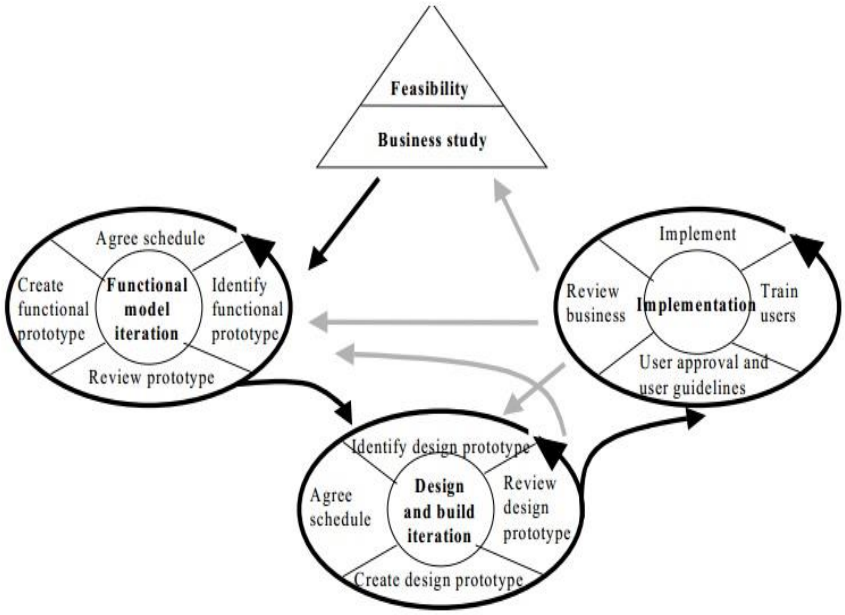

Figure 4: Dynamic Systems Development Method (DSDM), Stapleton (1997).

In 2007, DSDM became a generic approach to project management and solution delivery. DSDM is an iterative and incremental approach that embraces principles of agile development that includes continuous user/customer involvement.

DSDM fixes cost, quality and time at the outset and uses the MoSCoW prioritization of scope into musts, should, could and won't haves to adjust the project deliverable to meet the stated time constraint.

2.4 Success Factors of Agility

Based on what has been mentioned previously in the literatures about success factors of agile projects, the analysis of these factors is based on the studies and surveys conducted to find out what are these may lead to the success of the projects, as they support each of the four project success categories: "quality, scope, time and cost".

According to Cohn and Ford (2003) and Lindvall et al. (2004), in terms of attributes of success, they suggest quality (delivering a good product), scope (meeting all customer requirements), time (delivering on time), and cost (within estimated cost). All of them are seen as independent variables.

While there can be a list of different factors that can be identified, the holistic view of what project managers consider success in any software development project is worth considering. From a project manager's viewpoint, time, cost, and quality are three key components of any projects success (Net Worth Consulting, 2004; PMI, 2004; Schwaber and Beedle, 2002).

The challenging task for any software development project manager is balancing these three success criteria - time, cost, and quality, as shown in Figure 5:

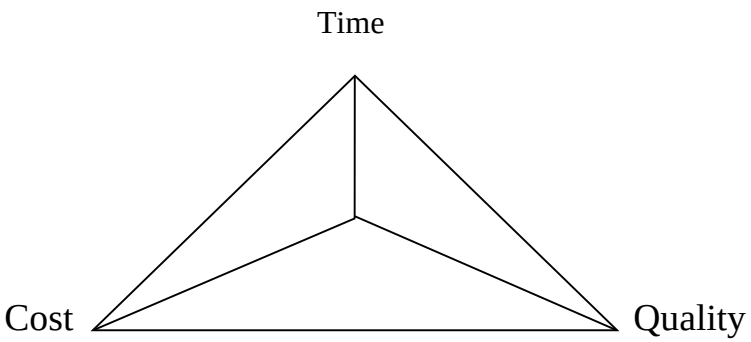

Figure 5: Quality/Time/Cost Tradeoff in Software Development

Chow and Cao (2008), divided the success factors of projects that use agile project management methodologies into dimensions. These contain Organizational, People, Process, Technical, and Project factors.

Figure 6 shows the relation between the dependent and independent variables, Chow and Cao (2008), draw this model after analyzing the survey.

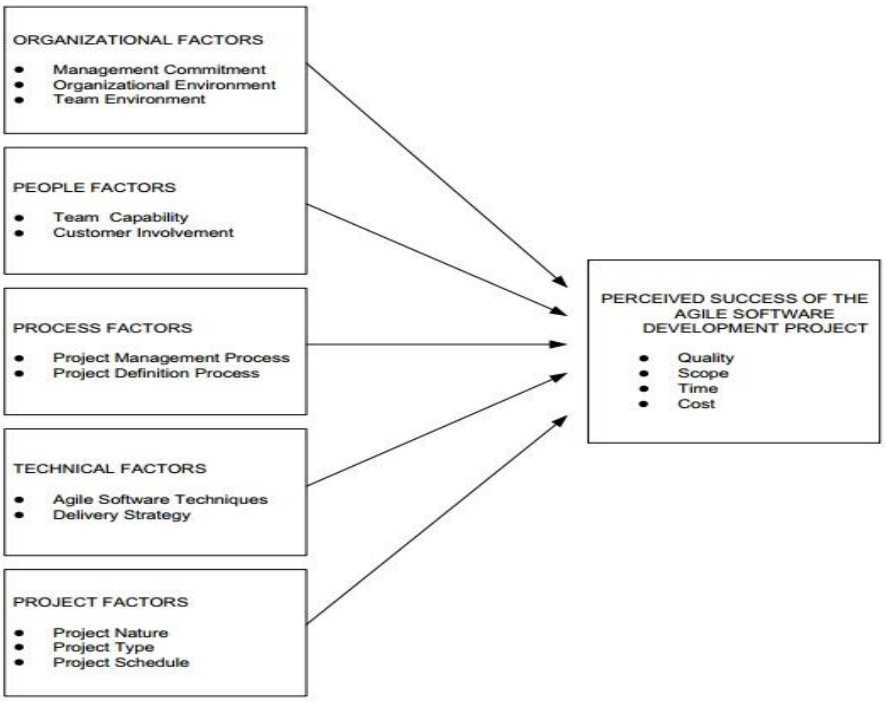

Figure 6: Project Success Factors Model, Chow and Cao (2008).

The success factors are classified as independent factors or variables based on several previous studies, and these include Customer Satisfaction, Customer Collaboration, Customer Commitment, Decision Time, Team Distribution, Team Size, Corporate Culture, Internalized Planning, Qualitative Control, Competency, Personal characteristics, Communication and Negotiation, Societal Culture and Training and Learning (Cohn and Ford, 2003; Lindvall et al., 2002; McMahon, 2004; Nerur et al.,2005;Opperthauser, 2003;

Turner and Boehm, 2003; Ambler, 2005c; Cockbum and Highsmith, 2001; Keith, 2002; Fowler and Highsmith, 2001; Drobka *et al.*, 2004).

Organizational Factors

They include everything related to the organizational context such as culture, resources, training, environment and group or individual rewards. The individual rewards also play an important role in the best individual performance and responsibility to the work. (Shore, J., Warden, S., 2008; Chen and Babar, 2014).

Organizations can have many factors to determine items of success or failure, commitment of manager, corporation in cultural organization instead of hierarchical, process of communication and face-to-face communication, accepting to apply agile methodology based on environment which is proper for agile style.

In addition, simply following an agile process is not agile; follow agile as an attitude not just a methodology or fixed steps (Fernandez and Fernandez, 2009).

People Factors

All interactions procedures among team members and other teams, customers, stakeholders and suppliers, or all parties of the project that affect and lead to good or bad team performance (Cao, L., Mohan, K., Xu, P., Ramesh, B., 2009). These factors may also include team interpersonal processes and communication between team people, and coordination processes.

Because agile methodologies focuses on the relationship between team members and teamwork and their interactions through agile practices, agile mediate the relationship between the input and output that measure the degree of the relations between team members.

Process Factors

Process contains information about how to follow agile-oriented needs for agile-based project management. It contains information about following agile-based configuration management process, daily face-to-face meetings, working schedule, following strong customer commitment and customer authority (Chow and Cao. 2008).

Technical Factors

In the software industry, experience can be accompanied by technical knowledge that has already been obtained. The previous researches about software development have shown good indicators of software knowledge and expertise compared to the length of experience (Doran, H.D., 2004).

According to (Chetankumar ,P.,& Muthu,R. ,2009), experience is one of the most important factors that leads to individual ability of knowledge management.

Cohen.M., and Levinthal.P, in 2004, suggested that the developers who had more experience are ready and capable to understand and manage the knowledge that leads to adopting agile methods or practices.

Project Factors

Software project includes planning, designing and leading software development process. Software project is a sub discipline extracted from

project management life cycle, where stages of software development projects life cycle are: planning, executing, monitoring & controlling and closing. Based on this meaning, the project aspects which have been mentioned are life-critical, variable scope, dynamic, accelerated schedule, team, multiple independent teams, up-front cost evaluation and up-front risk analysis (Chow and Cao. 2008).

Success Factors Summary

According to previous studies, the software development success factors consist of 14 elements. Based on what has been mentioned in figure 6, there are 5 major dimensions contain the 14 success factors. The researcher divided the factors into 4 groups, each containing similar elements, to facilitate data collection from companies. These have the same dimension and orientation and effect in the same direction on the process of the success or failure of the project.

The first group includes: [Customer Satisfaction, Customer Collaboration and Customer Commitment]. The second group includes: [Team Distribution and team size]. The third group includes: [corporate culture, Planning, Control, Technical competency, Communications and negotiations and Decision Time]. And the last group includes: [Personal characteristics, Societal Culture and Training].

Table (4) illustrates the references to which were divided into the 4 groups:

Table 4: Software Development Success Factors

#	The factor	References
1	Customer Satisfaction Customer Collaboration. Customer Commitment	(Cohn and Ford, 2003; Lindvall *et al.*, 2002; McMahon, 2004; Nerur *et al.*, 2005; Opperthauser, 2003; Turner and Boehm, 2003).
2	Team Distribution. Team size	(Dyba, 2000; eWorkshop, 2002; Turner and Boehm, 2003).
3	Corporate culture. Planning. Control. Technical competency. Communications and negotiations. Decision Time.	(Lindvall et al., 2002; Abrahamson *et al.*, 2002; Turner and Boehm, 2003; McMahon, 2004; Cohn and Ford, 2003; Ambler, 2005c; Cockbum and Highsmith, 2001).
4	Personal characteristics. Societal Culture. Training	(eWorkshop, 2002; Lindvall et al., 2002; Turner and Boehm, 2003; Cockbum and Highsmith, 2001; Ambler, 2005c; McMahon, 2004; Fowler and Highsmith, 2001; Drobka et al., 2004).

2.5 Changes and Challenges

The literature review that talked about the changes required and the challenges involved in the transformation of traditional projects into agile.

According to Cohn and Ford (2003), McMahon (2005), Subhas (2007) and Nerur et al. (2005), the main changes and challenges which have gained a common consensus among different researchers and practitioners are listed as follows:

1- Changes Required :

There are four types of changes required based on many of previous studies.

a. **Changes in Organizational Culture** is one of the most important changes required that the organizations must do to meet all the agile implementation requirements.

i. From policy and procedure based development culture to freedom of development and management by team members

ii. . From individually assigned roles to that of team-work.

iii. From solitary development attitudes of team members to that of working in teams.

iv. From no technical and interpersonal competency requirements in team composition to establishing a minimum set of competency requirements of team members

v. . From non-customer-centric to customer-centric development. (Nerur *et al.*, 2005. Subhas, 2007. Boehm and Turner, 2005; Chen and Babar, 2014).

b. Changes in Management Style: requires a change to be ready to apply APM practices. And it includes change from command and control management to leadership and collaboration. In addition to authoritative to collaborative and pluralistic decision making (Nerur *et al.*, 2005. Subhas, 2007).

c. Changes in Knowledge Management Strategies is another important issue that changes in knowledge management from heavy documentation-based to tacit (not spoken) knowledge management. This is a consequence of the agile approaches paying less importance on

documentation. Most of the knowledge resides with the developers (Nerur *et al.*, 2005. Subhas, 2007).

d. Changes in Development Processes is one of the most important differences between traditional approaches and agile approaches. The development process, and changing in development process are necessary to adapt APM practices. This change includes: from heavily process-centric to short, iterative, test-driven, and people-centric development. From standards compliance and measurement driven development to development under uncertainty. From contract-compliant to change-tolerant development. From lifecycle-based development to feature-driven evolutionary and iterative development (Nerur *et al.*, 2005. Subhas, 2007).

2- Challenges: according to Nerur et al. (2005). And Subhas (2007). Boehm and Turner (2005), Cohn and Ford (2003), and McMahon (2005), there are various challenges faced by the organizations such as Developer Resistance, Developer Perceptions of Micromanagement, Developer Perceptions of Freedom, Distributed development, Productivity differences between team members, Decrease in productivity during transition, Overzealous teams, Tester resistance, Upper management resistance, Human Resources resistance, Variability in subsystems and teams, Differences in lifecycles, Problems with incorporating agile in legacy systems, Differences in development processes, Differences in performance measurements and benchmarks, Conformance with

traditional process standards, Differences in attitude towards project success, Problems with team-size scalability and Problems with selecting the right agile methodology.

2.6 Agile Tools

There are many different types of agile tools. Some are free, some are paid, and some are going by the new business model called “Freemium” in which you get a distilled version of the software.

2.7 Agile Project Management in Palestine

The Middle East and the Arab countries are showing relative interest in agile project management. Because the agile project management is a new and modern system in Middle East countries, the Arab countries are trying to apply agile project management methodologies in the information technology and software development (PITA, 2015).

IT institutions, organizations, companies, technological incubators in Palestine are working to provide training courses in IT sector, so that they can improve the quality of the product or the service.

Palestinian Information Technology Association of Companies (PITA), began to provide training courses in agile methodology in the Gaza Strip in cooperation with Mercy Corps and ICAgile since March 2015.

There are two previous studies conducted in Palestine on agile SW development. The previous studies which include some methods of software development in particular, did not address the changes or the agile project

management practices or the success factors that will support the software development project in this sector to reduce the failure or the risks.

In 2013, there was a study entitled (Introducing Agile Software Methodology" SCRUM" into a software development project at a local firm). The researcher on the study tried to trade-off two methodologies practically through a case study in a local firm, and the research aims to investigate if it is possible to achieve a notable progress in a process of the developing SW project in many perspectives (Hanoun, 2013). This study give a great contribution to the local firm that adopted the research; it give a clear assessment for the working procedures, a clear understanding of the concepts behind upgrading customer communications, testing acceptance and adapting change within the work.

In 2014, there was a study entitled (impact of software project management methodology on customer satisfaction in the West Bank). The researcher on the study tried to investigate the impact of PM methodologies on customer satisfaction by improving customer satisfaction via increasing the satisfaction from satisfaction attributes (Rajeh, 2014). So this work provides a description of how SW management methodology impact on customer satisfaction. The empirical results of this study will help managerial level to concentrate more on management approach, customer satisfaction, and customer satisfaction attributes.

The previous studies in Palestine did not provide any managerial framework to assist in solving the problems of Palestinian IT companies. But this study provides a managerial framework to create the appropriate environment for agile project management implementation in software development sector.

Chapter Three
Research Methodology

Chapter Three

Research Methodology

3.1 Overview

This chapter covers research methodology and data collection techniques by using interviews, survey, sample, population, and the description of each tool and the validity, type of data. The methodology flowchart is presented in Figure 7:

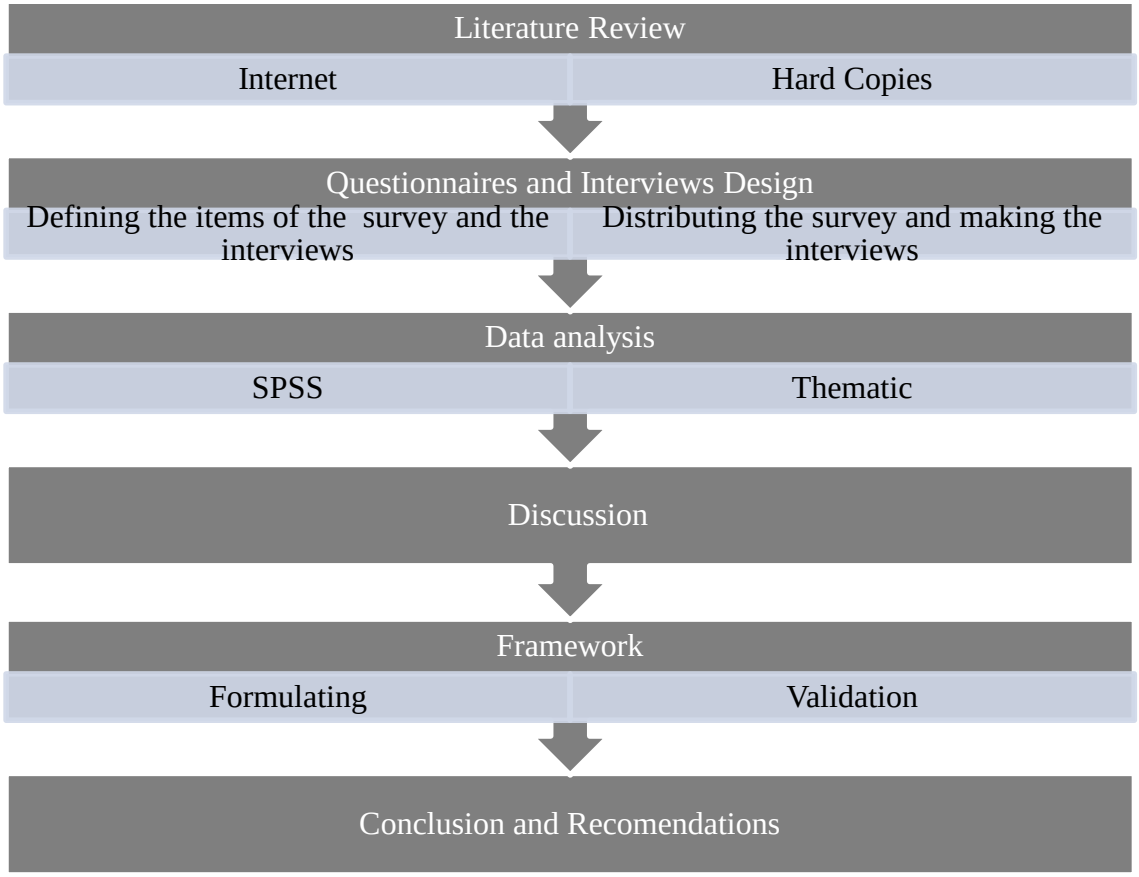

Figure 7: Research Methodology

3.2 Research Approach

Creswell (2003) defined the mixed method as a research approach using the qualitative and quantitative data in the research. There are three forms of mixed methods:

- **Sequential procedures:** The researcher uses one approach after another to utilize the data from one and refine the data from the other approach.
- **Concurrent procedures:** The researcher uses two methods to collect information (qualitative & quantitative) at the same time, and makes a comprehensive analysis about the problem.
- **Transformative procedures:** The researcher links two approaches with all research stages and phases.

Concurrent procedures are used in this research as a strategy of mixing method, and designed the interviews and a survey consequently.

Two methodologies in data collection: were used Qualitative research and Quantitative research. The former was interviews with experts in the field of agile project management, where those experts are working in important positions in the information technology companies in Palestine such as CEO, SW engineers. Project managers, SW developers, Programmers, and managers who have both managerial and SW experience.

The quantitative research was a questionnaire distributed to information technology companies, and has been answered by people working directly in agile project management, where all companies that do not apply agile project management methodologies in Software development have been excluded from the analysis.

3.3 Validity

Before collecting information from companies, the researcher asked 8 reviewers who are academician and specialist and have experience in research methods to refine the research tools to make sure that they can achieve the research objectives. Copies have been sent through e-mail, and every reviewer turned in the audit process and put his notes.

Appendix A shows the persons who carried out the audit and them scientific levels.

After the adoption of the consent of all the reviewers of the questionnaire, the Google Drive was used for the preparation of the questionnaire as an electronic copy which included the first page of the questionnaire containing several questions related to some of the general information, including two questions which the researcher can prevent companies that do not apply APM from answering the next pages, thus, they are excluded. Therefore, we can get accurate information.

The researcher has utilized multiple methods, including quantitative and qualitative, where the quantitative was represented by the online questionnaire, and the qualitative was represented by semi-structured interviews. In addition, the researcher used many sources in data collection, including both primary and secondary information.

The researcher checked the reliability of the quantitative tool by checking consistency through Cronbach Alpha test, which was (95.5%) considered as a high level or reliability.

3.4 Research Population and Sample

The main goal of this research is to find and test the assessment of APM practices in Palestinian IT Companies. Therefore the research population will be all IT companies in Palestine.

3.4.1 Palestinian IT Companies

Palestinian Information Technology Association (PITA) is considered as the official body which include all IT and software development Palestinian companies. The researcher can get all the information that help to recognize the number of all companies that work in the software development sector, considered to be the population who will achieve the research objectives.

According to PITA, the number of companies registered in PITA is 158 companies, but all of these do not work in the software development sector. After filtering and examining all companies' websites, and excluding the Gaza-Strip companies, the researcher found that there are 80 companies that could be included in the study. They are directly engaged in software development and information technology for the following reasons:

- They belong to **Appendix B.**
- The study excluded Gaza strip companies because they are out of the scope.
- The companies are registered under activities related to software development.

Table 5 shows the number of companies in a distributed to Palestinian cities:

Table 5: IT Palestinian Companies

#	Cities	Number of companies	Percentage
1	Ramallah and Al-Bireh	60	75%
2	Hebron	3	3.75%
3	Nablus	11	13.76%
4	Bethlehem	4	5%
5	Jenin	1	1.25%
6	Qalqilya	1	1.25%
Total	Total	80	100%

3.4.2 Sampling Technique

The main goal of the quantitative method is representative to collect data of the population, then the results can be generalize on the population. Determining the sample size is very important to reflect the results for the population.

According to Walliman (2006), there are two types of sampling procedures. The first one is probability sampling, the second one is non-probability sampling. Probability sampling is based on random selection. Non-probability sampling is based on non-random selection. The sample in the study considered to be non-random.

3.4.2.1 Sample Size

Based on the previous table, the population size is 80 companies that are working in SW development sector according to many activities that are listed in **Appendix B**. The sample size will be 67 based on population size, confidence level is 95%, and confidence interval is 5%.

3.5 Data Collection Technique

According to Bryman and Bell (2007), data collection tools or techniques are one of the most important elements in any study. As it is known that there are two different ways of data sources: primary resource and secondary resource.

Primary resource is the first-hand resource. There are many methods to collect data such as interviews, surveys, questionnaire and case study. Secondary resource is the second-hand information. It is already existed data such as books, internet, magazines, publications, and paper research.

3.5.1 Primary Resource

It is necessary to use the primary resources because the study will be applied on specific target group where the sample was taken from all IT companies that apply agile project management practices. Therefore, the use of this information is an essential part of the study.

Based on literature review, the questionnaire was designed to simulate the project's success factors and agile project management practices in software development and information technology sector.

The questionnaire contains all the elements and the points that have been measured in IT companies from which data has been collected on this basis. The projects were examined and followed up based on these standards and practices. Moreover, the factors are mainly associated with previous studies that the researcher mentioned in Chapter Two and Appendix C.

The interviews are a key part in this study, which were used to support primarily the questionnaire. Then they are considered a strength point to examine and accept or reject the hypotheses testing for this study.

The interview questions have been formed in accordance with the questionnaire which examines the hypotheses of the study, where it supports the research results through the answers provided by experts in the field of agile project management practices through their answers to the questions asked in interviews Protocol in Appendix D.

3.5.1.1 Interviews

To support the findings and the results of this study and provide strong evidence and foundations, the interview was conducted by many of experts in agile project management and other CEO, project managers, team leaders, software developers and top management. All of them have direct effects on the SW projects within the companies.

The interviews aim to achieve the following objectives:

1- To collect qualitative data from agile project management experts.
2- To support the researcher to get accurate results for the framework by examining how the qualitative data support the quantitative data and the research hypothesis.
3- To give the experts adequate freedom to expressing their personal opinion without restrictions when they answer the questions.

3.5.1.1.1 Interviews Design

After reviewing the five success factors that have direct effects on SW projects that the researchers mentioned it in Chapter Two, the researcher selected 19 questions that are related directly to the success factors and covered the five dimensions. These dimensions are organizational, technical, project, personal and process factors.

The researcher presented these questions to the same group of the academic experts external and internal, who were mentioned in the validity part of this chapter in Appendix A.

The interview questions that have been asked can be found in Appendix D.

According to Kajornboon (2005), there are four approaches of interviews:

1- **Structured Interviews** is a standardized interviews, the researcher asks the same questions to all interviewees.
2- **Semi-structured Interviews** is non-standardized and there is no specific hypothesis, and the researcher can change the questions by adding or removing some of them.
3- **Unstructured Interviews** where there is no direction, no restriction, flexibility. These interviews are open as there is no guide for them.
4- **Non-directive Interviews** in which the interviewer follows what the interviewee has to say.

The research used the semi-structured approach in SW development sector in Palestine to collect more data. And the researcher conducted eight interviews in the target companies in SW development sector, and the interviews were distributed as CEO, managers, Team leader, Software

Developer, Software Engineer, QA, CTO, project manager. Appendix E shows the interviewee title and specializations.

3.5.1.2 Questionnaire

Online questionnaire was conducted. And online questionnaire was sent by e-mail to the recipients by attaching the link to an e-mail after contacting with the companies and asking them to fill it in.

Appendix F shows the messages format between the researcher and the recipients.

The questionnaire aims to achieve the following objectives:

1. To collect quantitative data to check the research hypotheses.
2. To examine and identify the relations between all dependent and independent variables.
3. To analyze data statistically and generalize the results to all population.

3.5.1.2.1 Questionnaire Design

Based on literature review, the researcher conducted the questionnaire to examine the APM practices in Palestinian IT companies. The questionnaire consisted of four parts. These are:

1-Demographic or general information: This part contains general information about the IT companies, including gender, type of organization (products or services), number of employees, team members, the participant roles in the team, whether the company used agile methods. Then they can answer the survey questions.

2-Readiness for agile project management implementation: This part tests the readiness of the companies to transfer to agile methods by addressed the changes required and the challenges involved in the transformation of traditional methods into agile. The readiness consisted of two parts, the first one is measure the changes required in organizational culture, changes in management style, changes in management strategy and changes in development process. The second one measure the challenges that faced the organizations that want to transform from traditional to agile methods. The objective of this part was to test the degree of the readiness of the organization for agile project management practices.

3- Agile project management practices: in this part, there are twelve practices that were mentioned in the previous studies. The objective of this part was to examine the degree of applying these practices in the sampled organizations.

4- Success factors: this part consists of four groups. Each one includes a list of success factors that help the organizations to be agile and finish their projects successfully. The first group includes questions about Customer Satisfaction, Customer Collaboration, and Customer Commitment. The second group includes questions about Team Distribution and size. The third group includes questions about corporate culture, Planning, Control, Technical Competency and Decision Time. And last one includes questions about Personal Characteristics, Societal Culture, and Training. The objective of this part was to examine which of these elements are very important and had strong effects on the project's success within the organization.

3.5.2 Secondary Resource

The study mainly relied on secondary data, which had a significant role in the process of identifying the subject of study. It is subsequently determined the theoretical background about the study and identified the title of the study. It has been used as a secondary resource to initiate this research by the process of previewing the previous studies.

This part depended on E-Books that have been published on Web sites, libraries such as An-Najah National University Library and Palestine Polytechnic University library, research papers that have been published on Web sites and scientific articles that are published by specialist researchers on the subject of study.

3.6 Data Analysis

3.6.1 Questionnaire

On-line questionnaire was used and automatically stored to excel tables, and then all data was exported to SPSS program to be analyzed.

Descriptive and inferential analyses were conducted by the researcher. The former was used to examine all the percentages, mean, and median of all the questions. The latter was used by using SPERMAN tests to examine the research hypothesis.

The researcher examined the correlation in all parts of the questionnaires that were listed respectively, changes, challenges and risks, agile project management practices, and the success factors.

3.6.2 Interviews

The researcher used thematic analyses to analyze the data collected from semi-structured interviews. This approach is a qualitative method used to analyze and identify themes within the data, and describes the data in details and explains the main factors of the topic of research (Boyatzis, 1998; Braun and clarke, 2006; Jaaron and Backhouse, 2011).

According to Boyatzis (1998), and Braun and Clarke (2006), there are six steps of the thematic method:

- Reading: to be familiar with data, the researcher must read them repeatedly to search for the meanings and common elements and ideas to carry out the common code between the answers.
- Generating the initial code: codes must be produced from the common elements and ideas in the first step. The codes will be the characteristics and features that can be evaluated with meaning.
- Reviewing the codes to find the themes: Searching for the themes by reviewing the codes and sorting them under one theme for every similar code.
- Reviewing the themes: This step has two levels. The first one is reviewing the themes with the data, the second one is to consider the validity of themes and find the relations between them to build accurate map.
- Defining and naming the themes: In this step, the researcher must give a name to every theme based on the relations and the necessity for each one.
- Producing a report: Write a coherent, rational and summarized report to describe the overall story.

Chapter Four

Data Analysis

Chapter Four

Data Analysis

4.1 Introduction

After the required data has been collected, the researcher will analyse the data based on the methodology that was mentioned in the previous chapter. The researcher used mixed methods, quantitative and qualitative research ones. The quantitative consisted of a questionnaire, the qualitative consisted of semi-structured interviews to improve and increase research validity and reliability. Since a clear analysis of one problem is essential in process of solving it, this chapter presents an analysis of data obtained from interviews using thematic analysis approach

4.2 Interview Analysis

Interviews conducted as supplementary tool to obtain more information that reflected the situation of agile project management practices in IT Palestinian companies.

Semi-structure interviews were conducted by the researcher with the interviewee in administrative and technical levels that are distributed for General Manager, Software Test Engineer, Research and Development Manager, CTO, Team Leader, Software Developer, CEO, Project Manager, QA, and Software Engineer.

Thematic analysis was used to analyse these interviews. Table (6), presents the initial codes and issues discussed and the related initial codes, and the themes generated.

Table 6: Thematic Analysis Table.

Codes	Issues discussed	Themes
Needs Requirements Features Functions Relative estimations	Project requirements External and internal requirements. User stories approach. User stories and planning.	**User Stories**
Technical skills Experiences Task achievement Developed Tested Meet requirements	Continuous improvement Capacity Building Meaning of Done Systems Integration Published	**Process Development**
Negotiations Collaborations Customer involvement	Knowledge management Knowledge sharing Sharing information	**Stakeholder Communication**
Roles Assign Tasks Team size Project size and nature	Traceability Roles description Priorities and sequential process Time management Documentation process	**Product or services strategy**
Problems Instable requirements Changes Risks and challenges Impact	Document agreement Handling change Fault detection Incremental delivery Improve quality Customer involvement	**Quality Improvement**

The study summarized the findings that gained from interviews to five themes. These themes are user stories, process development, stakeholder communication, products or services strategy, and quality improvement.

4.2.1 User Stories

During the interviews, the researcher wanted to get the full story that revolves between the two parties (companies and their customers) to determine the agreement on the mechanism of work from the first point to the last point to facilitate the delivery of the service or product to the customer.

Many of questions were asked to get all the relative information that adopts this story through the answers of the General Manager, Software Test Engineer, R&D Manager , CTO, Team leader, Software Developer, CEO, Project Manager, QA and Software Engineer in Palestinian IT companies.

This part was obtained from the interviewees answers to all the questions, including all procedures and events or actions covered by the project under the general points from the point of view of both parties, as it contains: needs, requirements, functions, features and relative estimation, which have been classified under three main issues. These are project requirements, external and internal estimation, user stories approach and user stories and the planning.

The interviewees agreed that there are important considerations for writing user stories. It is known that user stories are written on sticky notes and arranged on walls or a table to facilitate planning and discussion. They are also based on the discussions because they are more important than whatever written in the text. Moreover, the stakeholders write a user story not the developer. Important concepts that people can write in the meeting in few minute in a simple way, and use the simplest tools to write them such as

index card or sticky notes were used in the analysis, with non-functional requirements, for the stories were used to describe a variety of requirements type.

In addition, indicating the estimated size which includes an estimation for the efforts that needed to assign user story to each card or sticky note. Besides, indicating the priority or requirements which include identifying the defects as part of your operations efforts and prioritized by project stakeholder and adding to the stack notes in the appropriate place.

The interviewees agreed that there are many approaches used to write stories of the users, which were summarized in the following approach:

As a (Role) I want (something) for (reasons). In this case, the company puts itself in the customers' shoes. By starting the story as a type of a user or a customer, and asking itself what I want and what the main goals or objectives that the company should achieve. Also, describing the main reasons that encourage the company to do this work.

The interviewees noted that the user stories and the planning are cornerstones, where the user stories affect the planning process. Scheduling and estimating are two areas for planning.

Scheduling including stories are addressed in priority order. And when the work will be done, and which requirement should be discussed earlier. Also stakeholders are responsible for prioritizing requirements, making decisions, providing information, and having the right to define the change or a new requirements.

According to estimation, the developers are responsible for estimating the effort required to implement the tasks, which include the size of the team work. So, the developers must have a good estimating skills to give accurate estimation.

4.2.2 Process Development

In this section, the researcher is going to ask many questions related to process development. There are questions regarding the process taken from companies using agility in software development, whether test and task achievement meet all the requirements of customers and agile tools that are needed for high quality in the projects.

Other questions related to the technical and technological skills and expertise are needed by the development team members that are related to the process development.

The researcher noticed that there are many related issues based on the previous paragraph. Continuous improvement, capacity building, meaning of “done” in services projects, system integration and published issues were discussed in terms of Process Development.

According to technical skills and experiences that are related to capacity building and continuous improvement, most of the interviewees said that the effort which is spent on this process and skills in Palestinian IT companies is enough, but that doesn’t mean that the companies stop the continuous improvement of the working environment even if the projects do not require significant resources.

Therefore, companies should always seek to put training programs that increase the experience of the team members to get a higher quality in the projects.

Process development also includes the meaning of “Done”. Which includes task development, task achievement, testing the task and meeting all requirements of the project.

All the interviewees agreed that the meaning of “Done” in agile project is to meet requirements in both development and quality in which a certain task is achieved, and when the scheduled requirements and updates for a planned release are completed (developed, tested, and published for customers).

According to testing, testing cannot prove the absence of defects. It reduces the probability of defects remaining undiscovered and the absence of failures does not prove the correctness of the software. The test procedure itself might contain errors. So, there is a possibility to not find some defects. The test conditions might be unsuitable for finding errors.

Regarding quality in agile vs not agile, in agile there is a focus on specific features, when they agree on features, the QA starts writing test cases while the developers implement the features, then the QA will test them. This makes more focus on project and higher quality.

Also, after confirming the acceptance of testing by client, this required to be done from QAs side as well, including negative and positive testing, integration, regression and environment testing.

4.2.3 Stakeholder Communication

Communication is one of the most cornerstones that is reliable in agile project management implementation. It is a key element for transferring information between individuals and groups, whether they are directors of departments in senior management with lower levels or team members within the company, or even the users of the service or customers.

During the interviews; the researcher collected a lot of data about the communication mechanism from the top level such as general managers, middle level such as project managers and the operational level such as technical or software engineers or programmers.

All the interviewees agreed that the communications role is very important in software development process. It must be open between all parts of the project during all the project stages.

The interviewees focused on collaboration, negotiation and customer involvement to meet all the needs and requirements.

General Managers and senior management said that communication is the way to see the workflow mechanism, and views exchange, and to make decisions through the exchange and sharing information and knowledge management which must remain open between all team members and project parties. Therefore, the top management is fully informed on the progress of work and followed up on all current events.

According to project manager perspective, they consider that communication between the team facilitates the work process, where they turn to attend daily meetings between team members to answer three questions: The first is What

did we do yesterday? The second is What to do today? The third is What must we do tomorrow? Then, they all know what is going on, as these meetings do not exceed these three questions. But it enhances to make a good decision and improve the shared information and exchange the point of views between team members to gain high levels of knowledge management. About customer involvement, all of interviewees agreed that the customer must be online all time by using tools that enhance the communication between the customers and the team members through negotiation and cooperation among all parties. The team can meet all customer needs by involving them to be fully informed of everything that is going on.

In addition to what has been mentioned in the previous paragraphs, all interviewees agreed there are also conditions and factors to get successful communications between team members. For example, the team members who are closer to another have a good opportunities for communication than those who work in different places. It should be noted that direct contact and face-to-face are one of the most useful and rich tools in communications.

Also, time factor, experience, and knowledge play important role in exchange of information, where the team members who work at the same time have a very great opportunity to communicate. So, all the interviewees see to create a suitable environment for all team members working at the same time to get successful communication in agile project management in case all the company's employees work in the same geographical environment or time zone.

In addition to many communication tools that contribute to share work or information, such as Whiteboard, Overview diagrams, Online chat, Overview documentation, Teleconference calls, Videoconferencing, Email and Detailed Documentation.

4.2.4 Product or Services Strategy

In this part, the researcher suggested many questions related to products or service strategies; all the interviewees answers centred on the roles, project size, team size, assigning tasks, document agreement, traceability, external and internal requirements, roles and job description, priorities and sequential process.

According to general managers and CEO and those who assign the tasks to others without being directly involved, the employee is aware of the tasks and actions to be carried out. The managers give staff some advice and guidance to ensure the highest rate of efficiency and quality in work and guidelines, which facilitate the work of team members in the tasks assigned to them.

Some of the strategies pursued by companies are the attempts to give team members an opportunity to act and work as if they were the owners. This is reflected positively on the team members experience in applying products or service strategies, and the ability to make decisions that directly contribute to the success and completion of the projects.

All the interviewees agreed that assigned tasks, roles, project size and team size are related to each other based on many criteria: task type, task required experience, resource involvement in similar tasks and resource availability.

The job description of each team member is well-known and well-divided through the team. There are mainly the development people, the QA person to perform testing, the team leader or the manager who supervises the team, and teams are mostly independent with little supervision of the leader. Development tasks are agreed between development team, each one who knows his there task.

Furthermore, these tasks are filed in an agile development software called (RallyDev).For each sprint (its duration is one week and sometimes it can be extended into two weeks) there are defined tasks, each task owner or responsible will change the status of that task (RallyDev) to be finished or to be in progress.

At the end of the week, there is an online meeting with the customers in order to show the completed tasks in a demo. The same thing is for QA, he is creates tasks in RallyDev, writes test cases, opens tickets in RallyDev, and retests those tickets which were said to be fixed by the developers. If that issue is fixed, then the QA will mark it as completed (closed/verified). Otherwise, QA reopens and assigns it to a developer to be reworked and fixed in the next sprint.

According to project size, as the researcher mentioned in the previous paragraphs, the roles and the tasks are related directly to project size, and they will be divided based on the size of the project. In Palestinian IT

companies that worked on different projects, the average project size is medium based on the interviewees answers, it is centred around (10 to 15) employees divided to a developer, QA, a consultant and a Project Manager. Then, products or service strategies will be initiated based on this size.

In addition, time management is a key element in products or service strategies. Hence, the researcher asked questions about over time strategy. All the interviewees agreed that the companies do not need to use over time, sometimes they work overtime, but not get thing paid for it. Normally, it is rare to be late beyond working hours. Correspondingly, working hours are flexible and an employee can come late in the morning and stay late (or leave on time) at the end of the work-day.

4.2.5 Quality Improvement

Most of the interviewees agreed and noted the effort which was spent in dealing with the problems, changes, instable requirements, risks and challenges. Additionally, the impact of transformation from the traditional approach to agile approach is enough and good to get a high degree of quality, because, the agile development process enhances the way of approaching problems. Accordingly, things get done very quickly.

In agile, the customer attends a demo once every one or two weeks, as a result, s/he is in charge with the finished work. Then, it shows a high quality. Accordingly, the customers will be involved all time. Likewise using agile methods is better than using traditional one, since managers can know progress for each stage according to its timeline.

Furthermore, agile stakeholders report a high level of process quality and satisfaction. Not to mention they are constantly involved in the development process. Regular communication with the project owner and development team makes the development process highly transparent. Agile also allows a high degree of outcome satisfaction. With early delivery of valuable software, stakeholders are able to begin using it quickly. Although its functionality will not be at full capacity, continuous delivery of iterations allows stakeholders to maintain a high level of quality and satisfaction with the overall project.

Based on risks and challenges, all of interviewees noted that there is no negative impact, and there are no any risks in applying agile development.

Most interviewees agreed and noted instable requirements and changes. Instable requirements need to be communicated and discussed beforehand. That is why there is scrum calls meetings. In a manner they discuss, then develop the stable parts with stakeholders and key customers.

In the light of any new requirements that were reported by client, it must be reviewed by the consultant and Product Manager before starting working on it. If any defects are found, the director returns them directly to client to discuss them and give some tips.

All interviewees agreed that the agility is mainly used to be implemented in projects that keep changing. For this reason, a signed copy of agreement document called Service Level Agreement (SLA), and for any new change the director asks them for “Change Request” explaining what to be changed and the risk of the change and the priority of the change. Also, the changes

are categorized into priorities, the top ones are done first. So, the companies can handl the changes and fault detection.

4.3 Questionnaire Analysis

The questionnaire that was designed has four parts: the first part includes 8 questions that contain demographic information. The second part includes two groups; group one contains 12 questions related to change required, and group two contains 6 questions related to challenges and risks.

Part three includes 12 questions related to the principles of APM. Part four has four groups; group one contains 3 questions related to customer centric, group two includes 2 questions related to team distribution and size, group three includes 12 questions related to Corporate culture, Planning, Control, Technical Competency and Decision Time, and group four includes 4 questions related to Personal Characteristics, Societal Culture, and Training. Each part consists of many questions designed based on a Likert scale. Question in the Likert scale were grouped and analysed in each part.

Likert ranked from 1 (strongly disagree) to 5 (strongly agree) as shown in Table 7.

Table 7: Likert Scale classifications

No	Corresponding Remark	Score
1	Very low	1 - 1.80
2	Low	1.8 - 2.60
3	Moderate	2.6 - 3.40
4	High	3.4 - 4.20
5	Very high	4.2 - 5

Table 8: Cronbach's Alpha for Questionnaire Items.

Scale: All VARIABLES	**Case**	**N**	**Percentage**
	Valid	67	100%
	Excluded	0	0
	Total	**67**	**100%**
Reliability Statistics			
	Cronbach's alpha	**No. of items**	
	.955	51	

4.3.1 Readiness for Agile Project Management Implementations

4.3.1.1 Change Required Analysis

According to Table (9), the researcher noted that the total average response for the change required is 3.63 which is considered as a high level or degree of change required in Palestinian IT companies.

The researcher noticed that there are two moderate levels with no low or very low level in the change required during APM implementation process, which means that there is no change resistance.

Table 9: Change Required Analysis

Change Required	1	2	3	4	5	Mean	Std. Deviation
From procedure based development culture to freedom of development and management by team members.	4%	7%	31%	34%	22%	3.63	1.06
From individually assigned roles to that of team-work.	3%	10%	16%	37%	33%	3.87	1.09
From solitary development attitudes of team members	1%	12%	30%	34%	22%	3.64	1.01

to that of working in teams.							
From nontechnical and interpersonal competency requirements in team composition to establishing a minimum set of competency requirements of team members.	4%	12%	27%	37%	19%	3.55	1.08
From non-customer-centric to customer-centric development.	9%	9%	27%	28%	27%	3.55	1.23
From command-and-control management to leadership-and-collaboration.	1%	6%	25%	34%	33%	3.91	0.98
From authoritative to collaborative and pluralistic decision making.	1%	6%	21%	52%	19%	3.82	0.87
From heavy documentation-based to tacit (not spoken) knowledge management.	3%	13%	46%	21%	16%	3.34	1.01
From heavily process-centric to short, iterative, test-driven, and people-centric development.	1%	7%	25%	42%	24%	3.79	0.95
From standards compliance and measurement driven development to development under uncertainty.	13%	12%	34%	24%	16%	3.18	1.24
From contract-compliant to change-tolerant development.	6%	12%	28%	37%	16%	3.46	1.09
From lifecycle-based development to feature-driven evolutionary and iterative development.	6%	3%	22%	39%	30%	3.84	1.08
Total valid						**3.63**	**1.05**
Level						**High**	

4.3.1.2 Challenges Analysis

Based on data in Table (10), the researcher noted that the total average of responses for the challenges and risks is 3.3 which is considered as a moderate degree in challenges and risks that faced the Palestinian IT companies during transformation from traditional to agile methods.

The researcher noticed that there is no high level on challenges and risks, which means that the Palestinian IT companies which work with stable environment will not face any challenges and risks, thus, challenges and risks are not important if top management staff accepts transforming process and accept the change.

Table 10: Challenges Analysis.

Challenges and Risks	**1**	**2**	**3**	**4**	**5**	Mean	Std. Deviation
Resistance from developers to transform from traditional heavyweight process centric development.	12%	22%	25%	34%	6%	3.00	1.14
Differences in productivity between team members in agile software development.	9%	9%	34%	33%	15%	3.36	1.12
Adopting agile methodologies for use in legacy systems, which are more resistant to changes in internal source code.	4%	16%	34%	31%	13%	3.33	1.05
Differences in development processes between agile methodologies and traditional methodologies.	6%	13%	22%	36%	22%	3.55	1.16
Differences between the team size requirements and suitability of the agile and traditional methodologies.	4%	12%	37%	36%	10%	3.36	0.98
Problems with selecting the appropriate agile methodology and the supporting tools according to organizational needs and characteristics.	6%	18%	27%	28%	21%	3.40	1.18
Total valid						**3.3**	**1.10**
Level						**Moderate**	

4.3.2 Agile Project Management Practices / the Principles Analysis

Based on Table (11), the researcher noted that the total average of responses for agile principles is 3.80 which is considered as a high degree of applying agile principles in Palestinian IT companies. Also, there is no moderate or low levels through data analysis in this part.

Table 11: Agile Principles Analysis.

The principles	**1**	**2**	**3**	**4**	**5**	Mean	Std. Deviation
We give high priority to satisfying customers through early and continuous delivery of valuable software.	3%	4%	12%	30%	51%	4.21	1.02
We welcome changing requirements, even late during development.	1%	9%	19%	55%	15%	3.73	0.88
We deliver working software more frequently, from couple of weeks to a couple of months, with a preference to a shorter timescale.	3%	7%	30%	33%	27%	3.73	1.04
Our business people and developers work together daily (very closely) throughout the project.	3%	10%	25%	30%	31%	3.76	1.10
We build projects around motivated individuals. We give them the environment and support their need, and trust them to get the job done.	1%	6%	15%	51%	27%	3.96	0.89
We emphasize more on face-to-face communication for conveying information to and within the development team.	4%	7%	19%	28%	40%	3.93	1.15
We measure and track progress based on working software.	1%	12%	30%	31%	25%	3.67	1.04
We promote sustainable development. Our sponsors, developers, and users maintain a constant pace indefinitely.	3%	9%	36%	37%	15%	3.52	0.96

Our software development project team follows continuous attention to technical excellence and good design for development.	1%	4%	16%	37%	40%	4.10	0.94
We practice simple designs, processes, and approaches in our software development methodologies. We implement features that are required by the customers -- nothing more.	6%	15%	22%	34%	22%	3.52	1.17
Our development teams are self-organizing -- our teams can (re)-organize continuously in different configurations to meet the changing requirements and the newly arising challenges of the business.	4%	7%	16%	43%	28%	3.84	1.07
At regular intervals, our team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.	3%	7%	24%	36%	30%	3.82	1.04
Total Valid						**3.80**	**1.02**
Level						**High**	

4.3.3 Success Factors Analysis

4.3.3.1 Customer Satisfaction, Customer Collaboration, Customer Commitment Analysis

According to Table (12), group 1 focused on customer centric factors that lead to project success in SW development. The total average of responses for customer centric success factors is 3.87 which considered as a high degree in Palestinian IT companies which give great attentions to the customer during software development process. The researcher noticed there is no moderate or low degree in this section, so, all Palestinian IT companies that applied APM practices oriented to make the customers an irreplaceable part through software development based on APM practices.

Table 12: Success Factors, Group 1 Analysis.

Customer Satisfaction, Customer Collaboration, Customer Commitment.	**1**	**2**	**3**	**4**	**5**	**Mean**	**Std. Deviation**
we give very high priority to achieving customer satisfaction	1%	6%	13%	19%	60%	4.30	1.02
Customers collaborate with the development team members.	4%	10%	25%	30%	30%	3.70	1.14
Customers are committed to the project, consider themselves to be responsible elements of the project.	4%	9%	34%	25%	27%	3.61	1.11
Total Valid						**3.87**	**1.09**
Level						**High**	

4.3.3.2 Team Distribution and Size Analysis

Results that, the preferred team size in APM is a small size and must be at the same location to facilitate agile process. Face to face meeting is one of the most important daily processes. And based on table (13), the total average responses of team size and distribution is 3.55 which is considered a high degree in Palestinian IT companies. The researcher noticed that there is one of the responses analysis considered as moderate level, which based on location of the team. The researcher considered this part to be waived through providing all the requirements that facilitate the communication between team members even if they are in different places.

Table 13: Success Factors, Group 2 Analysis.

Team Distribution and size	**1**	**2**	**3**	**4**	**5**	Mean	Std. Deviation
The members in our team are at the same location.	7%	25%	21%	19%	27%	3.33	1.32
We work in small teams.	4%	4%	28%	34%	28%	3.78	1.06
Total Valid						**3.55**	**1.19**
Level						**High**	

4.3.3.3 Corporate Culture, Planning, Control, Technical Competency and Decision Time Analysis

This section in part 4 in the questionnaire contains 12 questions that related to management success factors such as Corporate Culture, Planning, Control, Technical Competency and Decision Time.

According to Table (14), the total average responses for this group is 3.90 which considered as a high degree of management factors that leads to project success in Palestinian IT companies.

The researcher noted there is one response considered as a moderate level, which related to organizations bureaucratic management structure. The researcher assumes the Palestinian IT companies must make changes to the organizational hierarchy and administrative policies that will facilitate decision-making and information flow from the upper levels to technical and artistic level.

Table 14: Success Factors, Group 3 Analysis.

Corporate culture, Planning, Control, Technical competency and Decision Time.	**1**	**2**	**3**	**4**	**5**	Mean	Std. Deviation
Our organization encourages communication.	3%	4%	15%	37%	40%	4.07	1.00
Our organization culture trusts people.	3%	7%	18%	45%	27%	3.85	1.00
Our organization encourages feedback from customers.	1%	4%	19%	36%	39%	4.06	0.95
Our organization encourages changing requirements.	0%	9%	40%	34%	16%	3.58	0.87
Our organization has a bureaucratic management structure.	18%	19%	34%	16%	12%	2.85	1.25
Our software development team has qualitative control.	1%	3%	25%	37%	33%	3.97	0.92
Our team consists of technically and experienced people (who have developed alike software in the past).	3%	9%	13%	28%	46%	4.06	1.11
Our team majority consists of people who are motivated and collaborative attitude.	0%	6%	21%	34%	39%	4.06	0.92
Our team majority consists of people who have readiness to learn.	1%	7%	15%	28%	48%	4.13	1.03
Our tools in projects enables personal to communicate quickly and effectively with all business areas.	3%	7%	19%	30%	40%	3.97	1.09
We use face-to-face communications in the most case in our projects.	4%	7%	21%	31%	36%	3.87	1.13
We try to make important decisions rapidly within short time.	1%	4%	28%	45%	21%	3.79	0.88
Total Valid						**3.90**	**1.01**
Level						**High**	

4.3.3.4 Personal Characteristics, Societal Culture, Training Analysis

The last group of success factors part contains 4 questions related to people factors such as personal characteristics, societal culture and training.

Based on Table (15), the total average responses of this section is 3.5 which is considered as a high degree in Palestinian IT companies. The researcher noted that there are two of the four questions analysis has a moderate level which is related to communication. This takes place between people who are physically close to one another and negotiation in our projects happen between people who work at the same time. The other two questions which have a high degree are related to trust communication and progressive attitude through the team members.

Table 15: Success Factors, Group 4 Analysis.

Personal characteristics, Societal Culture, Training	**1**	**2**	**3**	**4**	**5**	Mean	Std. Deviation
Communication happen between people who are physically close to one another (in most cases).	9%	16%	39%	22%	13%	3.15	1.13
Communication and negotiation in our projects happen between people who work in the same time.	4%	16%	33%	34%	12%	3.33	1.04
People in our projects communicates with each other with trust.	3%	4%	21%	36%	36%	3.97	1.01
The people of our country in general have progressive attitude (step by step).	4%	7%	36%	33%	19%	3.55	1.03
Total Valid						**3.5**	**1.05**
Level						**High**	

4.4 Hypotheses Testing

The inferential statistics will be used to test the hypotheses in order to be able to generalize the results to population.

The analysis consisted of seven hypotheses. The researcher used the Spearman test to examine the correlation between all the elements that have been measured in the questionnaire.

In addition, these hypotheses answer the first and the second question in this study. Firstly, the correlation between the changes required and challenges and risks.

The second one tests the correlation between changes required and agile principles. The third one tests correlation between challenges and risks and agile principles.

The fourth one tests the correlation between success factor 1" customer centric" and agile principles. The fifth one tests the correlation between success factor 2" team characteristic" and agile principles.

The sixth one tests the correlation between success factor 3" management process" and agile principles. And the seventh one tests the correlation between success factor 4"people characteristic" and agile principle.

Hypothesis 1: Change Required vs Challenges and Risks.

H1: There is a statistical evidence confirms that there is correlation between change required and challenges at $\boldsymbol{\alpha} = 0.05$ in Palestinian IT companies.

Table 16: Correlation Test for H1.

Correlations				
			change required	challenges and risks
Spearman's rho	change required	Correlation Coefficient	1.000	.481**
		Sig. (2-tailed)	.	.000
		N	67	67
	challenges and risks	Correlation Coefficient	.481**	1.000
		Sig. (2-tailed)	.000	.
		N	67	67

From Table (16), the researcher noticed that the correlation significant between change required and challenges is 0.000, and 0.000 < .05, then, we reject the null hypothesis.so, there is a statistical evidence confirms that there is correlation between change required and challenges in Palestinian IT companies.

Hypothesis 2: Principles of APM vs Change Required.

H1: There is a statistical evidence confirms that there is correlation between APM principles and change required at $\alpha = 0.05$ in Palestinian IT companies.

Table 17: Correlation Test for H2.

Correlations				
			principles	change required
Spearman's rho	principles	Correlation Coefficient	1.000	.618**
		Sig. (2-tailed)	.	.000
		N	67	67
	change required	Correlation Coefficient	.618**	1.000
		Sig. (2-tailed)	.000	.
		N	67	67

Table (17) presents the correlation significance between APM principles and change required is .000, and .000 < 0.05. Then we reject the null hypothesis. Therefore, there is a statistical evidence confirms that there is correlation between APM principles and change required in Palestinian IT companies.

Hypothesis 3: Principles of APM vs Challenges and Risks.

H1: There is a statistical evidence confirms that there is correlation between APM principles and challenges at **α** = 0.05 in Palestinian IT companies.

Table 18: Correlation Test for H3.

Relations				
			principles	challenges and risks
Spearman's rho	principles	Correlation Coefficient	1.000	.439**
		Sig. (1-tailed)	.	.000
		N	67	67
	challenges and risks	Correlation Coefficient	.439**	1.000
		Sig. (1-tailed)	.000	.
		N	67	67

According to Table (18), the researcher noticed that the correlation significance between APM principles and challenges is 0.00. And it is less than 0.05. Then we reject the null hypothesis which presents there is a statistical evidence confirms that there is **No** correlation between APM principles and challenges in Palestinian IT companies.

Hypothesis 4: Principles of APM vs Customer Centric.

H1: There is a statistical evidence confirms that there is correlation between APM principles and customer centric (Satisfaction, Collaboration, and Commitment) at **α** = 0.05 in Palestinian IT companies.

Table 19: Correlation Test for H3.

Correlations				
			principles	customer centric (Satisfaction, Collaboration, and Commitment)
Spearman's rho	principles	Correlation Coefficient	1.000	.530**
		Sig. (1-tailed)	.	.000
		N	67	67
	customer centric (Satisfaction, Collaboration, and Commitment)	Correlation Coefficient	.530**	1.000
		Sig. (1-tailed)	.000	.
		N	67	67

From Table (19), the researcher noticed that the correlation significance between APM principles and customer centric is 0.000, and 0.00 < 0.05. Then we reject the null hypothesis which presents a statistical evidence confirms that there is **No** correlation between APM principles and customer centric (satisfaction, collaboration, and commitment) in Palestinian IT companies.

Hypothesis 5: Principles of APM vs Team Size and Distribution.

H1: There is a statistical evidence confirms that there is correlation between APM principles and Team size and distribution at **α** = 0.05 in Palestinian IT companies.

Table 20: Correlation Test for H5.

Correlations				
			principles	Team size and distribution
Spearman's rho	principles	Correlation Coefficient	1.000	.299**
		Sig. (1-tailed)	.	.007
		N	67	67
	Team size and distribution	Correlation Coefficient	.299**	1.000
		Sig. (1-tailed)	.007	.
		N	67	67

Table (20) above, the researcher noticed that the correlation significance between APM principles and Team size and distribution is 0.007. and 0.007< 0.05. Then we reject the null hypothesis. So, there is a statistical evidence confirms that there is correlation between APM principles and Team size and distribution in Palestinian IT companies.

Hypothesis 6: Principles of APM vs Process Factors.

H1: There is a statistical evidence confirms that there is correlation between APM principles and the process factors (Corporate culture, Planning, Control, Technical competency and Decision Time) at $\alpha = 0.05$ in Palestinian IT companies.

Table 21: Correlation Test for H6.

Correlations				
			principles	process factors
Spearman's rho	principles	Correlation Coefficient	1.000	.717**
		Sig. (1-tailed)	.	.000
		N	67	67
	process factors (Corporate culture, Planning, Control, Technical competency and Decision Time)	Correlation Coefficient	.717**	1.000
		Sig. (1-tailed)	.000	.
		N	67	67

According to Table (21) above. The researcher noticed the correlation significant between APM principles and the process factors is 0.000. And 0.00 <0.05. Then we reject the null hypothesis. So. There is a statistical evidence confirms that there is correlation between APM principles and the process factors.

Hypothesis 7: Principles of APM vs Personal Factors.

H1: There is a statistical evidence confirms that there is correlation between APM principles and the personal factors (person characteristic, social Culture and Training) at $\alpha = 0.05$ in Palestinian IT companies.

Table 22: Correlation Test for H7.

Correlations				
			principles	personal factors
Spearman's rho	principles	Correlation Coefficient	1.000	.428**
		Sig. (1-tailed)	.	.000
		N	67	67
	people factors (person characteristic, social Culture and Training)	Correlation Coefficient	.428**	1.000
		Sig. (1-tailed)	.000	.
		N	67	67

Table (22) above, the researcher noticed the correlation significance between APM principles and people factors is 0.000. and 0.00<0.05. Then we reject the null hypothesis. Thus, there is a statistical evidence confirms that there is correlation between APM principles and the people factors (person characteristic, social culture and training) in Palestinian IT companies.

Hypothesis 8: Principles of APM vs Number of the Employees in the Companies.

H1: There is a statistical evidence confirms that there is statistically significant differences between APM principles and number of the employees in the Palestinian IT companies.

Table 23: Sample Data Distribution According to Number of the Employees in the Companies

Level	Percentage
Less than 10	17.9%
10 – 20	23.9%
21 – 40	17.9%
41 - 100	20.9%
Greater than 100	19.4%
Total	**100%**

Table 24: ANOVA Test for H8

ANOVA					
principles					
	Sum of Squares	df	Mean Square	f	Sig.
Between Groups	2.183	4	.546	1.033	.397
Within Groups	32.741	62	.528		
Total	34.924	66			

Table (24) present that the Significant probability is 0.397, thus we cant reject the null hypothesis because the significant probability greater than 0.05. So, there is No statistically significant differences in the degree of Number of the Employees in the Companies.

Hypothesis 9: Principles of APM vs the Companies Using APM All Time or Sometime.

H1: There is a statistical evidence confirms that there is statistically significant differences between APM principles and the degree of the Companies Using APM all time or Sometime.

Table 25: Sample Data Distribution According to the Companies Using APM All Time or Sometimes

Level	Percentage
Yes (all Time)	50.7%
Sometimes	49.3%
Total	**100%**

Table 26: ANOVA Test for H9

ANOVA					
principles					
	Sum of Squares	df	Mean Square	f	Sig.
Between Groups	2.465	1	2.465	4.937	.030
Within Groups	32.459	65	.499		
Total	34.924	66			

Table (26) present that the Significant probability is 0.030, thus we reject the null hypothesis because the significant probability less than 0.05. So, there is a statistically significant differences in the degree of the Companies Using APM All Time or Sometime.

Chapter Five

Discussion

Chapter Five

Discussion

5.1 Overview

This chapter discusses results obtained from this research. This research includes two methods (interviews and questionnaire). The four survey factors are change required in APM, The challenges and risks, agile project management principles, and success factors.

All of these factors are analyzed in the previous chapter, and they will be discussed in this chapter. In addition to the five themes obtained from the interviews, these themes are user stories, process development, stakeholder communication, products or services strategy, and quality improvement.

In this section, the researcher will evaluate the results that were obtained from the interviews and the questionnaire. The interviews were analyzed by using thematic analysis. Moreover, the questionnaire was analyzed statistically by using “SPSS” program.

5.2 Results Discussion

5.2.1 Change Required

Agile team must strive to manage change not to prevent it as requirements change frequently. So, agile team needs flexible approach to manage change with high quality and high value.

The research shows after analyzing the change required part through the questionnaire that the change is not a problem in Palestinian IT companies

during agile implementation phase, and there is no change resistance in SW development sector in Palestinian IT companies.

According to Table (9), the researcher noticed that all changes will be accepted during transform from traditional approach to agile approach or during change management within SW projects based on the results presented in Table (9).

Palestinian IT companies deal with the change in a positive way because the total average responses for the change required is (3.63) which is considered as a high level or degree of change required, which is presented in managing the change from procedure based development culture to management by team members.

Palestinian IT companies gives the team members authority to take decisions through development process by transforming from command or control management to leadership or skills management and increased the collaboration within the team that gives the team members opportunities to focus on customer centric rather than non-customer centric, and assigned roles based on team-work which helps the company to transform from solitary development attitudes of team members to work together in one team. Also establishing and enhancing the set of competency requirements to team members, then the process of companies can be short, iterative, test-driven and change tolerant development which helps the companies to transform from lifecycle-based development to feature-driven and iterative development.

All these factors answer the first part of the first question of this study which asks about what are the most important changes that face the Palestinian IT companies that want to adopt agile project management practices?.

The researcher noted that there are two moderate levels which need extra efforts to be in high level such as managing the change that is presented in transforming from heavy documentation-based to tacit knowledge management. In addition to transform from standards compliance and measurement driven development to development under uncertainty.

In addition to the previous paragraphs, H1 and H2 explained that the Palestinian IT companies are in a good position to handle the change and have ability to deal with the projects which include a high percentage of change.

5.2.2 Challenges and Risks

Transforming from traditional approach to agile approach will face many challenges and risks. Management staff or team members should have many techniques to deal with agile implementation needs to manage transformation process to handle the change and reduce the challenges and risks.

As shown in the previous chapter, the total average of responses for the challenges and risks is (3.3) which is considered a moderate level of challenges and risks in Palestinian IT companies. The impact of challenges and risks of agile project management in IT companies are not important and companies can surpass and overcome these risks through good preparation in the infrastructure of the company and try to make the environment suitable

for agile implementation. This period of preparation is very important to increase change management and risk management awareness to make all the employees and team members ready by giving them training courses to increase their efficiency in managing risks and challenges. Besides, increasing their readiness to change.

These risks and challenges are summarized in resistance from developers to transform from traditional heavyweight process centric development, or differences in productivity between team members in agile software development and differences between the team size requirements. In addition to adopting agile methodologies for use in legacy systems because there are differences in development processes between agile methodologies and traditional methodologies or selecting the appropriate agile methodology.

All of these challenges and risks are answers to the second part of the first question of this study. “What are the most important challenges that face the Palestinian IT companies that want to adopt agile project management practices?”

In addition to the previous paragraphs, H1 and H3 present a good correlation between challenges and risks with change required and agile project management principles

5.2.3 Agile Project Management Principles

Agile SW development has been proposed as a solution to problems that faced SW development organizations or companies. It is a collection of core

principles which the companies must adopt to claim that they are truly taking agile in their work and meeting the accurate needs of the environment.

Based on Table (11), the total average of responses of agile project management principles was (3.80) in Palestinian IT companies, which is considered a high degree. The researcher noticed that the Palestinian IT companies adopt agile principles in a good way based on the results that are presented in the previous chapter in Table (11).

Palestinian IT companies give high attentions for all agile principles, where the average responses of customer satisfaction was (4.21) which is considered a high degree, so, these companies are considered highly interested customers by giving them the highest priority through early delivery of valuable software. This way gives the companies a chance for quick wins and early feedback about the team, customer requirements and the process.

It is well known that the agility found to deal with projects that contain many requirements and changes. Responses average of welcome to change in Palestinian IT companies was (3.73), which means these companies welcome changing requirements, even late in development. Agile processes harness change for the customers competitive advantage. The researcher noted that the changes are good because they give the team opportunities to know and learn more about what will satisfy the customer and increase team experience.

Average responses to deliver working software frequently from a couple of weeks to a couple of months, with a preference to the shorter timescale in Palestinian IT companies was (3.73), and it is also considered a high degree. Business people and developers in Palestinian IT companies work together daily (very closely) throughout the project. And this is clear and shown in the results, where the responses average was (3.76), which is considered a high degree, which means they emphasize customers' commitment to the project. And there are significant integration between developers, customers, and stakeholders.

In addition, the average responses in Palestinian IT companies in building projects around motivated individuals and give them the environment and support they need, and trust them to get the job done was (3.96). It is also considered as a high degree. People are the most important success factors, so, the companies give them high attentions and authority to take decisions because they know the most on the situation.

Based on face-to-face communication, average responses was (3.93), where the companies emphasize more on face-to-face communication for conveying information to and within the development team.

Working software is the primary measurement of progress responses average was (3.67), and it is also considered a high degree in Palestinian IT companies, where this principle helps the team to know earlier if project fails or not because they know more about the situation than the plans or documents.

In addition, the researcher noticed that the average responses of agile processes promote sustainable development. The sponsors, developers, and users should be able to maintain a constant pace indefinitely was (3.52), where this principle reflects high degree of social responsibility and project effectiveness by finding a working pace and project should be organized.

Continuous attention to technical excellence and good design average responses was (4.10). The researcher noticed that all agile team members are committed to producing high quality to go fast and keep the software clean by using good design for development.

Simplicity is essential because it is the art of maximizing the amount of work not done. Palestinian IT companies average responses about simplicity was (3.53), which are also considered as a high degree, but the researcher suggests that these companies must give extra efforts on their approaches to be simple, by giving team members a simple set of rules, and do not put a lot of importance on anticipating tomorrow problems and do the simplest work today.

The researcher noticed that the Palestinian IT companies teams are self-organizing and can re-organize continuously in different configurations to meet the changing requirements. The average responses was (3.84), which is considered as a high degree. That reflects the best architectures, requirements, and designs emerge from self-organizing teams. That means the interactions are high and the process rules are few. There are also organizational and technical approach explaining this principle. So, the

whole team shares those responsibilities and each member influences over them.

The last principle also was considered a high degree, where the average responses was (3.82). This advocates that the Palestinian IT companies' team reflects how to become more effective and adjusts its organization, relationships, and rules. As a result, the agile team in Palestine knows how and when to change because they must change with the environment to remain agile.

5.2.4 Success Factors

Customer centric is considered as a critical success factor in agile project management implementation in Palestinian IT companies, which includes customer satisfaction, customer collaboration, and customer commitment. Based on Table (12), the total average of responses for customer centric success factors is (3.87) which is considered a high degree.

Customers of Palestinian IT companies participate effectively in SW development process and they are able to balance between business, technical goals and requirements. The companies give high priority to achieve customer satisfaction through making them collaborate with team members and all development team or stakeholders. Customers can consider themselves to be responsible for the project elements, because, the customers are online all the time with development team through many tools which are used in SW process. So, the commitment should come from the customer

and business areas in general. The researcher noticed that both “customer and companies” participate together in all development activities.

Team characteristics also considered as a critical success factor in Palestinian IT companies. Based on Table (13), the total average responses of team size and distribution is (3.55) which is considered a high degree. Characteristics of the team is one of the most important success factors of agile in SW development such as team size and team distribution. Palestinian IT companies give high attention to this issue, where team members are geographically located and work in small team work.

Management or process factors are also considered as a critical success factors in agile project management in Palestinian IT companies. Based on table (14), the total average responses for this group is (3.90), which is considered as a high degree of management factors that lead to project success in Palestinian IT companies.

Communication was suggested by all respondents as a critical success factors. The average responses for communication was (4.07), which is considered a high level. All respondents agreed that the Palestinian companies encourage communication between developers themselves and between developers and customers in addition to using face-to-face communication in most cases in the projects. The average responses was (3.80) which is considered as a high level. And communication tools in projects enable personal communication quickly and effectively with all business areas where responses average was (3.97), which is considered as a

high degree. Thus, using appropriate project tools helps the development team to increase integration.

Corporate culture is also considered as a critical success factor, which summarized the culture for trusting people where average responses was (3.85). Moreover, it encourages changing requirement, where average responses was (3.58). And encourages feedback, where responses average was (4.06). So, the researcher noticed that the Palestinian IT companies are considered as a supportive culture by supporting adaptability to rapid change response and there are many tools to get feedback. Except bureaucratic management structure, where average responses was (2.85), which is considered a low level.

Qualitative control with average responses is (3.97) considered as one of the critical success factors. Based on this results, Palestinian IT companies make all the progress or project activities visible to all stakeholders in addition to help team members to make the important decisions rapidly. The responses average was (3.79) which is considered a high degree. Also decision making depends on team experience which is considered as a high degree where responses average was (4.06). As the experience of the team helps to make quick and important decisions that will contribute to the delivery of the service or product to the market.

Personal characteristics is also considered as a critical success factor in agile project management implementation in Palestinian IT companies. Based on Table (15), the total average responses of this section is (3.5), which is considered a high degree.

Peoples in projects have progressive attitude, where the responses average was (3.55), which is considered as a high degree. The personal characteristics are not only for development team, but they are also for the customer. So it reflects the social culture.

In addition, team members who are physically located or work at the same time are considered as not important success factor. The response average for physical located was (3.15), which is considered as moderate degree, where the response average for negotiation happen between people who work in the same time was (3.33), which is considered as a moderate degree. The researcher suggests that there are another characteristic should be such as talent, smart, individual capabilities, business knowledge, ability to take up responsibility, respect for other peoples, and willingness to works together.

5.3 A Managerial Framework for APM Enhancement in Palestinian IT Companies

This research clarifies many factors and practices that organize APM in Palestinian IT companies. To combine these factors together to help and enhance agile project management practices implementation, the researcher developed a managerial framework consisting of the best practices in agile project management in Palestinian IT companies.

This framework contain of two type of orientation, the first one is organizational orientation, and the second one is process orientation. These both orientation involves under top management support of the companies.

Table (27), presents the framework elements:

Table 27: Framework Elements

Top Management Support	Organizational orientation	Cultural change	Leadership and decentralization
			Knowledge Management: communication
		Change management	Challenges Risks
		Capacity building	Success factor 2: team characteristic Success factor 4: person characteristic
	Process orientation	Process development	Success factor 1 : customer centric
		APM principles implementation	
		Success factor 3: Management of process factors	

Top management Support must be through all process, to achieve efficient and effective implementation of this model. Agile project management framework presents many factors, which must be implemented in each stage to achieve the efficiency and effectiveness of SW development project in Palestinian IT companies.

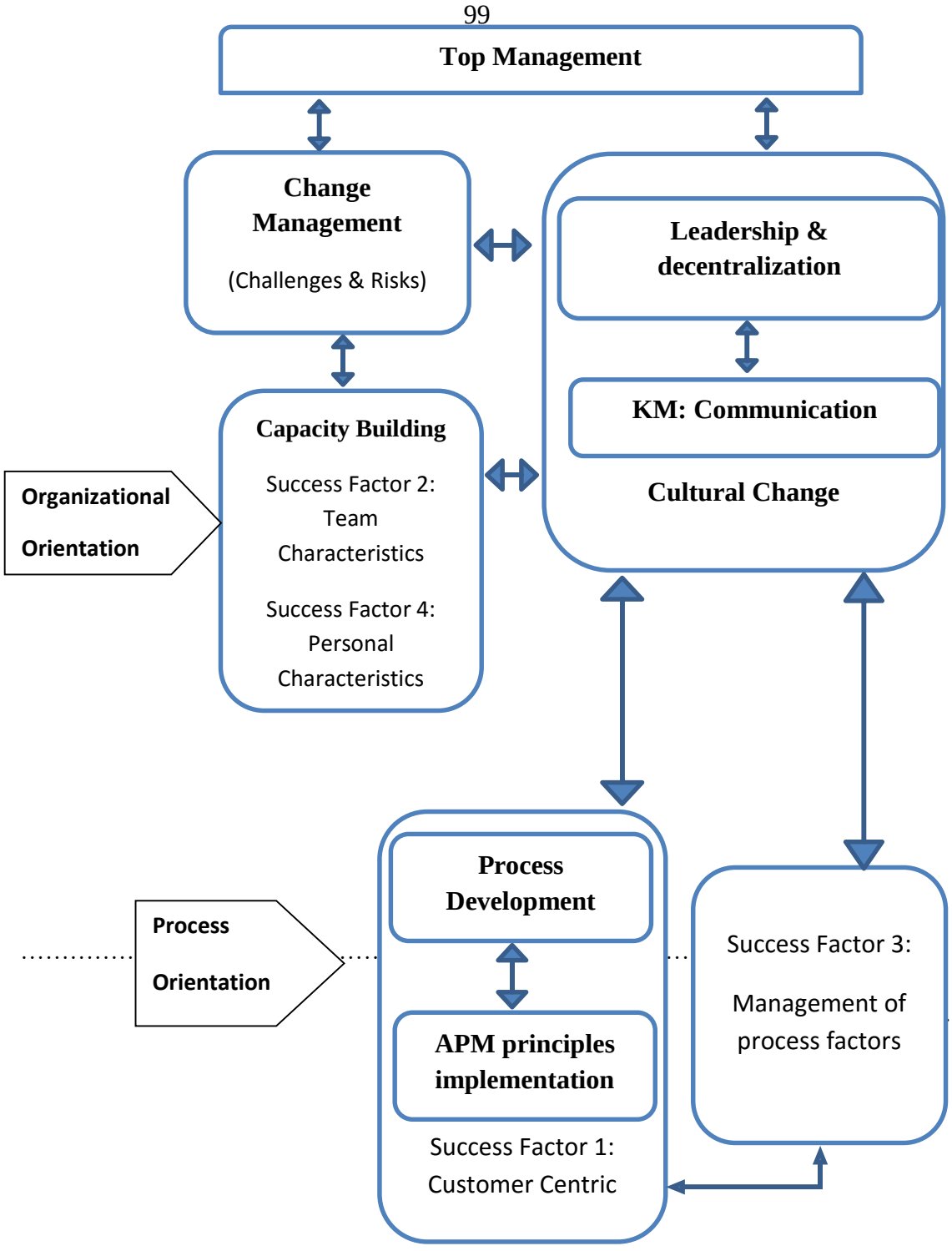

Figure 8: A Managerial Framework for APM Enhancement in Palestinian IT Companies.

This framework is considered to be the answer for the third research question: How can Palestinian IT companies navigate successfully through agile project management implementation?

This framework will help Palestinian IT companies to navigate successfully through agile project management implementation in both sides, organizational and process orientation. This model emphasized the importance of top management support to involve all parties in agile project management implementation in Palestinian IT companies.

- **Organizational Orientation.**
  - **Cultural Change:** Based on what has been obtained, the researcher has seen that the most important change is the cultural change. This type of change includes four types of change that the researcher has mentioned in chapter 2. The results from data analysis in chapter 4 lead us to be sure that all types of changes are important, were they include a change in organization culture, a change in management style, a change in knowledge management and a change in development process. These four types of changes are reflected in cultural change and covered by leadership style and decentralization and communication.

    Changes in organization culture and knowledge management are cornerstones in organizational orientation to be agile. It makes APM implementation process easier to achieve success by creating and adopting leadership and decentralization through the organization. This was reflected positively on knowledge management and communication that will enhance the next stages of this framework.

    The researcher has noticed that the change in management style is the most important type of change because there is a strong request on

these changes in case of shifting from traditional approach to agile approach.

Change in development process is also important. The required changes are to shift from heavyweight process to close interactions between team members themselves and between the team members and the customers.

- **Change Management**: In this stage, the change has happened and needs to be managed. Challenges and risks will appear. Therefore, change management must start in order to welcome the change and prevent the risks.

  It is important to build awareness to the change process that makes team work be able to achieve effectiveness and efficiency. There are many challenges that will appear through transforming from traditional approach to agile approach. Hence, resistance to change might occur because there are huge differences between traditional approach and agile approach. The top management must give high attention to this stage to be ready to adopt agile project management methodologies.

  According to Subhas (2007), there are many forms of challenges and risks that are listed below:

  - Differences in productivity between team members in agile software development.
  - Tester resistance to work closely with developers in agile development.

- Development process conflicts due to the differences in lifecycle between agile methodologies and traditional methodologies.
- Adopting agile methodologies in legacy systems.
- Differences in development processes between agile methodologies and traditional methodologies.
- Differences between the team size requirements and suitability of the agile and traditional methodologies.
- Problems with selecting the appropriate agile methodology.

- **Capacity Building:** this stage includes two success factors in agile implementation. The first one is team characteristics, and the second one is personal characteristics.

  Team characteristics include team size and team distribution. Team size is an issue, where small team size enables effective communication, and coordination becomes easy. Team distribution is measured by having a team that is geographically located to facilitate communication such as face-to-face and daily meetings.

  Personal characteristics are considered as one of the most important dimensions of capacity building. Good people are the key to success in agile team work. Personal characteristics such as collaborative attitude, honesty, responsibility, readiness to learn, cooperativeness, technical experience and qualifications are required and very important in agile team.

  In addition to having people who are in general communicative, progressive attitude, and similar culture, training and learning are

considered as an important key in personal characteristics. The companies must give high attention to training course that has a strong relationship with capacity building.

- **Process Orientation.**

  - **Process Development:** Agile development process required suitable environment. It provides the collaboration required in agile, performing continuous integration, continuous interaction, continuous feedback and tools that enhance the communication and collaboration. Agile approach encourages development in short iteration with small piece of functionality. Then, it is revised by collaborating with the customers.
  - **APM Principles implementation:** in this stage, the companies try to adopt all agile project management principles. Therefore, the companies must employ these 12 principles to serve SW development process.

    Also, these principles are considered to guide the generic nature of all different agile methodologies that the companies try to implement through SW development process.
  - **Customer Centric:** this stage is considered to be one of the most important success factors of agile implementation. The general idea of customer centric is developing SW to satisfy customers' needs. As we mentioned in the previous chapters, the customers must be committed to the project, motivated, active, and consider themselves to be responsible elements of the project. In addition, the customers must

work closely with the development team members to achieve customers' involvement and collaboration.

- **Management of Process Factors**: this stage is the fourth success factor which includes Corporate Culture, Control, Planning, and Decision Time.

  Corporate culture is a required, to achieve successful agile SW development. The organization welcomes change. It must have the right culture to be agile by encouraging rapid communication, trust people, customer centric, and feedback.

  Also, control is considered as a success factor. The companies must have qualitative control.

  Planning is considered as a key development process when our software development team relies on internalized, informal, undocumented plans.

  Decision time is the main role in managing process factors. Therefore, the whole idea behind agile implementation is fast, whereas, time to market and delivery time are considered as very important success factors.

Chapter Six

Conclusions and Recommendations

Chapter Six

Conclusion and Recommendations

6.1 Overview

This chapter covered the main conclusions, recommendations, future work and limitations of the study.

6.2 Conclusions

1- Based on literature review, there is high percentage of failure SW project and there is great importance for IT sector in Palestine.

2- This research aims to study and assess the current level of the APM practices that are used in Palestinian IT companies. Also, examine the benefits of adopting APM practices in Palestine. And identify the factors that encourage or prevent the adoption of APM practices in Palestinian IT companies.

3- This research was formulated via reviewing related literature. The research tools was consisted of qualitative and quantitative method. A questionnaire was the quantitative tool, whereas, the qualitative one was conducting interviews in Palestinian IT companies. Quantitative data was analyzed by the SPSS program to generate descriptive statistics required and to test a number of related hypothesis. However, the qualitative data was analyzed using the thematic analysis approach.

4- The interviews consisted of 19 questions that are related directly to the success factors and covered the five dimensions. These dimensions are

organizational, technical, project, personal and process factors. The questionnaire consisted of four parts. These are:

a. Demographic or general information.

b. Readiness for agile project management implementation.

c. Agile project management practices.

d. Success Factors.

5- This research answered three questions. The first one was what are the most important changes and challenges that faced the Palestinian IT companies wanting to adopt agile project management practices? The second was what are the most important success factors that have a strong influence on project success in the Palestinian IT companies that applied agile project management practices? The last one was how can Palestinian IT companies navigate successfully through agile project management implementation? In addition, there are 7 tested hypotheses.

6- SPSS was used to analyze the quantitative data and to examine the correlation between APM principles on one side, and change required, challenges and risks, , and agile success factors on other side.

7- The results prove that there is correlation between APM principles and change required, challenges and risks, and agile success factors.

8- ANOVA test was used to examine the relation between APM principles on one side, and number of the employees in the Palestinian IT companies and the companies using APM all time or sometime on other side.

9- A managerial framework was developed based on the results to facilitate SW development process.

6.3 Recommendations

For SW development sector in Palestine, to improve percentage of successful project and reduce percentage of failure, and after review the literature, and based on research results, this research present the following recommendations to be taken by SW development sectors in Palestinian IT companies:

1- To identify the usefulness of this framework, the new researchers need to try to apply this framework in companies that do not apply APM approach as a case study within a specific period to see results in reality and address its strength and leverage them and weakness to treat them.
2- It’s recommended to use appropriate strategies to reduce resistance, such as education and communication, negotiation, participation and involvement, facilitation and support.
3- It’s recommended to use effective training programs to all impacted individuals to increase awareness about APM approach. Agile approaches require a mentality shift. The team needs to be mature enough to own and understand what they are committing to.
4- It’s recommended for Palestinian IT companies to conduct customer satisfaction survey from time to time to pull customer opinion about provided service.
5- It’s recommended to make sure that you have a clear and commonly accepted definition of done. Simple things like saying something is "DONE" means is production ready. It doesn't mean the code is done and now somebody else will have to make sure it works.

6- Palestinian IT companies must give significant improvement toward customer satisfaction and loyalty, specifically understanding the specific needs of customer, providing the service at the time they promise to do.
7- It’s recommended for Palestinian IT companies to focus on all team skills by conducting training programs; this will help to have positive impact on SW development process in term of quality, performance, cost, and time.
8- Managing the change not prevent it. The whole idea behind the agile is welcoming change.
9- It’s recommended for Palestinian IT companies to Enhancing knowledge management process to facilitate shared information, transfer tacit knowledge, and transfer the experience through all agile team.

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Appendices

Appendix A: List of Arbitrators of the interviews and the Survey Questions

NO	University	Validity side
1	An-najah National University	Internal
2	An-najah National University	Internal
3	An-najah National University	Internal
4	An-najah National University	Internal
5	An-najah National University	internal
6	Palestine Polytechnic University	External
7	Palestine Polytechnic University	External

Appendix B: Business Activities that listed in PITA

No.	The Activity
1	Computer programming activities
2	Custom Software Development
3	Computer hardware consultancy and computer hardware facilities management activities
4	Web portals
5	Mobile Gaming
6	Mobile Application Development
7	Software publishing
8	Data processing, hosting and related activities
9	Game Developing
10	Enterprise Solutions
11	Information & Communication
12	Other services activities

Appendix C: The Questionnaire

Survey of Agile Project Management Practices

Dear Sir/Madam:

Let me at first introduce myself. My name is Abdalla J. Alhroub. I am a Master degree candidate in the Faculty of Graduate Studies, An-Najah National University. As part of my Thesis, I am conducting a survey on Agile Project Management (APM) Practices.
Specifically, I am trying to assess how APM practices affect the performance of software development projects in Palestine.
I would be extremely grateful if you would kindly help me in my research pursuits by completing the attached questionnaire. And all Data will be used purely for scientific purposes.
Finally, thank you very much in taking your valuable time considering responding to the enclosed questionnaire. Your input is very much appreciated.

Abdalla Alhroub
Master of Engineering management Student
Karass, Hebron District
West Bank, Palestine
abdalla.alhroub@hotmail.com
00972599154492

1-Demographic information

a. Gender *

- [ ] Male
- [ ] Female

b. Identity of your organization *

- [ ] Services
- [ ] Products
- [ ] Services and Products

c. The number of employees in your organization is *

- [ ] Less than 10
- [ ] 10-20
- [ ] 21-40
- [ ] 41-100
- [ ] Greater than 100

d. The number of employees in your team is *

- [ ] Less than 5
- [ ] 5-10
- [ ] 11-20
- [ ] 21-40
- [ ] Greater than 40

e. My role in the team *

- [ ] Functional Manager
- [ ] Project Manager
- [ ] Team Leader
- [ ] Dev/Tester
- [ ] Product owner
- [ ] Quality Assurance

f. I have become knowledgeable about Agile Project Management Practices for *

- ( ) nothing
- ( ) Less than 1 year
- ( ) 1-3 years
- ( ) 3-5 years
- ( ) Greater than 5 years

g. I have been developing software using agile project management principles/methods for: *

- [ ] Less than 1 year
- [ ] 1-3 years
- [ ] 3-5 years
- [ ] Greater than 5 years

The company uses " Agile Project Management Practices". *

- ( ) Yes
- ( ) Sometimes
- ( ) No

Survey of Agile Project Management Practices

*مطلوب

Part Two

2- Readiness for Agile Project Management Implementations.

According to your view, are the following changes required for adopting agile software development practices in organizations practicing traditional, Please rank the degree of importance of each.

Change Required *

1= Not at all Important / 2= Somewhat Unimportant / 3= Neutral / 4= Somewhat Important / 5= Very Important

	1	2	3	4	5
From procedure based development culture to freedom of development and management by team members.	○	○	○	○	○
From individually assigned roles to that of team-work.	○	○	○	○	○
From solitary development attitudes of team members to that of working in teams.	○	○	○	○	○

From nontechnical and interpersonal competency requirements in team composition to establishing a minimum set of competency requirements of team members.					
From non-customer-centric to customer-centric development.					
From command-and-control management to leadership-and-collaboration.					
From authoritative to collaborative and pluralistic decision making.					
From heavy documentation-based to tacit (not spoken) knowledge management.					
From heavily process-centric to short, iterative, test-driven, and people-centric development.					
From standards compliance and measurement driven development to development under uncertainty.					
From contract-compliant to change-tolerant development.					
From lifecycle-based development to feature-driven evolutionary and iterative development.					

Challenges and Risks *

1= Not at all Important / 2= Somewhat Unimportant / 3= Neutral / 4= Somewhat Important / 5= Very Important

	1	2	3	4	5
Resistance from developers to transform from traditional heavyweight process centric development.	○	○	○	○	○
Differences in productivity between team members in agile software development.	○	○	○	○	○
Adopting agile methodologies for use in legacy systems, which are more resistant to changes in internal source code.	○	○	○	○	○
Differences in development processes between agile methodologies and traditional methodologies.	○	○	○	○	○
Differences between the team size requirements and suitability of the agile and traditional methodologies.	○	○	○	○	○
Problems with selecting the appropriate agile methodology and the supporting tools according to organizational needs and characteristics.	○	○	○	○	○

Survey of Agile Project Management Practices

*مطلوب

Part Three

3- Agile Project Management Practices

The checklist below will help in assessing the degree of practice of agile software development principles" by your team". Please mark in the scale of 1 (totally disagree) to 5 (Totally agree) .

The principles *

1= Strongly Disagree / 2= Somewhat Disagree / 3= Neither Disagree nor Agree / 4= Somewhat Agree / 5= Strongly Agree

	1	2	3	4	5
We give high priority to satisfying customers through early and continuous delivery of valuable software.	○	○	○	○	○
We welcome changing requirements, even late during development.	○	○	○	○	○

We deliver working software more frequently, from couple of weeks to a couple of months, with a preference to a shorter timescale.	○	○	○	○	○
Our business people and developers work together daily (very closely) throughout the project.	○	○	○	○	○
We build projects around motivated individuals. We give them the environment and support their need, and trust them to get the job done.	○	○	○	○	○
We emphasize more on face-to-face communication for conveying information to and within the development team.	○	○	○	○	○
We measure and track progress based on working software.	○	○	○	○	○

We promote sustainable development. Our sponsors, developers, and users maintain a constant pace indefinitely.					
Our software development project team follows continuous attention to technical excellence and good design for development.					
We practice simple designs, processes, and approaches in our software development methodologies. We implement features that are required by the customers -- nothing more.					
Our development teams are self-organizing -- our teams can (re)-organize continuously in different configurations to meet the changing requirements and the newly arising challenges of the business.					
At regular intervals, our team reflects on how to become more effective, then tunes and adjusts its behavior accordingly.					

Survey of Agile Project Management Practices

*مطلوب

Part Four

4- Success factors.

Please mark your choice on a scale of 1 to 5, where 1 is "Strongly Disagree", and 5 is "Strongly Agree".

Customer Satisfaction, Customer Collaboration, Customer Commitment. *

1= Strongly Disagree / 2= Somewhat Disagree / 3= Neither Disagree nor Agree / 4= Somewhat Agree / 5= Strongly Agree

	1	2	3	4	5
We give very high priority to achieving customer satisfaction.	○	○	○	○	○
Customers collaborate with the development team members.	○	○	○	○	○
Customers are committed to the project, consider themselves to be responsible elements of the project.	○	○	○	○	○

Team Distribution and size. *

1= Strongly Disagree / 2= Somewhat Disagree / 3= Neither Disagree nor Agree / 4= Somewhat Agree / 5= Strongly Agree

	1	2	3	4	5
The members in our team are at the same location.	○	○	○	○	○
We work in small teams.	○	○	○	○	○

Corporate culture, Planning, Control, Technical competency and Decision Time. *

1= Strongly Disagree / 2= Somewhat Disagree / 3= Neither Disagree nor Agree / 4= Somewhat Agree / 5= Strongly Agree

	1	2	3	4	5
Our organization encourages communication.	○	○	○	○	○
Our organization culture trusts people.	○	○	○	○	○
Our organization encourages feedback from customers.	○	○	○	○	○
Our organization encourages changing requirements.	○	○	○	○	○
Our organization has a bureaucratic management structure.	○	○	○	○	○
Our software development team has qualitative control.	○	○	○	○	○

Our team consists of technically and experienced people (who have developed alike software in the past).					
Our team majority consists of people who are motivated and collaborative attitude.					
Our team majority consists of people who have readiness to learn.					
Our tools in projects enables personal to communicate quickly and effectively with all business areas.					
We use face-to-face communications in the most cases in our projects.					
We try to make important decisions rapidly within short time.					

Personal characteristics, Societal Culture, Training. *

1= Strongly Disagree / 2= Somewhat Disagree / 3= Neither Disagree nor Agree / 4= Somewhat Agree / 5= Strongly Agree

	1	2	3	4	5
Communication happen between people who are physically close to one another (in most cases).					
Communication and negotiation in our projects happen between people who work in the same time.					
People in our projects communicates with each other with trust.					
The people of our country in general have progressive attitude (step by step).					

Appendix D: Interviews Protocol

An-Najah National University

Faculty of Graduate Studies

Interview Protocol Questions to be answered by Agile IT Companies in Palestine

The company:
Interviewee (Name):
Interviewee Position:
Interviewer:
Interview Topics:
Other Topics Discussed:
Date:

To facilitate our note-taking, we would like to audio tape our conversations today. Please sign the release form. In addition, you must sign a form devised to meet our human subject requirements. Essentially, this document states that:

1. All information will be held confidential.
2. Your participation is voluntary and you may stop at any time if you feel uncomfortable.
3. We do not intend to inflict any harm.

We have planned this interview to last no longer than **one** hour. During this time, we have several questions that we would like to cover. If time begins

to run short, it may be necessary to interrupt you in order to push ahead and complete this line of questioning.

You have been selected to speak with us today because you have been identified as someone who has a great deal to share about Agile Project Management Practices. As part of my Thesis, I am conducting an interview on Agile Project management practices. Specifically, I am trying to assess how APM practices affect the performance of software development projects.

Thank you for your agreeing to participate.

Abdulla Alhroub

1. Are the business values always clearly stated and visible to all members of team, and Are you focused on business value delivery?
2. How did you assign the tasks to your team, and how would you coach the collaborative between them?
3. How do you deal with the customer feedback?
4. Can you tell me about involvement about the role of experts in your agile development?
5. Tell me about stakeholder satisfaction degree when used agile methods compare to Traditional methods? And what are the aspects of development process that leads to?
6. Do you used the user stories in your company? If yes, what is the main concept of it?
7. How did you apply user stories in daily process?
8. What is the communication strategies that used in your company?

9. Do you apply the overtime when you work on agile?
10. How do you evaluate the agile as a process in your company?
11. If you use agile tools, can you tell me the name or type of the Tools that you use in your daily process? And how?
12. The work is done? The word “Done” can you tell me when and where you saying it? And how can evaluate that?
13. Can you tell me something about the quality of the projects? Please make a comparison between Quality of agile projects and traditional projects?
14. How did you manage traceability of the requirements to testing?
15. What are the size of the projects that you apply the agile methodology for?
16. What are the risk attached to agile implementation in your environment if any?
17. Can tell me how do you deal with the instable requirements?
18. How do you bear your responsibility as a PM in agile projects?
19. Can you tell me a brief idea about their success or failures of the agile if you worked in before and why?

Appendix E: List of interviewees

NO	Company	Job Title	City	Date
1	InfiniteTiers, inc	Software Developer	Nablus	Aug-31-2015
2	Isra' Software & Computer Co. Ltd	R&D Manager (CTO)	Nablus	Seb-10-2015
3	Adham Inc	CEO and Project Manager	Nablus	Seb-16-2015
4	Exalt	Software Test Engineer	Ramallah	Seb-17-2015
5	Tamkeen for Information Technology	General manager	Hebron	Seb-18-2015
6	Trusted Systems for Computer & IT	CTO/ Team leader	Hebron	Seb-18-2015
7	Bisan Sys. Co	QA Software Engineer	Ramallah	Oct-7-2015
8	Asal Tech	Senior software engineer / Microsoft R&D developer	Ramallah	Oct-15-2015
9	Asal Tech	Senior software engineer and team leader	Ramallah	Oct-15-2015

Appendix F: The messages form between the researcher and the recipients.

الرسالة الأولى:

بسم الله الرحمن الرحيم

بعد التحية
السادة الاداريين والاعضاء في شركة :********** المحترمين .
أما بعد
بداية اود التعريف بنفسي, انا عبدالله جابر الحروب من مدينة الخليل , طالب في جامعة النجاح الوطنية الرقم الجامعي (11356928) , كلية الدراسات العليا , برنامج الادارة الهندسية , أقوم بعمل رسالة الماجستير تحت عنوان
Agile project management practices in Palestinian IT companies: managerial framework
تحت اشراف
Dr. Ayham Jaaron ,Asst. Prof. in Industrial Engineering, Director of Quality Assurance Unit, Director of ABET Centre, An-Najah National University

حيث ان هذه الدراسة تقوم على جمع بيانات من شركات تكنولوجيا المعلومات وتطوير البرمجيات, وتحليل هذه البيانات والخروج بالنتائج والتوصيات لمعرفة واقع القطاع التكنولوجي في فلسطين تحت هذا المسمى

لذلك اريد من حضرتكم التكرم والموافقة على تعبئة الاستبيان الذي سأقوم بارساله لكم في حالة وافقتم على عملية التعبئة والمساعدة في اجراء العملية البحثية , والجدير بالذكر ان هذه البيانات سيتم استخداماها للعمل البحثي والاغراض العلمية البحتة

الرجاء من حضرتكم الرد خلال هذه الفترة حتى اتمكن من السير في العملية البحثية كما هو مقرر لها

ولكم جزيل الشكر والتقدير
.....

الرسالة الثانية (بعد الموافقة الأولية) :

السلام عليكم
يسعد صباحكم استاذ ******
وشكرا على تعاونك
بعد التحية
حيث أتقدم لحضرتكم بهذا الاستبيان والذي يقوم بفحص ممارسات ادارة المشاريع الرشيقة في مجال تطوير البرمجيات وتكنولوجيا المعلومات في الشركات الفلسطينية

والذي يحتوي على 4 اجزاء

- ✓ Demographic information
- ✓ Agile Readiness for Agile Project Management Implementations.
- ✓ Agile Project Management Practices
- ✓ Success factors

مع العلم ان الاستبانة باللغة الانجليزية

الرجاء من حضرتكم التكرم والاجابة عليها من خلال الرابط المرفق

Functional Manager, Project Manager, Team Leader, Dev/Tester, Product owner, Quality Assurance

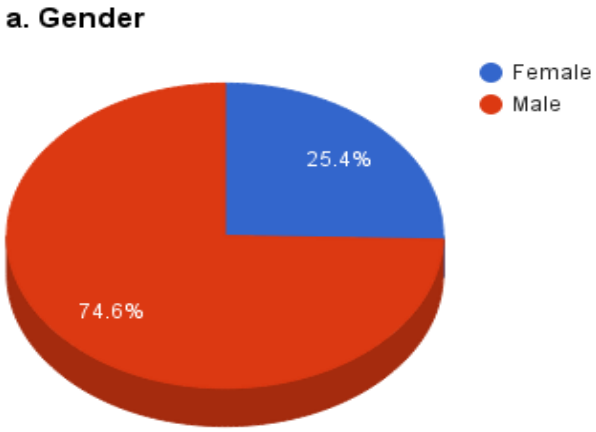
والسلام عليكم ورحمة الله وبركاته

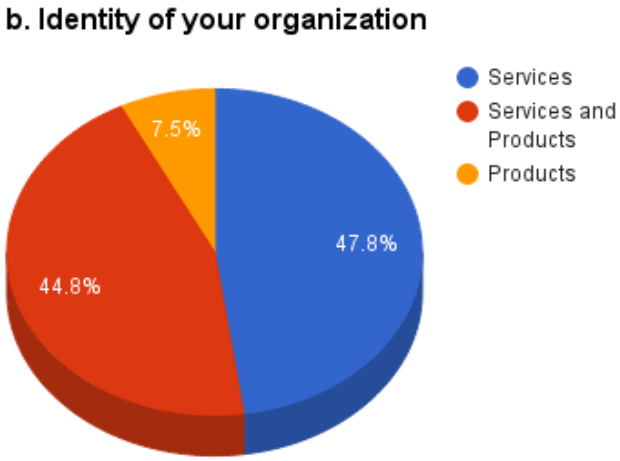
رابط الاستبيان
http://goo.gl/forms/hWXyIOQ8DA

او
https://docs.google.com/forms/d/1ksics2fhAi2U26aTh40_5quRMobIl-KNMIkBJ2ekaHo/viewform

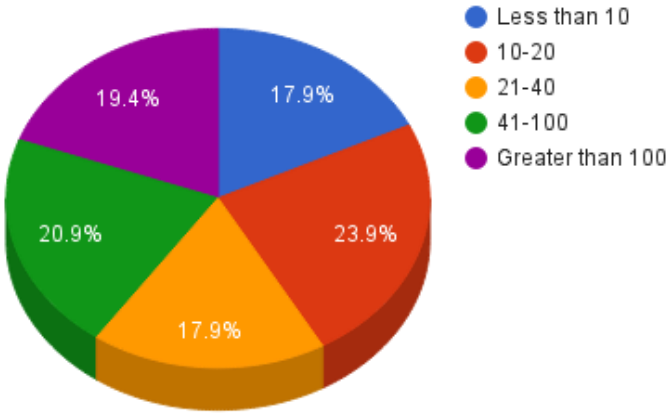
الرجاء التأكيد على انهاء تعبئة الاستبانة برسالة
وشكرا

Appendix G: Distribution of the Study Sample According to the Demographic Information

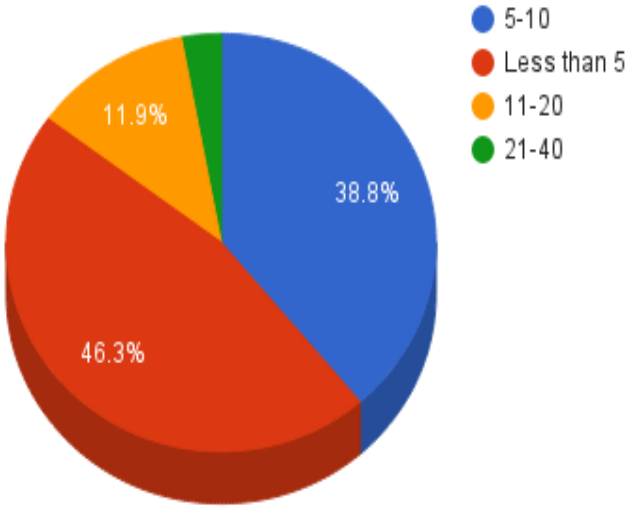




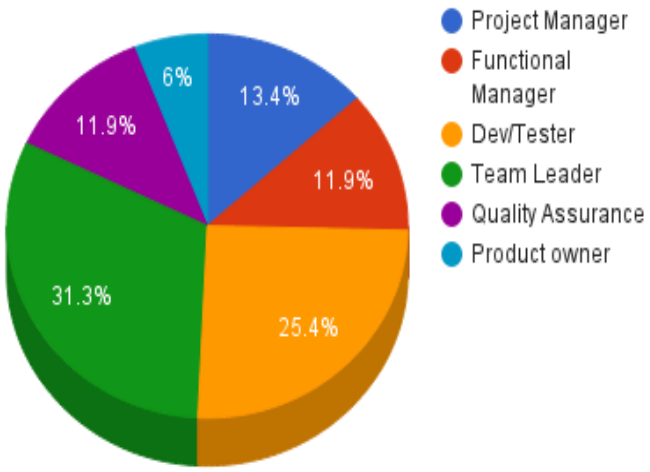
c. The number of employees in your organization is



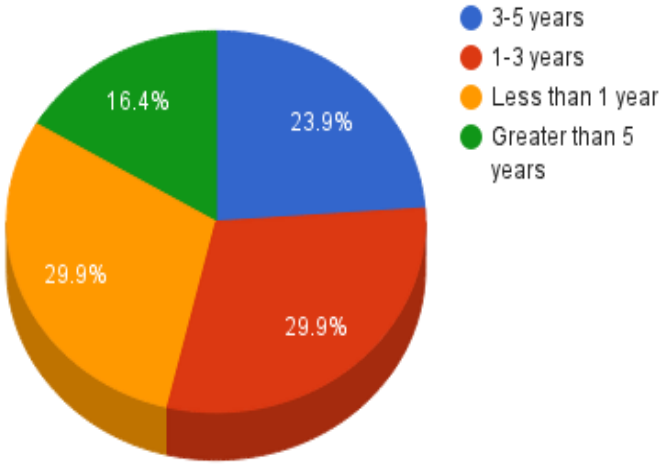
d. The number of employees in your team is



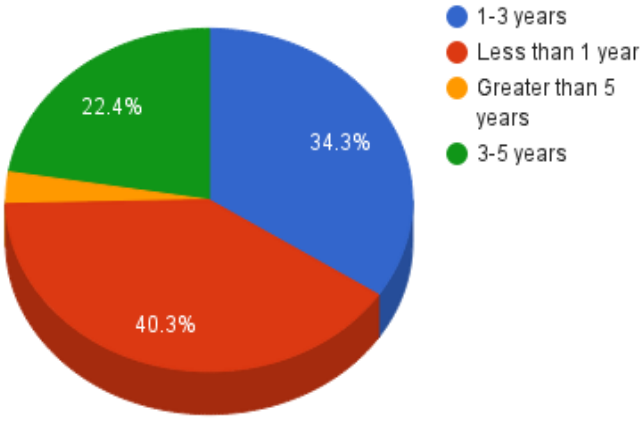
e. My role in the team



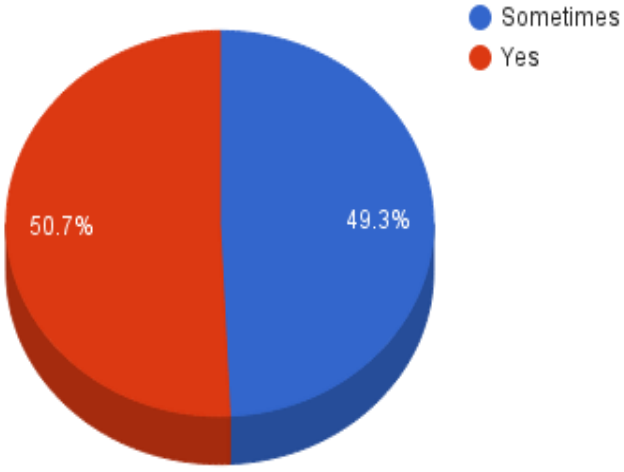
f. I have become knowledgeable about Agile Project Management Practices for



g. I have been developing software using agile project management principles/methods for:



h. The company uses " Agile Project Management Practices".



جامعة النجاح الوطنية
كلية الدراسات العليا

ممارسات ادارة المشاريع الرشيقة في شركات تكنولوجيا المعلومات الفلسطينية: الاطار الاداري

إعداد
عبدالله جابر عبدالله الحروب

إشراف
د. أيهم جعرون

قدمت هذه الرسالة إستكمالا لمتطلبات الحصول على درجة الماجستير في الإدارة الهندسية، كلية الدراسات العليا في جامعة النجاح الوطنية، نابلس، فلسطين.
2016

ممارسات ادارة المشاريع الرشيقة في شركات تكنولوجيا المعلومات الفلسطينية:

الاطار الاداري

إعداد

عبدالله جابر عبدالله الحروب

إشراف

د. أيهم جعرون

الملخص

يتأثر قطاع البرمجيات الفلسطينية مباشرة من التوجهات العالمية للتكنولوجيا. شركات تكنولوجيا المعلومات الفلسطينية تحاول البقاء في ساحة المنافسة. إدارة المشاريع رشيقة (APM) هو النهج الناشئ في هندسة البرمجيات، والتي يروج لها مجموعة من الفنيين والمختصين الستة عشر الذين يمارسون مجموعة من الأساليب، ويشتركون في مجموعة من القيم في تطوير البرمجيات. وتعريف هذه الأساليب بأنها " Agile".

يهدف هذا البحث إلى تقييم الممارسات APM في شركات تكنولوجيا المعلومات الفلسطينية. وتهدف هذه الدراسة إلى التعرف على إمكانية تحقيق فوائد إدارة المشاريع الرشيقة في مجال تطوير البرمجيات من خلال استخدام ممارسات إدارة المشاريع الرشيقة. وبحثت هذه الدراسة المواضيع ذات الصلة إلى APM. بناء على ما حصل عليها الباحث في الأدبيات ذات الصلة. قيم الباحث ممارسات إدارة المشاريع الرشيقة في قطاع تطوير البرمجيات من خلال تحليل استعداد تنفيذ بما في ظل التغييرات المطلوبة، والتحديات والمخاطر بالإضافة إلى اختبار المبادئ 12 وعوامل النجاح باستخدام منهجية أساليب متباينة، النوعية والكمية، وجميع هذه المبادئ و12 وعوامل النجاح تم العثور عليها في الأدبيات ذات الصلة.

وكان الاستبيان أداة الكمية، في حين كانت النوعية في إجراء المقابلات في شركات تكنولوجيا المعلومات الفلسطينية.

تم تحليل البيانات الكمية عن طريق برنامج SPSS . واختبار عدد من الفرضيات ذات الصلة. ومع ذلك، تم تحليل البيانات النوعية باستخدام منهج تحليل الموضوعي. تم تصميم استبيان لمحاكاة عوامل

نجاح المشروع وممارسات إدارة المشاريع الرشيقة في تطوير البرمجيات وقطاع تكنولوجيا المعلومات. وقد تم تشكيل لأسئلة المقابلة وفقا للاستبيان الذي يدرس فرضيات الدراسة، حيث أنها تدعم نتائج البحوث من خلال الإجابات التي قدمها خبراء في مجال ممارسات إدارة المشاريع رشيقة من خلال إجاباتهم على الأسئلة في المقابلات البروتوكول، وتوزيعها على الشركات التي شملتها العينة.

جمعية تكنولوجيا المعلومات الفلسطينية (PITA)، تعتبر الجهة الرسمية التي تشمل جميع المعلومات التي تندرج تحتها شركات تكنولوجيا المعلومات الفلسطينية.وفقا ل(PITA)، حجم المجتمع الدراسي هو 80 من الشركات التي تعمل في قطاع تطوير البرمجيات وفقا للعديد من الأنشطة. بلغ حجم العينة 67 على أساس حجم المجتمع الدراسي عندي مستوى الثقة 95٪، وفترة الثقة هو 5٪.

وأظهرت النتائج أن هناك مؤشرات تثبت أن شركات تكنولوجيا المعلومات الفلسطينية لديها درجة عالية من عملية التنفيذ الرشاقة في معظم الجوانب مثل التعامل مع التغيير المطلوب، والترحيب للتغيير، مع التركيز على مركزية العملاء، وإعطاء اهتماما كبيرا للفريق وخصائصه، والإجراءات الإدارية اليومية. ومع ذلك، فقد بينت النتائج أن شركات تكنولوجيا المعلومات الفلسطينية تفتقر إلى المستوى المطلوب من القدرة على التعامل مع التحديات والمخاطر من الرشاقة في ادارة المشاريع والعمليات وصفات الأشخاص. وتشير الدراسة إلى أن ثمانية من الفرضيات التسعة لديها علاقة ذات دلالة إحصائية مع النجاح.

وتم وضع إطار من قبل الباحث كمخرج أساسي لتمكين شركات تكنولوجيا المعلومات الفلسطينية لكي تعتمد بشكل صحيح مبادئ وممارسات إدارة المشاريع الرشيقة التي يمكن أن تعزز عمليات التنفيذ لادارة المشاريع الرشيقة. واعتبر هذا النموذج بوصفه شيئا جديدا في سوق تكنولوجيا المعلومات الفلسطيني.

يعتبر هذا البحث هو مقدمة لنموذج تعزيز الممارسات الرشيقة في ادارة المشاريع التي يمكن أن تساعد شركات تكنولوجيا المعلومات الفلسطينية لتسهيل عملية تطوير البرمجيات، وتواجه العقبات اليومية التي يجب حلها، والتخلص من معاناة قطاع تكنولوجيا المعلومات، والذي يفتح الباب لمزيد من الإبداع في قطاع تكنولوجيا المعلومات الفلسطيني.