

**An-Najah National University**

**Faculty of Graduate Studies**

**Impact of software project management methodology on  
customer satisfaction in the West Bank**

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**This Thesis is Submitted in a Partial Fulfillment of the Requirements  
for the Degree in Master Engineering Management, Faculty of  
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**2014**

*Dedication*

To my parents, who endured all kinds of pain to make my dreams come true. I love you.

To my wife and my beautiful children Taysier, Rand and Muath, who mean the world to me.

**Impact of software project management methodology on customer satisfaction in the West Bank**

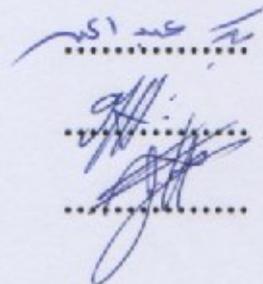
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## **Dedication**

To my parents, who endured all kinds of pain to make my dreams come true. I love you.

To my wife and my beautiful children Taysier, Rand and Mua'th, who mean the world to me.

## **Acknowledgement**

I am very thankful to Allah the Almighty who gave me courage to do this thesis, then prayers of my parent, my wife and my sisters.

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Thank you all.

## الاقرار

انا الموقع ادناه مقدم الرسالة التي تحمل العنوان:

### **Impact of software project management methodology on customer satisfaction in the West Bank.**

اقر بأن ما اشتملت عليه هذه الرسالة إنما هي نتاج جهدي الخاص، باستثناء ما تمت الإشارة إليه حيثما ورد، وان هذه الرسالة ككل، أو أي جزء منها لم يقدم من قبل لنيل أية درجة علمية أو بحث علمي أو بحثي لدى أية مؤسسة تعليمية أو 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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التاريخ :

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## List of Acronyms

<b>Acronym</b>	<b>Definition</b>
<b>ACM</b>	Association of Computing Machinery
<b>AMI</b>	Agility Measuring Index
<b>ANOVA</b>	Analysis of variance
<b>ASD</b>	Agile Software Development
<b>CEO</b>	Chief Executive Officer
<b>CRM</b>	Customer Relation Management
<b>CSF</b>	Critical Success Factor
<b>CSFs</b>	Customer Satisfactions Factors
<b>CTO</b>	Chief Tech Officer
<b>DSDM</b>	Dynamic Systems Development Method
<b>ERP</b>	Enterprise Resource Planning
<b>FDD</b>	Feature Driven Development
<b>HR</b>	Human Resources
<b>IBM</b>	International Business Machines
<b>IT</b>	Information Technology
<b>NPD</b>	New Product Development
<b>OSS</b>	Open Source Development
<b>PITA</b>	Palestinian Information Technology Association
<b>PMBOK</b>	Project Management Body of Knowledge
<b>PMO</b>	Project Management Office
<b>QA</b>	Quality Assurance
<b>QFD</b>	Quality Function Deployment
<b>RUP</b>	Rational Unified Process Model (RUP)
<b>SDLC</b>	Software Development Life Cycle
<b>SLA</b>	Service Level Agreement
<b>SOW</b>	Scope of Work
<b>SPSS</b>	Statistical Package for the Social Sciences

<b>SUMI</b>	Software Usability Measurement Inventory
<b>TOC</b>	Theory of constraints
<b>UAT</b>	User Acceptance Test
<b>USA</b>	United State of America
<b>WBS</b>	Work Breakdown Structure
<b>XP</b>	Extreme Programming

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**Abstract**

The aim of this work is to investigate the impact of software project management methodology on customer satisfaction and customer satisfaction attributes. The basic idea is that if we chose specific methodology, can we improve customer satisfaction via increase satisfaction from satisfaction attributes.

To achieve this idea the researcher will compare between two tracks in software project management methodologies, traditional or heavyweight methodology and agile or lightweight methodology and which methodology that the firms should adopt to achieve more customer satisfaction.

This paper goes across the literature to offer an overview on some terms that represents this research like Software project management methodology, Project management, Agile, Waterfall, Customer satisfaction, Customer satisfaction attributes, and Customer satisfaction importance.

The researcher needs empirical data to check the relation between mentioned terms. So the survey has been submitted to several customers and the answers have been analyzed using descriptive and inferential

statistics. Furthermore, interviews with stakeholders for software project have been arranged to gather more exhaustive information and to validate the survey questions.

Consequently, Data collected from primary and secondary resources show that there is relation between software project management methodology and customer satisfaction and customers were more satisfied with projects managed by more close to agile manifesto. Regarding customer satisfaction factors, those factors are also affected by management methodology (that is close to agile) positively. So this work provides a description of how software 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. And sure these conclusions will decrease percentage of fail projects in software industry.

**Keywords:** Methodology, Traditional methodology, Agile practices, Survey, Customer satisfaction, Scrum, XP, Spiral methodology, Software quality, Project management, Communication skills, Team stability and Team management effectiveness.

# Chapter One

## Introduction

### 1.1 Introduction

Software projects face challenges in the success percent, only 29% of software projects succeeded (Preuss, 2013). Customer satisfaction was considered one of factors to measure success in project (PMI, 2008). And Customer satisfaction very important for firms (Vavra, 2002).

PMI (2014) mentioned that project management reducing risk, cut costs and improve success rate. Further, Stepanek (2005) mentioned that there are differences between software project and other types of projects like construction projects.

From the above facts and as the researcher works in IT sector in Palestine as IT supervisor in PMO office, he raised questions that if the project manager can manage the software project by the same ways he manages other types of projects? Are the results, percents of success and customer satisfaction level for software projects will be same? And is there specific methodology for software project may yield more customer satisfaction?

Therefore the researcher felt that these questions are worthwhile to have answers. To answers these questions, this basic research was performed to find the impact of software project management methodology on customer satisfaction. And this absolutely not means that the results and

recommendations can't be apply to the real world applications, on the contrary many applied research depends on the results of basic research.

## **1.2 Scope of work**

The scope of this study is to present the relation and the impact between software project management methodology and customer satisfaction and customer satisfaction attributes. Research population will be customers of software firms in the west bank, and to achieve this scope the researcher will depends on triangulation data. The expected deliverables will help software firms and customers to adopt the right methodology that has positive impact on the project stakeholders, and these deliverables will be presented after pass needed descriptive and inferential statistics.

## **1.3 Background the area of study**

Importance of software industry in Palestine (PECDAR, 2012) drives us to consider producing successful software projects that achieve customer satisfaction.

But the results published by Standish Group (2001) mentioned that only 28 percent of Software projects in 2000 succeeded outright (Stepanek, 2005). Also customer satisfaction considered one of factors to measure success in project (PMI, 2008). Also Stepanek (2005) presents the following points that make software differ from other types of project:

- Software is complex: Software is unique in that its most significant issue is its complexity.
- Software is abstract: Software is the most abstract product that can be created in a project.
- Requirements are incomplete: It is uniquely difficult to define a complete set of requirements for software before beginning development.
- Technology changes rapidly: Software development technologies change faster than other construction technologies.
- Best practices are not mature: Most software development technologies are not mature enough to have a set of proven best practices.
- Technology is a vast domain: Software development has far more technologies, and its technologies have far more complexity than a single individual can hope to gain expertise with.
- Technology experience is incomplete expertise with particular software development technologies is very quickly outdated, and therefore most specific skills are learned through the job.
- Software development is research: Software development isn't just a process of creating software; it's also a process of learning how to create the software that is best suited for its purpose.
- Repetitive work is automated: Software development has been automated to a greater degree than other project-based activities.

- Construction is actually design: Unlike other products, software is not constructed, but rather designed into existence.
- Change is considered easy: Software can be modified rapidly, and this pace is expected, but it's better to implement the changes properly.
- Change is inevitable: No software is perfect as first envisioned; it will always require changes to make it best suit its role.

So Based on this background the researcher will try to help to increase the success percent for software project in Palestine by increase percent of customer satisfaction, through find the impact and the relation between software project management methodology and customer satisfaction. And is this relation positive with lightweight methodology or with heavyweight methodology? Also how customer satisfaction attributes are affected by management methodology?

Answer for these questions can be achieved by defining and knowing what is the meaning of success, software project management methodologies, customer satisfaction, customer satisfaction attributes and the relation between these items, and the constraints in these items.

## **1.4 Problem statement**

In order to increase percent of successful software project it's important to increase and improve customer satisfaction, but unfortunately the available statics mentioned that there is low percent of successful

software project and the studies mentioned that there are differences between software projects and other types of projects. Also there is discussion if software projects need specific management methodology capable to handle these differences and capable to improve customer satisfaction or not. So the researcher proposes to find the relation and the impact of software project management methodology on customer satisfaction and customer satisfaction attributes. Furthermore there is shortage in academic topics that discuss the issues related to new software management methodology in the Arab world (Torgeir Dingsøy, Sridhar Nerur, VenuGopal Balijepally, Nils Brede Moe, 2012). So this research will contribute to cover this shortage.

## **1.5 Research Questions**

The main research question is what is the impact of software project management methodology on customer satisfaction?

The other questions related to the impact of management methodology on customer satisfaction attributes. And these sup questions are:

1. What is the impact of software project management methodology on software quality?
2. What is the impact of software project management methodology on team stability?
3. What is the impact of software project management methodology on team management effectiveness?

4. What is the impact of software project management methodology on project management effectiveness?

## **1.6 Research Hypothesis**

The following hypothesis about management methodology and its relation with customer satisfaction has been inferred:

H1: There is a relation between software project management methodology and customer satisfaction.

H2: The alignment between closing to agility as management methodology and satisfaction from quality attributes is positively associated from customer's point of view.

H3: The alignment between closing to agility as management methodology and satisfaction from team stability is positively associated from customer's point of view.

H4: The alignment between closing to agility as management methodology and satisfaction from team management effectiveness is positively associated from customer's point of view.

H5: The alignment between closing to agility as management methodology and satisfaction from project management concepts is positively associated from customer's point of view.

## 1.7 Research Objectives

To be able to achieve the research objectives, the researcher should answer research questions. Answering research questions will be via test the research hypothesizes and this scenario will provide empirical evidence to accept or reject the hypotheses and the main objective that was identify the impact and the relation between software project management methodology and customer satisfaction will be realized.

In addition to the main objective, the below objectives will be realized:

1. Highlight the impact of software project management methodology on software quality as on one of customer satisfaction attributes.
2. Highlight the impact of software project management methodology on software team stability as on one of customer satisfaction attributes.
3. Highlight the impact of software project management methodology on project management effectiveness as on one of customer satisfaction attributes.
4. Highlight the impact of software project management methodology on project management effectiveness as on one of customer satisfaction attributes.

Also by achieving the above the objectives other benefits will emerge like check if there are other attributes effect on customer satisfaction, if management methodology is competitive advantage for software

company, if there are differences between level of agility according served sectors and if there are differences between level of customer satisfaction between served sectors. Furthermore these objectives will help project managers to adopt methodology that increase customer satisfaction and yield successful projects.

## **1.8 Research Methodology**

The purpose of this section is to identify the appropriate research method that capable to answering research questions. After review the research methods, the researcher used triangulation to collect data from different resources as this will help to ensure that there is consistency between resources. Literature review helped in identifying other studies and can be used as benchmark for comparing the results, qualitative research is the best approach to collect relevant information. And validate survey and final resource was quantitative research by implement survey.

Finally, the collected data was analyzed using descriptive and inferential statistics.

## **1.9 Research Significance**

Decision makers in software firms and also customers would agree that produce successful software project will have positive impact on all project stakeholders. But, without understanding particularity of software project, importance of customer satisfaction, available software management methodologies and the relation between these items, software

firms will still suffer from producing software project not match customer expectations and then unsatisfied customers and then unsuccessful project.

So the theoretical framework and the empirical evidence that were presented by this research will achieve the research objectives via explore the available software project management methodologies and its impact on customer satisfaction.

By knowing the relation and the impact of software project management methodology on customer satisfaction, the firms will be able choose the right methodology that has positive impact on customer satisfaction and customer satisfaction attributes, and from customers side the customers will have the needed knowledge about the difference between software projects and other types of projects and they will urges firms to adopt the methodology that handle the differences between software projects and other types of projects and capable to enhance customer satisfaction.

Moreover research results will enhance software industry and this will impact positively on economic situation.

Moreover the terms related to new software management methodology studied heavily in the world, but unfortunately only 10 papers discussed these terms in on the Arab world until 2010 (Torgeir et al., 2012).

## **1.10 Ethics consideration**

Many studies considered ethical issues very important in any research and any researcher should be able to answer question how he will treat the people and the data involved in his research.

It is the researcher's responsibility to protect participants in the research against deception, dangers and sure keep their privacy. So the researcher should give the participants clear idea about the research aims and assure them that their answers will be confidential (Roger H, Gates, Carl D, McDaniel, 1998; Vavra, 2002).

## **1.11 Delimitation of study**

The concepts of project management, software project management methodology and customer's satisfaction are broad and have many different sub areas interfere between these areas.

To be sure that the study has achieved its purpose and has become easy to understand, it's important to state that this study focuses on the relation and the impact between software project management methodology and customer satisfaction in the West Bank from customer's point of view.

Based on literature review and experts' opinions, the researcher measures level of agility based on agile manifesto to differentiate between heavyweight methodology and lightweight methodology,

Also the researcher measures satisfaction based on four attributes quality, project management effectiveness, team management effectiveness and team stability. The population of study based on customers of PITA member's.

So it is recommended that other researchers focus on sub areas like agile methods and its relation with customer satisfaction attributes or check the relation from developers' point of view in future studies.

### 1.12 Terminology

<b>Customer Satisfaction</b>	"State of mind that customers have about a company when their expectations have been met or exceeded over the lifetime of the product or service" (Cacioppo, 2013).
<b>Project</b>	"a project a temporary endeavor undertaken to create a unique product, service or result" (PMI, 2008).
<b>Project Management</b>	"is the application of knowledge, skills, tools and techniques to project activities to meet project requirements." (PMI, 2008).
<b>Methodology</b>	A set of guidelines that can be tailored and applied in a specific situation, so in our case it could be like check list that project manager should do during project lifecycle (Asif Irshad Khan, Rizwan Jameel Qurashi, Usman Ali Khan, 2011).
<b>Heavyweight methodology (traditional software model)</b>	It's a methodology follows sequential steps and phases in execution of project and follow particular outlook, it is considered as a process oriented and plan driven as it follows software development life cycle steps as subsequent, a step is not started until the previous one is completed so no feedback loops (Ghosh, 2012; Vamsidhar Guntamukkala a, H. Joseph Wen b, J. Michael Tarn, 2006).
<b>Agile</b>	"The ability to prosper in a competitive environment characterized by constant and unpredictable change." (Steven L. Goldman, Roger N. Nagel, Kenneth Preiss, 1995)

### **1.13 Structure of Thesis**

The study consisted of six chapters, chapter one is an introductory chapter that covers scope of work, the background of study, statement of problem, research questions, research hypothesis, research objectives, research methodology, delimitation of study, terminology, ethics consideration and structure of thesis.

Chapter two covered theoretical framework about research topics, so it covered customer satisfactions, project management, software project management, heavyweight methodologies, light weight methodologies and related studies.

Chapter three was the research methodology that discussed the different types of researches methodologies especially those related to software management, and then the researcher discussed credibility of study and why he adopted pilot testing.

Chapter four presented the ways of collecting data, beginning of state of art, interview and survey, and then discussed how the survey was built, and the way adopted to determine population and sample, and discussed percentage of response rate.

Chapter five was analysis and discussion of collecting data from interview and survey, and also the results of hypothesis testing and answering of research question.

Chapter six was the final chapter that includes summary of findings, conclusion, recommendations, suggestions for future research and limitations of study.

## **Chapter Two**

### **Theoretical Framework**

To be more familiar with research topics, the researcher will try to review existing and relevant literature within customer satisfaction, project management and software project management. Discussions will be based on the definitions, importance and measurements of these topics and how they are related.

#### **2.1 Customer Satisfaction**

Since the researcher is exploring the impact of software project management methodology on customer satisfaction, the researcher will begin with a discussion of the current (state of art) literature on customer satisfaction.

##### **2.1.1 Defining customer satisfaction**

As customer satisfaction is very important to companies (Vavra, 2002), so it's important to be clear on exactly what's meant by this term.

After reviewing relevant extant study, the researcher found the following definitions for customer satisfaction.

Khaled Alkilani, Kwek Choon Ling and Anas Ahmad Abzakh (2013) Defined customer satisfaction as "a conscious evaluation or cognitive judgment that the product has performed relatively well or poor, and suitable or unsuitable for its use/purpose."

- Vadivelu Thusyanthy and Samithamby Senthilnathan (2012) defined customer satisfaction as key to create differentiation between companies and will be a key strategic to overcome competitors so it's a measure to evaluate the service or products if it meet or surpass customer expectation.
- Oliver (1981) found definitions of satisfaction concentrate on elements of appraisal and comparative, also he mentioned to the definition from first consumer satisfaction conference which summarize the feelings of speakers that the product experience from rendered evolution should be as at least as good as it supposed to be, taking into consideration "effect of an emotion". And he provided us with unconventional definition which was "the summary psychological state resulting when the emotion surrounding disconfirmed expectations is coupled with the consumer's prior feelings about the consumption experience". Furthermore he stated that "satisfaction may best be understood as an evaluation of the surprise inherent in product acquisition and/or consumptions experience".
- According to Nguyen (2010) Customer satisfaction represents degree of positive or negative perspective about the value of using the product or service, so it can be measured as the differences between the customer expectation and needs from first side and the value if output that the customer received from the second side.

- Cacioppo (2013) considered customer satisfaction represents "state of mind that customers have about a company when their expectations have been met or exceeded over the lifetime of the product or service".
- To view customer satisfaction from software development side and according to Buresh (2008) Customer satisfaction can be viewed as an emotional response to the experiences of customer provided during the association with software development project and if the customer ready to pay for out come from software development project.

So from the previous definitions and after reviewing many resources the researcher found that customer satisfaction depends on product or service perceived performance relative to customer expectations. So if the product or the service met customer expectations the customer will be satisfied and if the there is a gap between customer expectation and product or service features then customer is dissatisfied (Grünewälder, 2013).

And according to Cengiz (2010) the researcher summarized customer satisfaction approach as follows:

1. The existence of an objective: The existence of an objective and attributes and functionality that the consumers or customers wish to reach.

2. Comparison: The satisfaction of the objective, attribute and functionality, customers or consumers should have reference to judge and make comparison.
3. Evaluation: The evaluation process of satisfaction represents evaluation at least two stimuli: a result and a reference or standard of comparison.

### **2.1.2 Importance of Customer Satisfaction**

To study customer satisfaction in correct way it's important to know the importance of customer satisfaction.

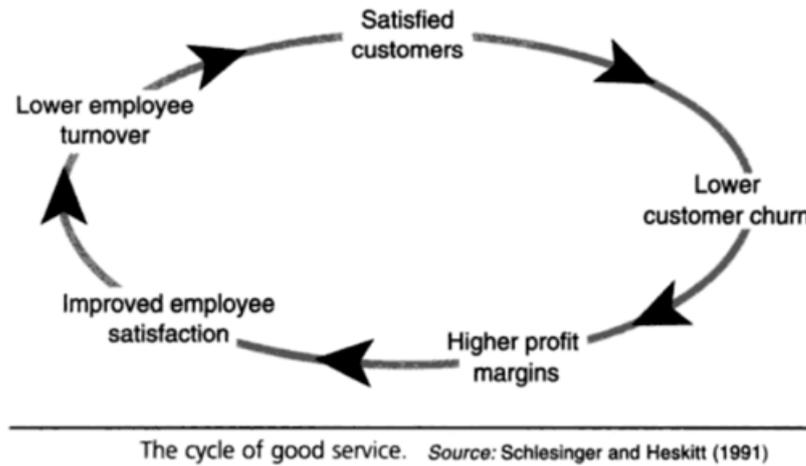
Many studies mentioned that in an increasingly competitive environment, companies must be customer oriented (Cengiz, 2010), also the concept of customer satisfaction has become a strategic goal for most firms. And continues occupies central position in research practitioners marketing representative because achieving customer satisfaction have many impacts on organizations (Tam, 2011) like:

- 1) Customer satisfaction can lead to customer loyalty (it's considered as key determinant for customer loyalty (Tam, 2011; Bloemer, J., Lemmink, J, 1992).
- 2) Customer satisfaction can generate favorable word-of-mouth communication (Tam, 2011).
- 3) Customer satisfaction will generate higher revenue and profits by lower acquisition costs (Tam, 2011).

- 4) Customer satisfaction can generate repurchase action and dissatisfaction will decrease likelihood of repurchase (Tam, 2011).
- 5) Customer satisfaction has positive impact on brand (Bloemer, J., Lemmink, J, 1992).
- 6) Customer satisfaction fundamental determinant for long term customer behaviors (Chatura Ranaweera, Jaideep Prabhu, 2003).
- 7) Highly achievable customers satisfaction the greater their retention (Chatura Ranaweera, Jaideep Prabhu, 2003).
- 8) Satisfying and retaining customers improving companies' competitiveness and securing market share (Cengiz, 2010).
- 9) Customer satisfaction as an antecedent of long-term relationship between the organization and their customers (Aistė Dovalienė, Agnė Gadeikienė, Žaneta Piligrimienė, 2007).
- 10) Customer satisfaction mean minimum numbers of defective good and service so lower costs, increase buying, use more products, higher level of retention and loyalty and higher profitability (Edward C. Malthouse, James L. Oakley, Bobby J. Calder, Dawn Iacobucci, 2004). And this not contradicts with Six Sigma concept because in reference to General Electric Company Six Sigma revolves around few concepts most of them concentrate to produce service or product meet customer needs (Businessballs, 2014).
- 11) Vavra (2002) mentioned that customers satisfaction has good impact on whole organization and he illustrated that in cycle of good service that satisfy customer will increase organization profit so

firms will win and employee morale and salary will increase and turnover will decrease, so the relation will be win-win-win.

The Figure below illustrates (win-win-win) relation.



**Figure 1** : The cycle of good service (Vavra, 2002)

- 12) There was study which mentioned that there was clear relationship between the use of customer satisfaction measurements by management and the market strategies and priorities (Piercy, 1996).
- 13) Customer satisfaction allow firms to create benchmark with other companies so the firms should work to improve customer satisfaction and this can be done by increasing awareness of team that they are in customer care department and they should be aware that customer satisfaction should be achievable goal and this can be done by listening to what customers are saying and what they do not say (Reh, 2013).

If the firms achieved customer satisfaction so it should struggle to keep their customers satisfied to prevent them from switch to other companies as a decrease in customer switching will impact positively on income statements (Susan M. Keaveney, Madhavan Parthasarathy, 2001).

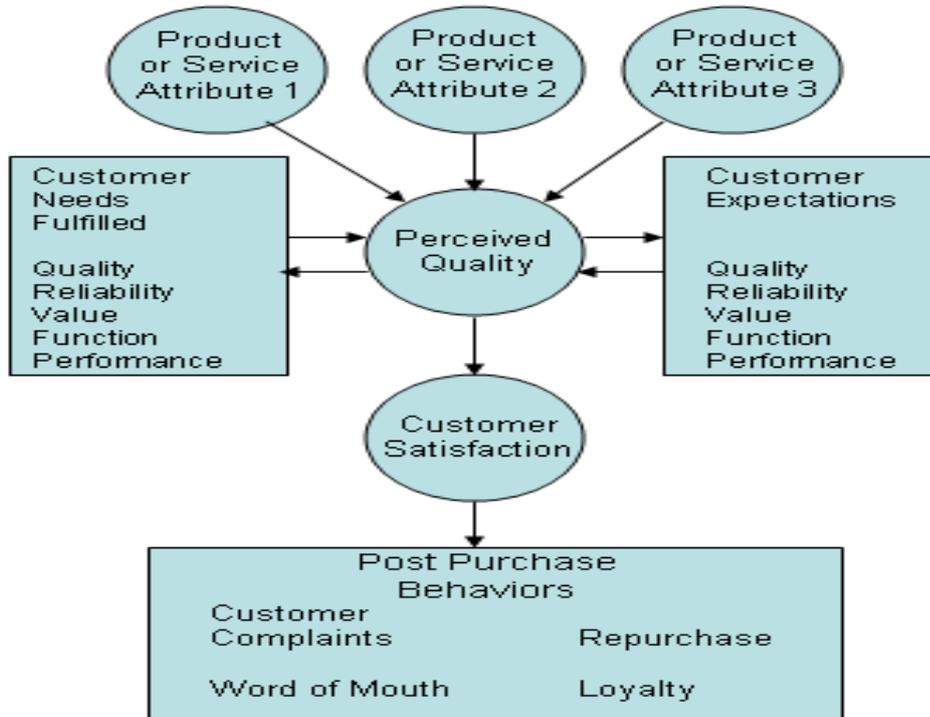
Furthermore, the researcher presented some facts that should be taken in consideration regarding the importance of customer satisfaction in numerical approach.

1. To get new customer will cost five to eight than to hold ones from finance perspective.
2. Just 5% increase in loyalty and retention can increase profits by 25-85%.
3. Dissatisfied customer will tell 9 other people about his negative experience and bad treatment.
4. Satisfied customer tells 5 to 6 other people about his positive experience and good treatment.
5. Just 4% of dissatisfy customers actually complain to the company. So firms don't know what the subsequent behavior is.

(Cacioppo, 2013; S. Aarthi, R. Sathiya Priya, 2012).

6. Customer satisfaction is very important to companies and became in their mission statements and in recent survey according to 95% of US senior executives mentioned that customer satisfaction is the important concern in their organization (Vavra, 2002).

The figure below illustrate how to achieve satisfied customer and its subsequent positive behavior and to avoid create dissatisfied customer and its negative subsequent behavior from firms perspective.



**Figure 2:** How to achieve satisfied customer (S. Aarthi, R. Sathiya Priya, 2012).

### 2.1.3 Customer satisfaction attributes

According to S. Aarthi and R. Sathiya Priya (2012) Leonard Berry in 2002 defined ten dimensions of satisfaction (Quality, Value, Timeliness, Efficiency, Ease of Access, Environment, Interdepartmental Teamwork, Front line Service Behaviors, Commitment to the Customer and Innovation). And each industry can develop set of satisfaction measurement according to the nature of the business and relationship with the customer.

According to Edward C. Malthouse et al. (2004) service quality is considered as main attribute to create long term relation and customer satisfaction and retention.

So it's recommended to any researcher to check perceived quality through (overall quality, perceived reliability, and the extent to which a product or service meets and fulfills the customer's needs) (S. Aarthi, R. Sathiya Priya, 2012). And there are many approaches that can be used to measure service quality like QFD and Servqual and Kano model (Mohsen Kashi, Mohammad Ali Astanbous, Mojtaba Javidnia, Hasan Rajabi, 2012). Other main attributes could be in evaluation process such as satisfaction from ongoing business relationship, satisfaction form price-performance ratio (Cacioppo, 2013).

#### **2.1.4 Customer satisfaction measurement**

From figure below, previous definitions and literature review about importance of customer satisfaction, companies now recognize that customer satisfaction is a key and strategic weapon to hold on the customers they have, to attract new customers, to increase market share and increase profits because there is little product differentiation between large numbers of competitors (Cacioppo, 2013).

And according to Piercy (1996) customer satisfaction measurement became one of its primaries of successful products for market research agencies.



**Figure 3:** Importance of customer satisfaction (S-M-A-R-T, 2013)

But to track and manage customer satisfaction, Managers should measure it because they can't manage what they don't measure (Reh, 2013).

There is broad literature toward formalize customer satisfaction measurement by developing different concepts, attribute and parameters (usually marketing and sales staff should be involved in designing customer satisfaction programs and collecting the attributes, that can be done usually by focus groups or interview) of customer satisfaction which can be evaluated by participants and then designing effective customer satisfaction tool for data collection and reporting purpose (Piercy, 1996; Cacioppo, 2013).

As firm collected the needed data and gained the reports, the firm should adopt methods for institutionalizing customer satisfaction measurement into firm systems.

After that the organization should adopt and develop systems to take corrective actions and to respond effectively to dissatisfied customers and to remove any obstacles that could prevent customer to be satisfied (Piercy, 1996).

Furthermore the firms should take the points below in their account when working on customer satisfaction measurement program.

1. "More is better" is not always correct on satisfaction because according to Dr. Kano performance of attributes is not equal among customers (Richard E. Zultner, Glenn H. Mazur, 2006).
2. According to Dan Sarel, Walter Zinn (1992) customer perceptions and perceptions of non-customers to service performance and on firm performance can be significantly different. So it's important to take non customer's voice in our account.
3. Measurement program should cover performance relative to competitors (S-M-A-R-T, 2013).
4. Deming (1993) argued that the customer learns rapidly, so he will compare one product to another, so it's not enough to have customer merely satisfied because satisfying customer may change, so firms should innovate, appreciate, listen to and predict customer's needs to give them more.

5. Edward C. Malthouse et al. (2004) argued that to achieve positive long –run impact on firm, customer satisfaction program should concentrate on attribute that produce superior products.
6. Market and customer segments are considered as important factors when measuring customer satisfaction and its implications because attributes evaluation can have different implications and customers have different characteristics (Edward C. Malthouse et al., 2004).
7. Cacioppo (2013) mentioned that top management should be the champion of programs, and the results of customer satisfaction program should circulate to all employees and stakeholders, and improvements also should circulate to customers. Furthermore results and improvement should be tied to firm's mission and impact on external and internal process.

## **2.2 Project Management**

The researcher will present brief literature review for project management and for the differences between software project and other projects like construction projects. This will lead us to the importance of selecting appropriate methodology to manage software projects.

A project was defined as "a project a temporary endeavor undertaken to create a unique product, service or result" (PMI, 2008). This means the project has a beginning and end date. End date mean that the project achieve its objective, terminated or the need for project is no longer exist.

Unique means that there are differences in some attributes of project results even though there are some repetitive elements in project deliverables.

Project could be new product, service, effective change style of an organization, developing information system or constructing infrastructure ...etc (PMI, 2008).

John H. Blackstone, James F. Cox and John G. Schleier (2009) cited from APICS Dictionary (APICS Dictionary 12 edn, p.109), that project management 'An endeavor with a specific objective to be met within the prescribed time and dollar limitations and that has been assigned for definition or execution'.

Project Management according PMI (2008) "is the application of knowledge, skills, tools and techniques to project activities to meet project requirements." Is accomplished through the use of the appropriate processes such as Initiation, Planning, Execution, Controlling and Closing.

Managing the project includes identifying requirements and addressing the stakeholders and balancing project constraints that include others constraints not only (scope, quality, schedule, budget, resources and risk). And there is a relation among these competing project constraints is such that if any constraint changes at least one other constraint is likely to be affected (PMI, 2008).

So achieving the objectives of project should pass through balance between the mentioned constraints and addressing the stakeholders, so any variances in these constraints will cause project failure.

So in the reference to TOC if project managers know the status of constraints in current project management methodology they could overcome them and achieve improvement in project management and deliver successful project (Asta Murauskaite, Vaidas Adomaskas , 2008).

### **2.2.1 Why a project fails.**

After reviewing the state of art many papers discussed failure phenomenon.

John H. Blackstone et al. (2009) argued that the failure can occur if:

- Projects are late
- Projects are over budget
- Projects do not meet specification

Reasons like poor skills and competencies, poor communication between stakeholders, not enough support from top management, unclear requirements definition and lack of leadership can lead to failure in addition to the below major reasons.

- Estimate was made per project task (90% chance of finishing), so the buffer for task not for whole project

- The student syndrome: This is "the tendency to put off starting until the last minute".
- Parkinson's Law: "Work tends to expand to fill the time available".
- Early completion will be wasted if scheduling to start date not considers completion of the predecessor.
- Convergence of tasks.
- Resource dependencies.
- Early consumption of project slack because poor to recognize how to buffer the project as a system.

(John H. Blackstone et al., 2009).

Also it's important to highlight the three types of risk that face managers and mentioned by Nadim F. Matta and Ronlad N.Ashkenas (2003) first one called execution risk that belong to manage project plan, time, budget and most manager know this type of risk. But unfortunately the managers neglect the second that called white space risk, that belong to activities not identified. Third one called integration risk, belong to capability to handle disparate activities at the end of project.

In Palestine there is perception that service delivery from Public Private Partnership projects not meet consumer requirements and this has bad impact on satisfaction which consider as one attributes of project success (Nabil I. El-Sawalhi, Mohammed A. Mansour, 2014).

### **2.2.2 Factors for Project Success**

After reviewing the paper of "Critical Factors in Successful New Product Development: An Empirical Study of Malaysian Manufacturing Companies" the author defined critical factor as circumstances, facts, influences or elements which must exist to create environment that where projects can be managed on consistent basis to contribute the project to completed successfully and this study summarized the literature review about the success factor in Table 1. (Chan Wai Kuen, Suhaiza Zailani, 2012).

**Table 1 Summary of Literature Review of Critical Factors for Project Success (Chan Wai Kuen, Suhaiza Zailani, 2012).**

Success Factors from the Literature	Pinto (1986)	Kerzner (1987)	Pinto & Slevin (1989)	Belassi & Tukul (1996)	Wateridge (1995)	Belout (1998)	Clarke (1999)	Cooke-Daview (2002)	Muller (2005)
Corporate understanding		X	X		X				
Common understanding with stakeholders on success criteria				X					
Executive commitment	X	X	X		X				
Organizational adaptability		X							
Communication	X		X				X		
Project manager selection criteria	X	X	X		X				X
Project manager leadership / empowerment	X	X	X		X				X
Environment			X						
Commitment to planning & control	X	X	X				X		X
Project mission / common goal / direction	X		X				X	X	
Top management support	X		X		X				
Client consultation / acceptance	X	X	X						
Monitor performance and feedback	X		X					X	X
Personnel / teamwork	X	X	X		X	X		X	X
Technical task ability	X	X	X						
Trouble shooting / risk management	X		X					X	
Project ownership								X	X
Urgency of project			X		X				
Duration and size of project					X		X	X	
Remarks: "X" success factor(s) that is determined by the researcher either on a conceptual or empirical basis									

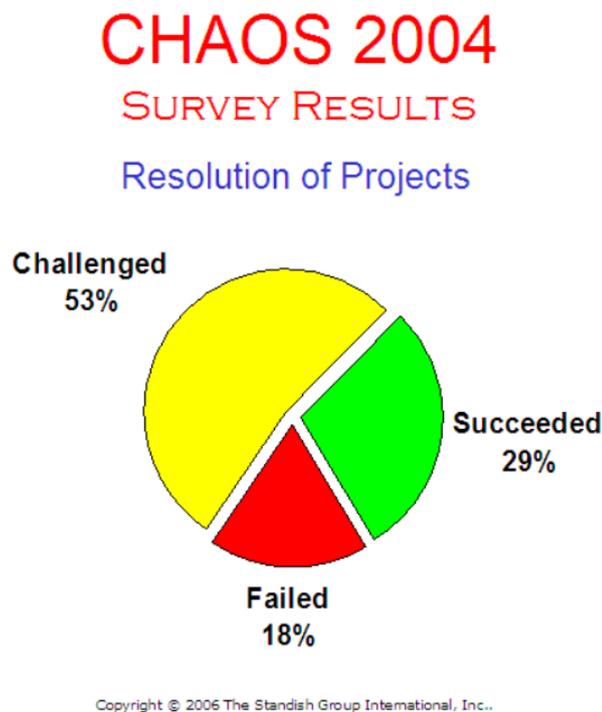
### 2.3 Software project management

Software has remarkable effect on development of modern society (Asif et al., 2011). Also Ayşe Günsel, Atif Açıkgöz, Ayça Tükel and Emine Ögüt, (2012) confirmed that software development competed in dynamic

environments and both business and technological environment change rapidly so this has effect on problem solving and taking decisions.

And Stepanek (2005) cited from Standish Group (2001) report that only 28 percent of Software projects in 2000 succeeded, some of them were canceled, late, over budget, lacking features or very often, all of those issues combined.

Also according to an interview with Mr. Jim Johnson the founder and Chairman Standish Group, he presented statistics for information technology projects status in figure 4, he mentioned that only 29 % of projects succeeded (Preuss, 2013).



**Figure 4:** Percentage of project succeeded (Preuss, 2013)

Therefore, and as software has remarkable effect on development of modern society and as this industry suffer from high percentage of fail, it's very important to find the methodology (can be defined as "the analysis of the principles or procedures of inquiry in a particulate field" (Buresh, 2008), or can be defined as set of guidelines that can be tailored and applied in a specific situation, so in our case it could be like check list that project manager should do during project lifecycle (Asif et al., 2011)) which if the project manager follows may be the best defense to avoid the risks that represent threats to produce successful project.

The definition for success in PMBOK guide (PMI, 2008) is measured by product and project quality, timeline, budget compliance and degree of customer satisfaction. So what is the best methodology that is capable to handle all concerns, produce successful project and tackle the points that make software project differ.

According to Asif et al. (2011) Some software firms have their own customized methodology for developing and managing their software projects, but most companies argue that there are two software project management methodologies heavyweight methodology and light weight methodology and each one has its own characteristics and own pros and cons. Therefore the researcher will discuss both heavyweight and lightweight methodologies in detail. But before software industries reached to current methodologies, it passed historically in many stages.

## 2.4 Heavyweight methodology

Heavyweight methodology or traditional software model follows sequential steps and phases in execution of project and follow particular outlook, it is considered as a process oriented and plan driven as it follows software development life cycle steps as subsequent, a step is not started until the previous one is completed so no feedback loops. For example, design is done after analysis is completed there is no overlap between system development lifecycle steps (analysis, design, development, testing and rework, implementation) (Ghosh, 2012; Vamsidhar Guntamukkala a et al., 2006). In heavyweight methodology Work Breakdown Structure (WBS) for the software project will be clear during the planning process. (Ghosh, 2012)

In heavyweight methodology project manager believe that heavy and detailed requirements specifications permit more direct control over the process and increase percentage of successful projects (Vamsidhar Guntamukkala a at el., 2006). And heavyweight methodology advocates extensive documentation so it's considered as documentation driven and follow sequential steps (Yu Beng Leau, Wooi Khong Loo, Wai Yip Tham and Soo Fun Tan, 2012).

As a result from the above features for traditional heavyweight methodology it is suitable for project where goal defined well and business requirement and technologies required well known (therefore its suitable for routine and repetitive projects), minimum change request and project

manager have established templates (Daniel J Fernandez, John D Fernandez, 2009; Vamsidhar Guntamukkala at al., 2006).

#### **2.4.1 Historical review of development methods**

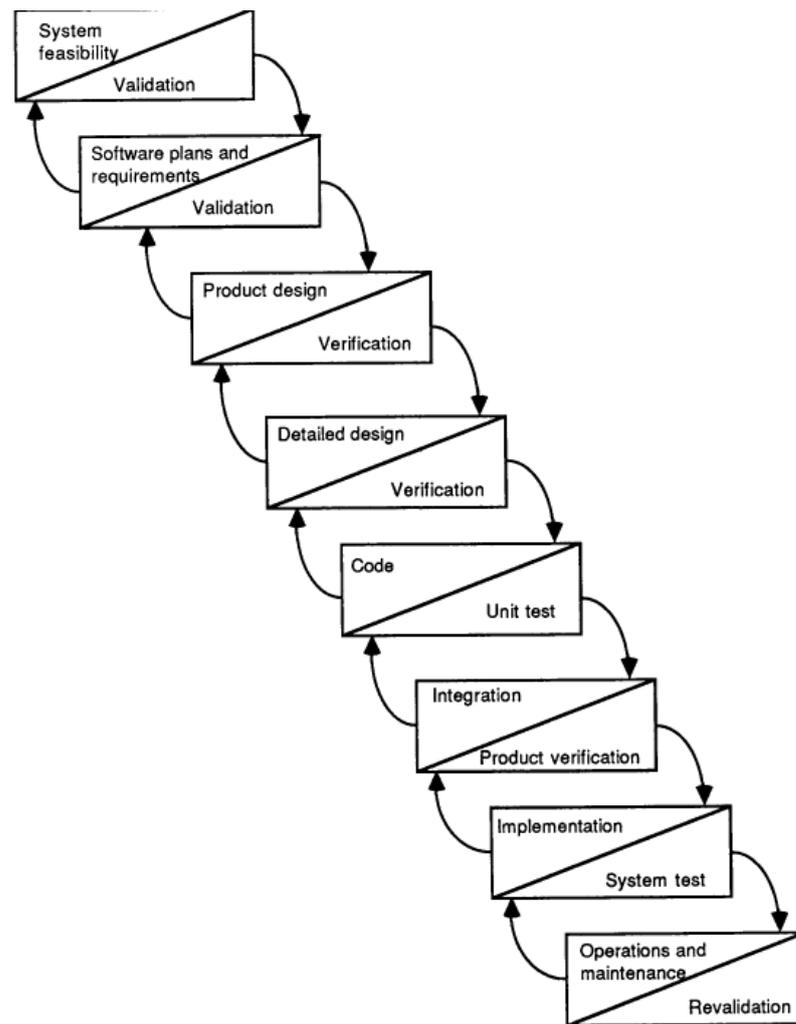
1. Subhas Misra, Vinod Kumar, Uma Kumar, Kamel Fantazy, Mahmud Akhter, 2012; Boehm, 1988) discussed Code-and-fix method that is considered as one of the earliest methods, this method consists of two stages: the first one is writing the code and the second is fixing the problem in the code. Cons of this methodology is the cost of fixing code because poor preparation for coming phases, and there is limitation in scalability of system because after number of fixes the code will be poorly structure, and frequently missing some requirements will lead to rejected it or it will be expensively redeveloped.

The above limitations emphasize that project manager should be aware of importance of SDLC phases and should take enough time in preparation and planning to avoid the limitations.

2. The experience in large software in early 1956 and the limitation of code-fix method led to develop the stage wise method that consists of operational plan, operational specifications, coding specifications, coding parameter, testing, assembly testing, shakedown, and system evaluation. The cons of this methodology that there is no ability for enhancements because enhancements in

current stage depend on previous stages (Boehm, 1988; Subhas Misra et al., 2012).

3. The waterfall method is one of the popular method for many years, It follows sequential steps so subsequent step is not started until the previous one is completed. It consists of analysis, design, development, testing and rework, and implementation. It added two primary enhancements to the stage wise model (first importance of feedback between stages and set guide line to confine feedback loops, second the importance of initial incorporation of prototyping (parallel with analysis and design phase) in SDLC. So WBS is done in planning process. Limitation in this methodology costly to fix and heavy documentation and any misunderstanding of user's requirements will lead to incorrect design and large quantities of unusable code. But sure waterfall methodology was able to eliminate many limitations in previous methods such as formal software development and verification, cover incremental development program families, parallel development and risk management. And it will be suitable for some classes of software such as compilers and Operating system, but it will not work well for interactive-end-user application. Figure below show waterfall phases (Boehm, 1988; Ghosh, 2012; Subhas Misra et al., 2012).



**Figure 5:** Waterfall phases (Boehm, 1988)

4. The evolutionary development method proposed by McCracken and Jackson in 1982, experience of users incorporate in SDLC, therefore this model met with fourth generation language because the experience of users determine the subsequent product improvement, the difficulties in this model are: inability to distinguish it from code-fix model (lack of planning and unused code), hard to change code (architectural and usage consideration) and unrealistic assumption that the system will be

flexible enough to accommodate new improvements (Boehm, 1988; Subhas Misra et al, 2012);

5. The dilemma of "spaghetti code" in previous models led to formulation of transform method that was proposed by (Robert Balzer, Thomas E. Cheatham, Jr., Cordell Green, 1983). In this method the Robert Balzer et al. 1983 tried to overcome difficulties on all previous methodologies by confirming that any later modification on code are made only to the specification, not to other stages in SDLS. So the formal specification, transformation it to code, iterative loop, exercise of resulting product and outer iterative loop to match the specification will lead to desired product. This methodology can reduce cost and time of project and has good code structure because the modifications are made on specification. But this method has some difficulties such as need for expert system analyst and business analyst capable to transform formal specification software into code that describes the requirements. It will face formidable maintenance request from reusable software component or commercial software product so the assumption that the system will be flexible enough to accommodate new improvements will be unrealistic. Therefore Automatic transformation to code will be suitable for small products only (Boehm, 1988; Subhas Misra et al., 2012).

## 2.4.2 Spiral methodology

Proposed by Boehm in 1988 based on experience and from the improvements on the waterfall methodology, Figure 6 represents Spiral Methodology. This methodology had important contribution to software development because it took a risk-driven approach and took iterative approach in software development. The model represents SDLC in the form of spiral and consists of two dimensions.

- Radial dimension: That represents cumulative cost.
- Angular dimension: that represents percentage of completion of each cycle.

(Boehm, 1988; Subhas Misra et al., 2012).

### 2.4.2.1 Spiral Features

1. Identification of:
  - Objectives of the portion such as performance, functionality, expandability ...etc.
  - Alternatives related to this portion implementation such as reuse, buy... etc.
  - Constraints related to alternative such as cost, time...etc.
2. Evaluation: evaluate the alternatives that appeared in previous step related to the objectives and constraints and this step will raise significant risks facing the project.

3. Some tools are used in the evaluation of risks and constraints such as simulation, prototype... etc. Risk consideration will lead and determine the following step.
4. Develop verify next-level product: As the risks are determined, managed or resolved, this model can accommodate any approach of software development for next step.
5. Review: this feature aims to ensure that all stakeholders' requirements in previous cycle are covered and to take commitment from them about plans for the next cycle.

An important question rose about initiation, termination and iteration in spiral model. The answer to this question depends on testing hypothesis, if current operational mission could be enhanced by software product or not, if not the spiral is terminated otherwise the spiral will terminate with implementation of new or modified software (Boehm, 1988).

#### **2.4.2.2 Advantage of Spiral Model**

1. The main advantage of spiral model is that it accommodates good features from previous models and avoids all limitations in previous models because it adopts risk driven approach.
2. Identification and evaluation steps in spiral model encourage focusing and checking the options for reuse of existing software.
3. Identification and evaluation steps in spiral model will increase software quality as it allows project team to choose best scenarios and avoid any limitations or concerns.

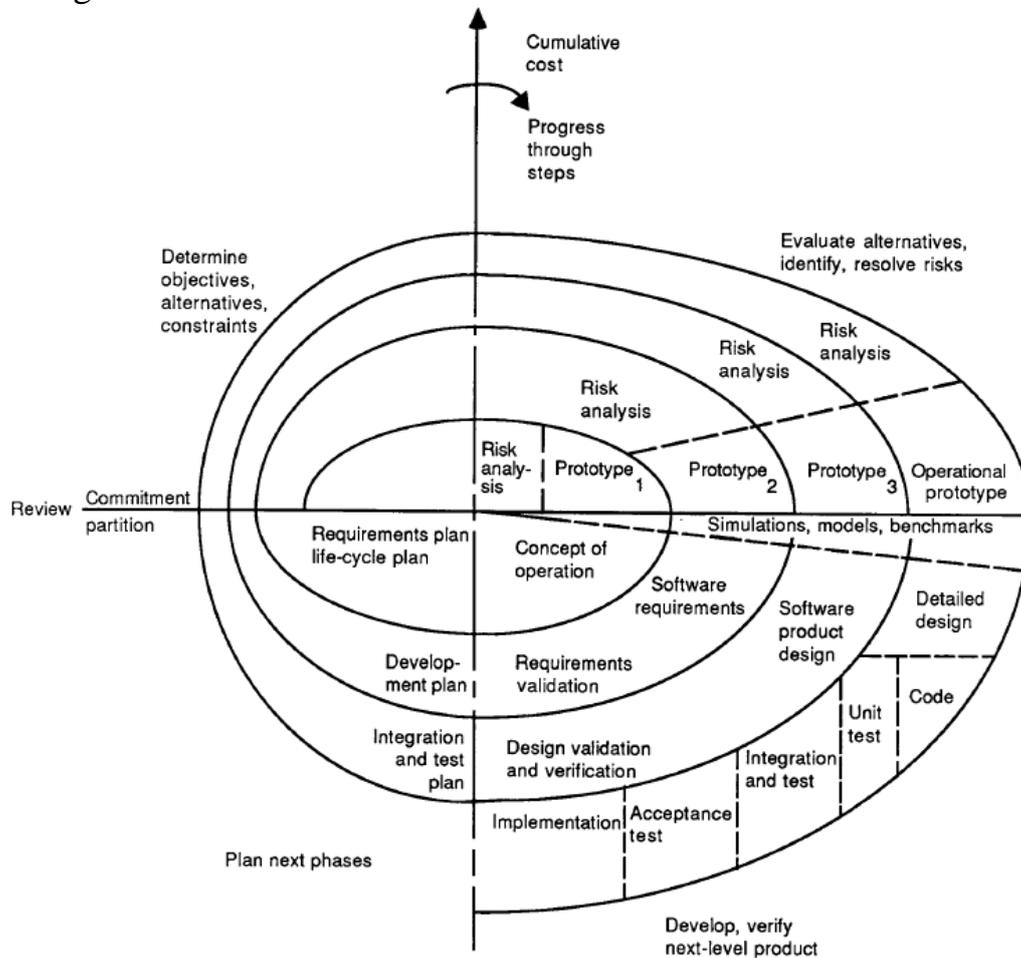
4. Time needed for each phase in SDLC will be determined by level of risk related to these phases.
5. The spiral model has attractive approach to study alternatives so it is capable to accommodate growth or changes in software product and risks management and evaluation of alternative. This can be done for hardware, too. (Boehm, 1988)

#### **2.4.2.3 Limitation in Spiral Model**

All the methodologies above concentrate on heavy documentations. It's also difficult to learn and use, and it doesn't have the ability to adapt changing in customer requirements. Subhas Misra et al. (2012) with reference to Boehm (1988) the main limitations in spiral model which prevent it from reaching maturity are:

- Matching to contract software: Spiral model worked well in internal software and achieved high flexibility. But the world of contract software need more time to achieve the same degree of flexibility.
- Relying on risk assessment expertise: Spiral model took risk driven approach. So any miss in assessment of risks will lead to disastrous results.
- Need for further elaboration of spiral model steps: Spiral model need further elaboration from stakeholders to ensure that all the team is in the same rhythm. This needs many tools and techniques such as checklist and synchronized plan techniques.

Note: Efforts to enhance and refine spiral model have focused on risk management.



**Figure 6:** Spiral methodology (Boehm, 1988)

### 2.4.3 Rational Unified Process Model (RUP)

It depends on succession of incremental iteration to build software. It was proposed by Rational Software and later by IBM in the late 1990s. It differs from other methodologies in the sense, it has the ability to accommodate and adopt changes during development process and it has most of SDLC processes in each iteration.

It provides a disciplined approach and provides guidelines, templates and tool mentors. So it considered a comprehensive framework and software engineering process. By this approach the team can assign tasks and responsibilities within a development organization to be sure that the software produced is high-quality, as it meets customer needs within a predictable schedule and budget (Asif et al., 2011; K.Krishna Mohan,A. K. Verma, A. Srividya, 2011; Stepanek, 2005).

Developing software based on iterative approach, manage new or update requirements, use component-based architecture, visual model software and assess and verifies software quality are considered as main guidelines in RUP methodology (Asif et al., 2011).

Asif et al. (2011) and K.Krishna Mohan et al. (2011) mentioned that the above guidelines exist in the below RUP phases:

**Inception:** Understand scope and estimate and assess other dimensions to successful like costs, risks, business case, environment and architecture and achieving concurrence among all stakeholders.

**Elaboration:** Deeply understood requirements are specified and needed resources and architecture is prepared.

**Construction:** Building and finalizing the system base on elaboration phase with needed document and support and the system will be ready for testing.

**Transition:** Transfer the product to operation after users sign UAT and product deployed.

Stepanek (2005) and Asif et al. (2011) mentioned that the RUP methodology will be suitable for distributed systems, very large team or, complex or critical systems, systems in more than one business area and systems reusing other systems.

Distributed development of a system as RUP needs process configuration so RUP will be suitable

- If process configuration already available or the team has the time to build it.
- If the team has the culture to share knowledge between each other.
- Quality and reliability very important.

**Note:** Stepanek (2005) categorized RUP under agile methodology while Asif et al. (2011) and K.Krishna Mohan et al, (2011) categorized it under heavyweight methodology, and Stepanek (2005) mentioned that it can be traditional methodology if it used very prescriptive and process-heavy way or if the team neglected to perform process configuration.

#### **2.4.4 The pros of Heavyweight methodology**

1. All project milestones are scheduled (Daniel J Fernandez, John D Fernandez, 2009).

2. Resource requirements are known (Daniel J Fernandez, John D Fernandez, 2009).
3. As most skilled resources are not required so team members can be distributed (Daniel J Fernandez, John D Fernandez, 2009).
4. Expandable architecture designed for current and future requirements (Asif et al., 2011).
5. The main objective is to produce high assurance product (Asif et al., 2011).

#### **2.4.5 The cons of heavyweight methodology**

Many studies presented the following cons in heavyweight methodology

1. Plan and schedule can't cover change very well so this is more restrictive and bureaucratic.
2. Increase in cost and time by any change in plan and it is considered as labor intensive.
3. Developers hate writing and reading documentation.
4. Project stakeholders must follow a defined set of processes.
5. Difficult for stakeholders to learn and use them quickly.
6. Not customer oriented as it give more value for delivering project according plan, so client has low involvement .
7. Type of development not adaptive so it considers anticipatory methodology.

(Asif et al., 2011; Daniel J Fernandez, John D Fernandez, 2009; Stepanek, 2005; Subhas Misra et al., 2012).

## **2.5 Lightweight method**

Software is now included in a vast domain and it enters all aspects of life. Many researchers mentioned that most software project fail against measure of project success and software engineer noticed that reasons of fails depend on requirement readiness (not clear, not solved problem, changes in requirements during SDLC), testing not done well, system not expandable, valuable feature missing, resources and schedule and scope commitments not match project plan and finally technical risks (Kai Petersen, Claes Wohlin, 2009; Lowell Lindstrom, Ron Jeffries , 2004).

Until mid of 1990s software engineer thought that to keep software project out of trouble can be only by strictly follow heavyweight methodology (Williams, 2012).

But even though they followed heavyweight methodology, the results were not well as wishes (Cervone, 2011) and as noticed there are several disadvantages emerged in traditional development methodology like huge effort for planning and gathering information "half (or more) of the resources for the project are expended before any development work even begins" (Cervone, 2011).

From this context, new methodology emerged, which is agile project management or lightweight methodology (Cervone, 2011) to handle vast amount of software products that need flexible methodology to response to requirements changing and customer needs (Kai Petersen, Claes Wohlin, 2009). And with reference to Torgeir et al. (2012) this methodology has received great attention from researchers community in the world and there are about 1551 research papers which discussed agile software development between 2001 and 2012. And among of which only ten papers were from the Arab world.

### **2.5.1 What is agility**

Reference to Yauch (2011) he mentioned that Steven L. Goldman et al., (1995) defined agility "as the ability to prosper in a competitive environment characterized by constant and unpredictable change." So as the firm is able to responds and adapts changes successfully and keeps their customers satisfied then it is considered agile.

And in software industry agility can be defined from what was agreed on from practitioners of formulized the agile manifesto that all of them encourage close collaboration, face to face communication between all project teams (tech and business), no need for heavy documentations, delivery of product depends on short iteration and the practitioners believe that they should accepting changing requirements by customers during software development (Subhas Misra et al., 2012). Also reference to

Cervone (2011) in agile project management the risk is minimized by focusing on short iterations like sprints in scrum.

Lowell Lindstrom and Ron Jeffries (2004) viewed agile from two sides. First, the customer side: customer will have many releases without defect, most valuable features available in the system, he can request change or modify requirements and can contact development team. Secondly, the developer side: The developer can contact customer to inquire about details, he will estimate his tasks time, he can deliver project based on iterations, and decide his colleague, and he also has flexibility in working hours. and Ahmed A, Ahmad S., Ehsan N., Mirza, E., Sarwar, S.Z., (2010, p. 287) summarized agile definition by one row that agile "is an iterative approach to keep pace with dynamic development environments."

### **2.5.2 Agile manifesto**

"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.org, 2013)

To understand this manifesto better the researcher should discuss the principles behind the manifesto

1. Any procedure boosting team spirit like close team relationship and close working environment, consider as a core in agile practices, so agile believe that human role should reflect in the contracts (Pekka Abrahamsson, Outi Salo, Jussi Ronkainen, Juhani Warsta, 2002).
2. Highest priority is to satisfy customers via delivery working software at frequent intervals with urged to keep quality of code higher as much as possible. So no need for heavy documentation (Agilemanifesto.org, 2013; Pekka Abrahamsson et al., 2002).
3. The relationship between business people and developers must be over strict contracts and the team (Business and developers) should cooperate and meet daily if possible to be sure that they are on same rhythm. Therefore they can mitigate and overcome any risks that do not meet contract rules (Agilemanifesto.org, 2013; Pekka Abrahamsson et al., 2002).
4. Agile software process is considered as people oriented. Therefore it believes in relationships and community over contracts, face to face communication over formal communication and experienced developers can speed up the development time from 2 to 10 times compare to slower team members (Agilemanifesto.org, 2013; Pekka Abrahamsson et al., 2002).
5. One major claim for design agile is its ability to adopt changes during SDLC. As change is inevitable throughout life cycle and as

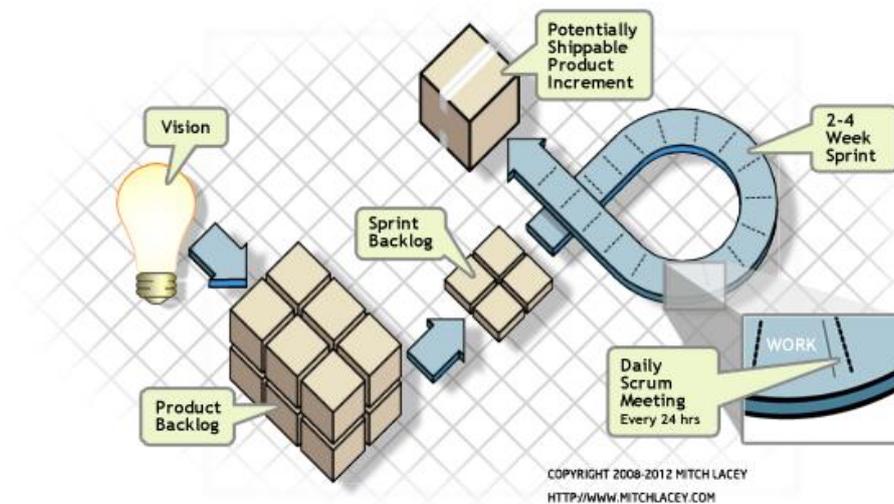
highest priority for customer satisfaction and working software is primary measure of progress, agile methodology concentrates upon adopting the changes in requirements even late in development via early win and rapid feedback so first delivery should be within weeks, test constantly, improve design quality and invent simple solution. This will make next iteration less expensive, defects fewer and implementing changes easier (Agilemanifesto.org, 2013; Pekka et al., 2002).

### **2.5.3 Examples of lightweight methodology (Scrum)**

With Reference to Cervone (2011) scrum is considered as one of the most important agile methods. In rugby game the way to restart the game after interruption is called Scrum. But in agile project management a Scrum "is simply an agile, lightweight process for managing and controlling software and product development in rapidly changing environments" (Cervone, 2011).

Also Scrum was defined as a set of practices and rules based on the Agile Manifesto (Cervone, 2011; Marlon Luz, Daniel Gazineu, Mauro Teófilo, 2009).

Marlon Luz et al. (2009) mentioned that Scrum consist of three roles, three ceremonies and three artifacts (Figure 7).



**Figure 7** : Scrum methodology (scrumalliance, 2013)

The three roles are defined as

- **Product Owner:** Responsible for the success of the product and he is responsible to arrange and manage all stakeholders interest, therefore he responsible for business value of product.
- **ScrumMaster:** Is responsible for the Scrum process, therefore he ensures that the team is functional and productive by following and respecting practices and rules.
- **Team Member:** typically cross-functional, self organizes and is responsible for getting the work done by developing the project. The team has to work collectively. It usually consists of five to ten people who work full time and a team member should not change during sprints. (Cervone, 2011; Marlon Luz et al., 2009)

The three ceremonies are:

- Sprint planning meeting, kickoff the Sprint (Kickoff meeting and Sprint was added by Cervone (2011), the kickoff meeting similar to Sprint planning meeting but this meeting discuss high-level backlog and the major project goals. The Sprint can begin as Sprint planning meeting has been held), the team (Scrum team, Scrum Master) meet with the product owner, presents and set the highest priority items of work to deliver during next Sprint (time needed to accomplish agreed items usually two to four week) and the team ask questions about how the item should work, and this is one of the differences between Sprint and phases in a traditional project. Another second difference between Sprint and phases in traditional project is that no outside influence or interruption should be allowed to affect on the work of the Scrum team (Cervone, 2011; Marlon Luz et al., 2009).
- Daily Scrum meeting: the team meets each day (fifteen minutes) to share difficulties and progress and to answer three questions.  
  
“What have you done since last Daily Scrum?”  
  
“What will you do before the next Daily Scrum?”  
  
“What impediments are in your way?”
- This meeting will help team to involved and synchronize in the work of each other (Cervone, 2011; Marlon Luz et al., 2009).

Marlon Luz et al., (2009) consider the Sprint Review meeting ceremony as the last ceremony of iteration and divided it into two parts: first part is related to product owner and stakeholder by presenting the work done, so the stakeholders can check the increasing in the work. The second part of this ceremony according to scrumalliance (2013) is called "Sprint retrospectives", in this part the team reviews and looks for ways to improve the product, techniques and the process used in past sprint.

Note: Cervone (2011) referred to ceremony as process and divided it into five major activities as he added the kickoff, and the sprint.

The three scrum artifacts:

- Product Backlog: create by product owner, its wish list and ideas for the product (cannot be changed until the next sprint planning meeting).
- Sprint Backlog: A small chunk from the product backlog that the team agrees to complete in a sprint.
- The Burn down Chart: Its chart to show the amount of work estimated to finish the tasks planned and this will help in transparency and visibility.

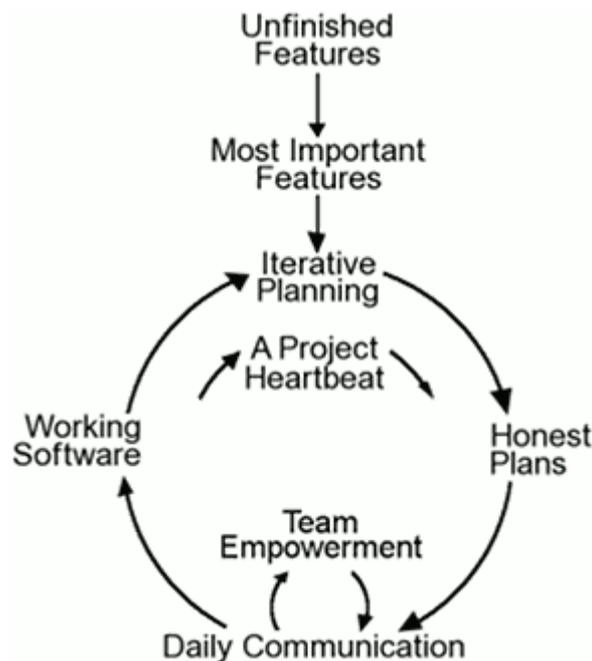
(Marlon Luz et al., 2009; scrumalliance, 2013).

### 2.5.4 Examples of lightweight methodology (Extreme Programming)

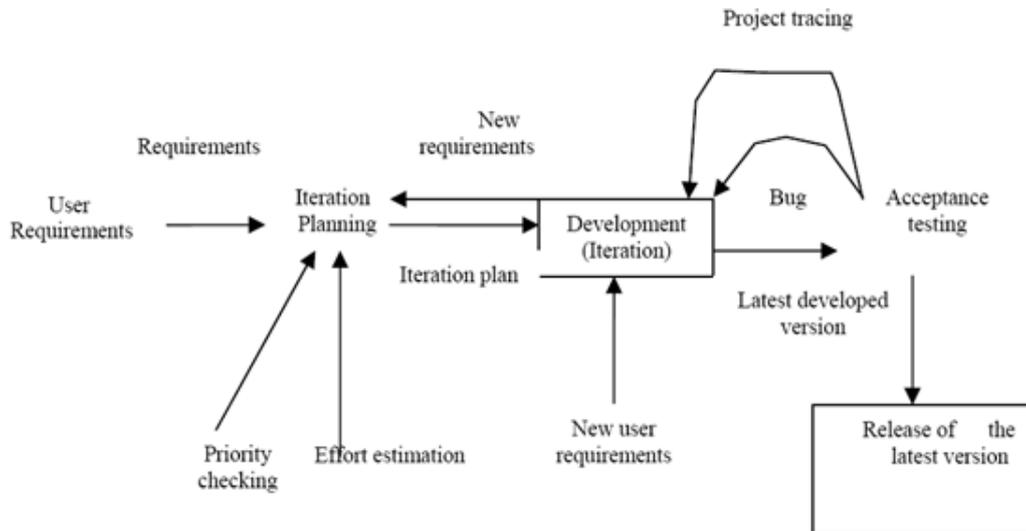
Many papers discussed the importance of XP programming and its relation with agile manifesto. Sheetal Sharma, Darothi Sarkar and Divya Gupta (2012) mentioned that it is one of the most successful methods and Lowell Lindstrom and Ron Jeffries (2004) mentioned it's widely used.

Wells (2013) and Lowell Lindstrom and Ron Jeffries (2004) described extreme programming as one popular agile process. Many studies mentioned that XP programming focuses on customer satisfaction.

(Lowell Lindstrom, Ron Jeffries , 2004; Sheetal Sharma et al., 2012).



**Figure 8** :Extreme Programming (Wells, 2013)



**Figure 9** :Method of development Agile Process using Extreme Programming (Sheetal Sharma et al., 2012).

From the previous figures (09 & 10) and with reference to Lowell Lindstrom and Ron Jeffries (2004) the researcher defined Extreme Programming as a discipline and process of software development which stresses on customer satisfaction (the customer sit with the team daily) and emphasizes five values that improve software project. The values are Simplicity, Communication, Feedback, Courage and Respect so whole team become highly productive.

Gathering requirements is first step in extreme programming and depending on this step the team decide the next phases as the requirements are divided into iterations, each iteration contains small set of requirements, and one of the major advantages of extreme programming is that it will except changes during iteration, and after finishing the development in

iteration it is passed to testing process and if any bugs appeared it would removed in next iteration (Lowell Lindstrom, Ron Jeffries , 2004; Sheetal Sharma et al., 2012).

Also tracing should be done after finishing each iteration and getting approval. And this feedback is to ensure that the project is on track (Lowell Lindstrom, Ron Jeffries , 2004).

Therefore extreme programming has introduced the following things to developers and team:-

1. The team believes continuous integration, code ownership and shares a common and simple picture of what the system looks like.
2. Developers work in pair programming and in open workspace, coding standard, extensive code review and code refactoring.
3. Simple design, test-driven development and design improvement are considered as core practices for XP.

(Lowell Lindstrom, Ron Jeffries , 2004; Sheetal Sharma et al., 2012).

Finally, from Lowell Lindstrom and Ron Jeffries (2004) I quoted the following expression which I think summarizes the values and practices of XP methodology "Be together with your customer and fellow programmers, and talk to each other."

Figure 10 and description from Lowell Lindstrom and Ron Jeffries (2004) show the practices of XP.



**Figure 10** :XP Practices and the Circle of life (Lowell Lindstrom, Ron Jeffries , 2004).

- The inner circle: represents the role of the programmers. (simple design, pair programming and heavy testing to improve the results).
- The outer loop: represents the relation and planning between customers and programmers (planning done by whole team and they answer the main questions "what will be accomplished by the due date, and determining what to do next.").
- The middle loop: represents feedback, communication and coordinate to deliver software with needed features and quality by collective ownership, coding standard, metaphor, continuous integration and sustainable pace.

## **2.6 General features of agile software development methods**

In their review and analysis publication Pekka Abrahamsson et al., (2002) present three points:

- They define and classify agile software development approach
- They present analysis for ten agile methods (that are classified as agile according predefined criteria)
- They highlight the similarities and difference between these ten methods

He also presented table 2 that summarized ten agile methods depending on key points, special features and identified shortcomings.

**Table 2 General features of agile software development methods (Pekka Abrahamsson et al., 2002).**

Method name	Key points	Special features	Identified shortcomings
ASD	Adaptive culture, collaboration, mission-driven component based iterative development	Organizations are seen as adaptive systems. Creating an emergent order out of a web of interconnected individuals.	ASD is more about concepts and culture than the software practice.
AM	Applying agile principles to modeling: Agile culture, work organization to support communication, simplicity.	Agile thinking applies to modeling also.	This is a good add-on philosophy for modeling professionals. However, it only works within other methods.
Crystal	Family of methods. Each has the same underlying core values and principles. Techniques, roles, tools and standards vary.	Method design principles. Ability to select the most suitable method based on project size and criticality	Too early to estimate: Only two of four suggested methods exist.
DSDM	Application of controls to RAD, use of timeboxing, empowered DSDM teams, active consortium to steer the method development.	First truly agile software development method, use of prototyping, several user roles: “ambassador”, “visionary” and “advisor”.	While the method is available, only consortium members have access to white papers dealing with the actual use of the method.
XP	Customer driven development, small teams, daily builds	Refactoring – the ongoing redesign of the system to improve its performance and responsiveness to change.	While individual practices are suitable for many situations, overall view & management practices are given less attention.

FDD	Five-step process, object-oriented component (i.e., feature) based development. Very short iterations: from hours to 2 weeks.	Method simplicity, design and implement the system by features, object modeling.	FDD focuses only on design and implementation. Needs other supporting approaches.
OSS	Volunteer based, distributed development, often the problem domain is more of a challenge than a commercial undertaking.	Licensing practice; source code freely available to all parties.	OSS is not a method itself; ability to transform the OSS community principles to commercial software development.
PP	Emphasis on pragmatism, theory of programming is of less importance, high level of automation in all aspects of programming.	Concrete and empirically validated tips and hints, i.e., a pragmatic approach to software development.	PP focuses on important individual practices. However, it is not a method through which a system can be developed.
RUP	Complete SW development model including tool support. Activity driven role assignment.	Business modeling, tool family support.	RUP has no limitations in the scope of use. A description how to tailor, in specific, to changing needs is missing.
Scrum	Independent, small, self-organizing development teams, 30-day release cycles.	Enforce a paradigm shift from the “defined and repeatable” to the “new product development view of Scrum.”	While Scrum details in specific how to manage the 30-day release cycle, the integration and acceptance tests are not detailed.

## 2.7 Measuring agility

Many approaches have been proposed to quantify agility DATT (2009) in his Doctoral Dissertations "METRICS AND TECHNIQUES TO GUIDE SOFTWARE DEVELOPMENT" he proposed a metric that will help to solve the common problem in software development, which is the methodology that project manager should adopt to develop the project. The metric was Agility Measurement Index (AMI). This index depends on the following dimension: Duration (project duration from inception until delivery deadline), Risk (mission criticality like patient monitoring system), Novelty, Effort, and Interaction.

The Agility Measurement Index (AMI) is formally defined as:

$AMI = SA/SM$  where SA = Sum of the actual scores for each dimension and SM = Sum of the maximum scores for each dimension. And the Specific Dimension (SD) for each dimension as the ratio of actual score and max score. Table 5 is an example.

**Table 3 Agility Measurement Index**

Dimension	N(Min)	X(Max)	A	SD A/X
Duration	1	3	1.5	0.5
Risk	1	5	2.5	0.5
Novelty	1	4	1	0.25
Effort	1	6	5	0.83
Interaction	1	10	7	0.7

Based on the above formula, a low value of AMI means that waterfall will be a suitable methodology for a given project and a high value of AMI

means that agile will be a suitable methodology for a given project and with reference to SD project manager can determine which agile methodology fit the given project.

A Fuzzy Based approach was suggested by (Kurian, 2013) for estimating agility of an embedded software process. This approach uses project velocity as metric for agility (Pv1 project velocity without change in requirements and Pv2 with change in requirements). The parameters contribute in velocity are Technical Complexity, Documentation, Programmer Capability, Risk Impact, Testing and Deadline. In addition to requirements change for Pv2.

The researcher also found that there are many agile self-assessments tools and checklists to determine whether or not a team is using agile practices (Linders, 2014).

From the above review the researcher found that delivery iterations, documentation, communication, testing, requirements, culture, planning, quality, technical practices and user accessibility are major attributes to assess agility.

Therefore and as the researcher framework aims to find if there is impact for software project management methodology on customer satisfaction, the researcher will try to find the best way that will allow the customer to know if the software delivered was managed by agile or waterfall methodology. After comparing the above attributes with agile manifesto he

found that many of them were a like such as response to change, documentation, customer involvements, individual and interactions and working software. So the researcher will adopt approach depending on agile manifesto to know if the software delivered was managed by agile or waterfall.

## **2.8 Related Study**

In this section the researcher tried to find how other researchers measure customer satisfaction in software industry and what they believe regarding software management methodology and its impact on customer satisfaction and customer satisfaction attributes. He also tried to find what the attributes affect on customer satisfaction were and how agility was measured in software.

As in all industries customer satisfaction is very important for software industry. Explosive growth in this industry, lead to competition between a huge numbers of firms. This competition and to achieve good percentage in market share, gain new customers and retain current customers, the firms and software developers should focus on customer satisfaction. They should work to meet customer needs and expectation to achieve higher customer satisfaction and to consider customer satisfaction as measure of software quality (Jung, 2007; Sunder Kekre, Mayuram S.Krishnan, Kannan Srinivasan, 1995).

So in the context of this study and after reviewing the importance of customer satisfaction, it's important to know where critical success factors exist (in which software management methodology) because these CSFs will lead to project success and customer satisfaction. Critical success factors defined as "the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department, or organization. CSF's are the few key areas where 'things must go right' for the business to flourish and for the managers goal to be attained" (Tsun Chow, Dac-Buu Cao, 2008). Tsun Chow and Dac-Buu Cao (2008) mentioned that the attributes of success for a particular project are Quality, Scope, Timelines and Cost.

Jung (2007) and Sunder Kekre et al. (2007) mentioned that listen to customer voice, take the feedback from customers and identify priorities are major attributes of quality that will increase customer satisfaction. Further H.Kan (2003) and Jung (2007) mentioned that there is relation between software quality and customer satisfaction because the definition of software quality consists of two dimensions product quality and customer satisfaction.

Arash Shahin, Ali Asghar Abandi and Mohammad Hosein Moshref Javadi (2011) in thier research "Analyzing the Relationship between Customer Satisfaction and Loyalty in the Software Industry - With a Case Study in Isfahan System Group" mentioned that he used quality factors to assess customer satisfaction.

And Nafees (2011) mentioned that "Quality in use becomes a more permanent driver of customer satisfaction as the customer begins to routinely use the software".

The quality attributes in software industry discussed in many articles.

ISO/IEC 9126 (Software Product Quality) defined a series of documents on software product quality consisting of 120 measures for measuring characteristics, sub characteristics of software product quality. ISO/IEC 9126 main characteristic (FUNCTIONALITY, RELIABILITY, USABILITY, EFFICIENCY, MAINTAINABILITY, and PORTABILITY) (Alain Abran, Rafa Al-Qutaish, Juan Cuadrado-Gallego, 2006; Jung, 2007). Description and sub characteristics are available on <http://www.cse.dcu.ie/essiscope/sm2/9126ref.html>. Also a revision happened on ISO/IEC 9126-1, the new version called ISO/IEC 25010 (Isi Castillo, Francisca Losavio, Alfredo Matteo, Jorgen Boegh, 2010) and in reference to draft version from ISO/IEC (2013) it provided interoperability and security to the characteristics mentioned before (Isi Castillo et al., 2010).

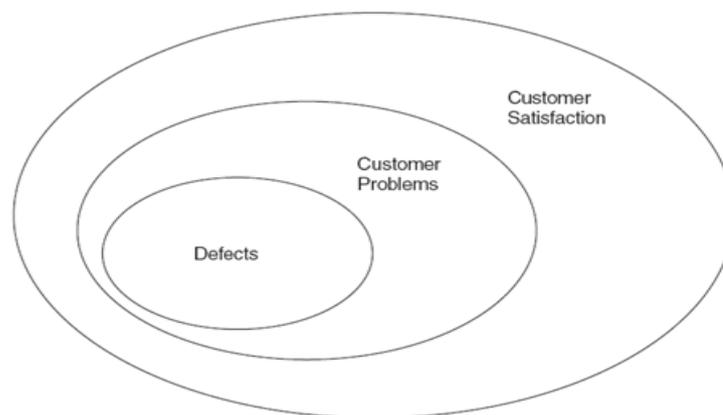
Also SUMI that a solution method for measuring software quality from the end user's point of view consists of a questionnaire that measures affect of efficiency, learnability, helpfulness and control on customer satisfaction (TANJA ARH, BORKA JERMAN BLAŽIČ, 2008).

Moreover Hayes (2008) in his book "Measuring Customer Satisfaction and Loyalty Survey Design Use and Statistical Analysis Methods" and Sunder

Kekre et al., (1995) in his Paper "Drivers of Customer Satisfaction for Software Products: Implications for Design and Service Support " that he did in IBM laboratory in Canada, confirmed and added some points to quality attributes. So the researcher can summarize the quality attributes in software industry as follows:-

1. Correctness: The degree to which software meets client specifications. Does the software can complete the needed job?
2. Testability: Resources needed to test the software to ensure that this software performs intended functions, so if the customer or tester can do the testing within a short time and in an easy way then software quality increase.
3. Portability: If the system can be transferred and configured in different hardware and software environments easily then quality of system will increase.
4. Interoperability: The effort required to integrate the system with other systems should be minimized to increase the rate of quality.
5. Intra-operability: To increase software quality the modules and components in the same software should be easily configured.
6. Reliability: The degree to which the software performed intended functions correctly and with precision.

7. Usability: The software is considered usable if I can understand and learn the functionality of the system easily and in short time. Usability can increase by help, documentation and examples. Customer can develop negative attitude toward system if he face complexity in understanding the system and this will affect overall satisfaction.
8. Maintainability: To increase software quality the effort required to find, diagnose and fix an error should be in minimum because this will minimize the disruption of service on client side. And in general H.Kan (2003) mentioned that "short fix response time leads to customer satisfaction and fix quality". He also presented the relation between defects, customer problems and customer satisfaction by Venn diagram below.



**Figure 11:** Venn diagram (H.Kan, 2003)

9. Flexibility: The software system is considered flexible if I can modify it easily and within a little effort.

10. Installability: The effort and time needed to install the software should be in minimum, so the firms provided user interface to facilitate the installation process.
11. Performance: Response time in performing functionality is a critical attribute in customer satisfaction, so the software architecture should improve this point by optimal use of different resources in software and hardware.
12. Documentation: Good documentation is very important for software, because it improves efficiency in using the system. Examples of documentation are test document, design chart and user manual.
13. Overall satisfaction: In general I'm happy with this software so this software meets my expectation.

Denning (2013) in his commentary from Communications of ACM mentioned that the approach to define software quality that depends on executing list of process (clear and comprehensive requirements ,formal specification for the requirements, build system according requirements, implement the software that meet system requirements) is not enough to deliver software with needed quality. He suggested reforming the question "what is software quality" to "How do we satisfy the customers of our software", so he gave the customers the main role to judge software, because assessment of software is based on customers and their experience.

So the greater the level of customer's satisfaction is the more likely it will be dependable software and has good quality.

And before discuss other attributes that impact customer satisfaction it's important to highlight what Sfetsos Panagiotis and Stamelos I (2010) mentioned, they argued that software quality attributes improved when implement agile practices correctly.

But what are other attributes effects on customer satisfaction in software industry?

Tsun Chow and Dac-Buu Cao (2008) mentioned that the CSFs in software projects are:

1. The fundamental project management techniques
2. Combination between software engineering and business strategy
3. Development life cycle
4. Estimation and Validation
5. Executive management Support
6. Resources and Strategic-level planning

Sriram Narayanan, Sridhar Balasubramanian and Jayashankar M. Swaminathan (2011) added project planning, team stability and communication skill as attributes which affect significantly customer satisfaction and project performance.

Choon Seong Leem and YongKi Yoon (2004) mentioned that there are many studies that evaluate software from development process point of view and they suggested a model to evaluate software from customer point of view. their results were that current models are not suitable to assess customer satisfaction from the product and related services. He mentioned that the level of customer satisfaction should reflect and represent the degree of response to customer opinions about product and its related service. Carroll (1995) noticed that if customer needs are not achieved then the system is considered failure system even it achieved tech requirements, and he considered customer satisfaction as one of the major quality dimensions. He added that achieving customer needs could be reached by understanding customer requirements, user's involvement in system design, providing high quality service to the customer and concentration on human factors (communication, management and workers) to help in understanding business requirements and to stabilize and improve the development process as it cause the most quality problems. So human factors were considered as complements to the technical aspects of quality.

Results and recommendations Buresh's (2008) research are very important for any researcher who wants to study the relation between customer satisfaction and software development methodology. He discussed the relation between customer satisfaction as dependent variable, and three independent variables (product quality, project team effectiveness, project management effectiveness) the dummy variable was

zero for traditional methodology and one for agile methodology. The result of Buresh's (2008) study was that there were no significant statistical differences (when participants know the methodology) in customer satisfaction even in use or results of agile or plan-driven (traditional) methodology at 95% confidence level.

But Mann C. and Maurer F. (2005) in their case study "A case study on the impact of scrum on overtime and customer satisfaction" showing that the empirical results of the case study introduced that the customer satisfaction increased when using Scrum methodology which is considered as one of the main lightweight methodology.

Sriram Narayanan et al. (2011) found that project performance, project planning, communication effectiveness, and team stability that has a positive effect on customer satisfaction are more consistent with recent software development methodologies (agile methodologies) because it rapidly response to changing in market, also recommended that the researchers should be more sensitive regarding the findings that related to the tension between uncertainty management (usually tackled waterfall model) and the need to be agile in some contexts.

And communication was considered important success factor to manage change in project scope and team, also communication was improved when software project managed by XP and Scrum practices (M. Pikkarainen, J. Haikara, O. Salo, P. Abrahamsson J. Still, 2008).

Also productivity and quality were improved with agile practices (Ahmed A et al., 2010).

Amran Hossain and Dr. Md. Abul Kashem, Sahelee Sultana (2013) considered the ability to respond to customer satisfaction and changing in requirements as main advantage for agile methods and they concluded that agile methodologies try to enhance software quality by increase customer value without forget other quality attributes and critical success factors like closing the project within time and budget.

It's also important to mention that there are little empirical researches to prove that agile methodology yields customer satisfaction higher than plan driven methodology (Buresh, 2008).

As a conclusion the researcher, and based on state of art, found that there is a relation between customer satisfaction and software quality attributes, project management methodology, project performance, project planning, communication effectiveness, team stability, human factor, customer involvement, quality of development process, achieving customer need and customer opinions about product and its related service.

And table 4 summarized what the researchers said about the factors that affect on customer satisfaction.

**Table 4: Factors effect on customer satisfaction.**

Researcher	Quality	Project management methodology	Team stability	Communication skill	Project Management effectiveness	customer involvement
(Sunder Kekar et al, 1995)	X					X
(Jung, 2007)	X					X
(H.Kan, 2003)	X					
(TANJA ARH, BORKA JERMAN BLAŽIČ, 2008)	X					
(Arash Shahin, Ali Asghar et al., 2011)	X					
(Hayes, 2008)	X					
(Denning, 2013)						X
(Sriram Narayanan et al., 2011)*		X	X	X	X	
(Tsun Chow, Dac-Buu Cao, 2008)	X				X	
(Choon Seong Leem, YongKi Yoon, 2004)						X
(Carroll, 1995)	X		X	X	X	X
(Mann C.,Maurer F., 2005)		X				
(M. Pikkarainen et al., 2008)				X		

\* Mentioned project planning as one of attributes that affect customer satisfaction and the researcher classified it in under project management effectiveness as project management effectiveness cover project planning (Buresh, 2008).

\* More details about attributes effect on customer satisfaction are available in the above paragraph.

Sriram Narayanan et al. (2011) and Carroll (1995) considered communication skill as attributes effect on customer satisfaction. M. Pikkarainen et al. (2008) considered communication major success attribute to manage change in scope and team, so it has positive impact on customer satisfaction. While other reserchers considered customer involvement as attribute that affects customer satisfaction (Carroll, 1995; Choon Seong

Leem, YongKi Yoon, 2004; Denning, 2013; Jung, 2007; Sunder Kekre et al., 1995). Buresh (2008) defined project team effectiveness as the attribute that deal with human factor in project that include professionalism of team , responsiveness to customer issues availability of team to response to customer notes. So the researcher can set communication skill and customer involvements under one attribute that defined as project team effectiveness.

Many researchers discussed project management effectiveness (Carroll, 1995; Sriram Narayanan et al., 2011; Tsun Chow and Dac-Buu Cao, 2008). So the researcher from brief literature review presented project management effectiveness as "is delineated to include primarily the activities of project planning and execution and the assessment of how the project management objectives have been complied with" (Morrison J., Brown C., 2004).

Buresh (2008) cited from Kerzner (2006) and summarized project management effectiveness to answer the set of questions related to budget, obligation to project and time frame assessment for project time and project planning from the beginning to the end.

Sriram Narayanan et al. (2011) and Carroll (1995) tackled team stability, so in reference to (Rebecca J. Slotegraaf, Kwaku Atuahene-Gima, 2012) who cited from (Abbie Griffen, John R Hauser, 1992) the definition of team as "a group of people from different functions who are responsible for the management and coordination of the NPD project" and team stability

"refers to the extent which the core members of a cross-functional team remain for the duration of the project, from project approval to product launch". And there is positive relationship between team stability and the ability to manage and recognize risks because new team members are less capable to take corrective actions as they didn't recognize problem in early stage, as sharing knowledge and mutual understanding increase when team is stable (Sriram Narayanan et al., 2011).

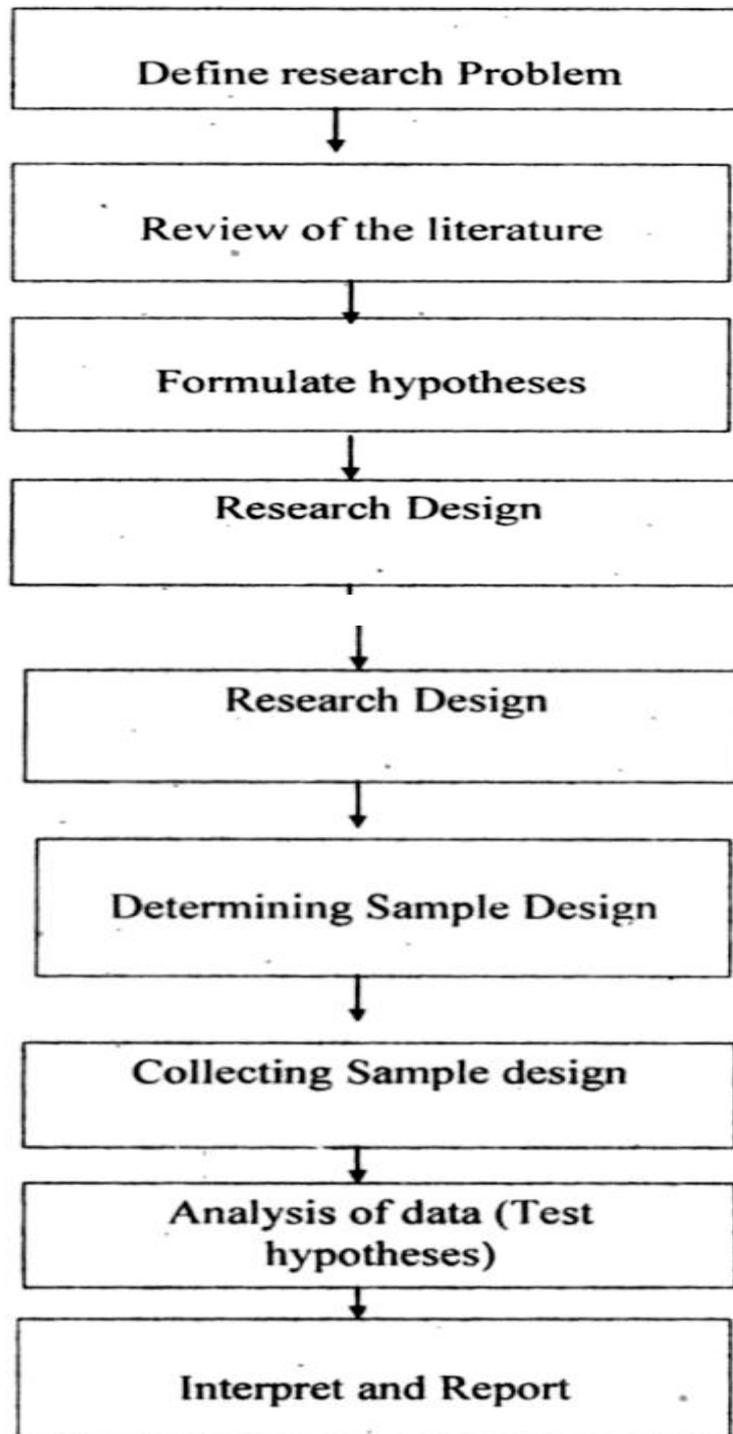
## **Chapter Three**

### **Research Methodology**

In this chapter the researcher presented research method that was used to verify the research problem.

In addition the researcher identified the research population and identified the criteria used to select population and the way the researcher followed to select sample, and what were the validation approaches that the researcher followed to validate framework, population, samples and results.

As a summery Sekaran (1992) and Kumar (2008) steps were followed to solve research problem. After observing and identifying the problem, the researcher started with theoretical framework to investigate the background the area of study, define hypothesis, research design, sample, analysis and finally interpret and report.

**RESEARCH PROCESS**

**Figure 12:**Research Steps (Kumar, 2008)

The researcher discussed the two main types of research paradigms that have different approaches to empirical studies: Qualitative research and Quantitative research (Reidar Conradi, Alf Inge Wang, 2003).

### **3.1 Qualitative research**

Qualitative research is studying objects in their natural setting (Reidar Conradi, Alf Inge Wang, 2003). So during the interpretation of the phenomenon the persons are asked to evaluate object, as this evaluation and explanation of phenomenon depend on persons, the differences in interpretations will be accepted (Creswell, 2003). Level of details is taken and other aspects emerge during the study. In qualitative research several methods for data collection are available like open-ended observations, interviews, and documents. The qualitative research reflects personal biography and how it shapes the study.

### **3.2 Quantitative research**

Quantitative research is to test and investigate hypotheses and claims that the researcher generates and develop knowledge, and this done by suitable instruments that generate statistics data (Creswell, 2003). The quantitative research is concerned with quantifying a relationship, comparing between groups, promoting statistical analysis, and finding the relation between variables. Therefore it identifies a cause-effect relationship. So using quantitative research helped the researcher to test his

hypothesis and identify cause and affect relationship (Reidar Conradi, Alf Inge Wang, 2003).

### **3.3 Research Methodologies in software engineering**

It's very important to study the available research methodologies in software engineering domain, as software engineering is not only about tech solution but it also extends to cover organizational issues, project management and human behavior to choose that which is compliant to research questions (Reidar Conradi, Alf Inge Wang, 2003).

Reidar Conradi and Alf Inge Wang (2003) introduced four research methods that will help decision maker in software engineering to clarify scientifically whether something is better than something else. The methods were Controlled experiments, Case studies, Survey and Postmortem analyses. Also literature review is used in software engineering (Pearl Brereton, Barbara A. Kitchenham, David Budgen, Mark Turner, Mohamed Khalil, 2007). Also Kvale (1996) mentioned that the researchers can use qualitative researches and it help to "try to understand something from the subject's point of view and to uncover the meaning of their experiences".

Note: It's very important to mention that the researcher could use more than one method to have more than one source of information, thus these methods complement each other not compete with each other. It's also important to know why the researcher should use empirical methods in

software development, because human aspects are very important in software development so that makes very difficult to use analytical approaches (Reidar Conradi, Alf Inge Wang, 2003).

### **3.4 Selected research methodology**

As the researcher aims to find causality and the effect between research variables, so this explanatory study concentrated to eliminate plausible rival hypotheses (Martin Terre Blanche, Kevin Durrheim, Desmond Painter, 2006).

The researcher started with literature review so he studied and did heavy literature review and reviewed state of arts from comprehensive data bases to cover research title and terms like customer satisfaction and software project management methodology. Through these literature reviews the researcher has gained a good background about problem elements and has highlighted the motivations for answering the research question.

After literature review the researcher adopted an approach which is a combination of qualitative research (help to answer research questions and to validate the framework that will be used to collect quantitative data) and quantitative research (to answer research questions by collecting empirical data) for this purpose, survey will be the best selection as it will help to perform backward- and/or a forward- looking investigation from a respondents and unbiased sample. So this Cross-Sectional study allowed the researcher to collect data about problem variables at one point of time,

so he was capable to uncover the relationship between study variables (Kumar, 2008).

### **3.5 Credibility of study**

The definition of credibility in Merriam-Webster (2014) dictionary was "the quality of being believed or accepted as true, real, or honest" so the researcher going to increase trustworthiness and reducing the possibility of getting the answer wrong and this can be done by checking reliability and validity when designing the survey (Mark Saunders, Philip Lewis, Adrian Thornhill, 2009).

#### **3.5.1 Reliability**

Mark Saunders et al. (2009) stated that reliability" refers to the extent to which your data collection techniques or analysis procedures will yield consistent findings". Also Mark Saunders et al. (2009) quoted from (Mark Easterby-Smith, Richard Thorpe, Paul Jackson, Andy Lowe, 2008) that reliability is concerned with three questions. The first one is that will the measurement tools yield the same results in another time with the same environment? Second: Will the similar results and observation yield to other researcher? Third: is there transparency in interpretation of raw data? Therefore, the researcher should know how to test reliability and in reference to Mark Saunders et al. (2009) he quoted from (Mitchell, 1996) that the common approaches to assessing reliability are test re-test, internal consistency and alternative form.

And the researcher should not forget comparing the data collected with data collected from other resources like interview and literature review.

In this research the researcher are going to compare the results collected from questionnaire with data collected from interviews and literature review and will highlight the controversial and harmonic points. Regarding other approaches like Test re-test will not use because this needs respondents to fill questionnaire twice and this may create difficulties for respondents (Mark Saunders et al., 2009). And regarding alternative form also will not use because it increases the length of the questionnaire (Mark Saunders et al., 2009). Instead of the above two approaches the researcher calculated Cronbach alpha as a coefficient of internal consistency to measure internal consistency to assess reliability, and in reference to Reg Dennick and Mohsen Tavakol (2011) before the survey employed, the researcher performed internal consistency test to ensure validity depended on pilot study. The values of Cronbach alpha were displayed in table 5.

Reliability Statistics (Cronbach's Alpha)

**Table 5 :Cronbach Alpha on pilot results**

<b>Attributes</b>	<b>Cronbach's Alpha</b>	<b>Cronbach's Alpha Based on Standardized Items</b>	<b>N of Items</b>
Measuring Agility	.676	.678	5
Quality	.838	.843	13
Team stability	.029	.029	2
Team Management effectiveness	0.826	0.861	3
Project Management	0.870	0.879	9

In reference to Aiken (2006) if Cronbach alpha is greater than 0.6 it is acceptable in many marketing studies, so the reliability of research questionnaire is acceptable for Measuring agility, Quality, project team effectiveness and project management effectiveness. Regarding team stability it could be due to a low number of questions (there were two questions), due to heterogeneous construct of questions, or due to sample size as key point effect on reliability because it has significant impact on accuracy of Cronbach alpha (Adam Duhachek, Anne T. Coughlan and Dawn Iacobucci, 2005; Reg Dennick and Mohsen Tavakol, 2011). To address these points, the researcher refined the questions to be clearer and more homogenous, and regarding sample size, the above calculation was done on sample size 15 as pilot study, this point will be covered in real analysis because sample size will be greater than pilot study.

### 3.5.2 Validity

Reference to Mark Saunders et al. (2009) validity "is concerned with whether the findings are really about what they appear to be about." To be able to determine validity, researcher follow some steps like asking series of questions, and taking a look on state of art (Golafshani, 2003) An example of question is if the instrument can measure what it intended to measure. The answer and in reference to Salwa Ammar, David Moore and Ronald Wright (2008) surveys are commonly used for evaluating customer satisfaction, then the researcher should validate if the questions in the survey can answer the main research question (if there is relation between software project management methodology and customer satisfaction) and to answer this question the researcher followed two approaches. Firstly: the researcher reviewed state of art about the research variables and questions in a systematic way. Secondly: the researcher reworded the questions to cover research subject, by referring to experts in software industry to determine how them are suitable to answer the research question. The feedback from experts was that there were some questions which needed more justification and some questions needed to be more specific to avoid ambiguity. The main change in survey questions after they were reviewed by experts was that the questions should be in Arabic. The researcher reviewed and discussed the questions and variables in the survey with interviewees who also added their comments which the researcher took it in his account before circulate the final copy of survey.

In term of qualitative data, the researcher found semi structure interview will be the best choice to collect needed data based on (Willo Pequegnat, Ellen Stover, Cheryl Boyce., 2011). Regarding sample selection the researcher chose judgmental sample based on (Mark Saunders et al., 2009; WorldBank, 2013) and the Heterogeneous strategy based on (Mark Saunders et al., 2009). So in order to reach data saturation the researcher had six interviews with IT experts.

### **3.5.3 Generaliability**

Reference to Mark Saunders et al., (2009) generalisabiliy refers to external validity. This means to ensure whether finding and results of study are generalisable or not. In this study the probability sampling techniques was used to collect quantitative data (survey) and the researcher can generalize the collected data from a calculated sample back to a population (Jaames E. Bartlett, II, Joe W.. Kotrlik, Chadwick C.. Hiiggins, 2001.)

Referring to Figure (14) the data can be collected from the entire population so no need to sample. But to be more scientific and based on population size 198 and with confidence level 95% and confidence interval 5% the accepted sample size will be 131 (Surveysystem, 2013).

The first purpose of the study is to present collected data that belongs to relation between software project management methodology and customer satisfaction in a meaningful way by using descriptive analysis so no problem regarding generalization.

The second purpose is to use inferential statistics that allow the researcher to use collected data to make generalizations about the population by the estimation of parameter(s) and testing of statistical hypotheses.

#### **3.5.4 Pilot testing and assessing validity**

As mentioned before the researcher used pilot testing as this would help to refine the questionnaire and increase validity of questions and reliability of the collected data and based on this test the researcher can investigate if the data collected can answer research questions or not (Mark Saunders et al, 2009). Pilot testing will also help to find out the time needed to complete the questionnaire, to check that respondents understand filter questions or not (Mark Saunders et al., 2009).

The first step to go on pilot testing is to ask experts about the representativeness and suitability of questions (Mark Saunders et al., 2009). The researcher did this step in interview and he reworded questions to be suitable and valid to answer research questions.

To decide the participants and their number in pilot questionnaire there are many attributes that will be involved in this process like research questions, research objectives, research population, time and money available (Mark Saunders et al., 2009). In this thesis the sample of pilot study was 15, which is an acceptable number according to Mark Saunders et al. (2009) who cited from Fink (2003) that in student questionnaires the minimum number for a pilot was 10.

## **Chapter Four**

### **Collecting Data**

#### **4.1 State of the art**

As mentioned previously in selected research methodology.

#### **4.2 Interview**

##### **4.2.1 Objectives of Interview**

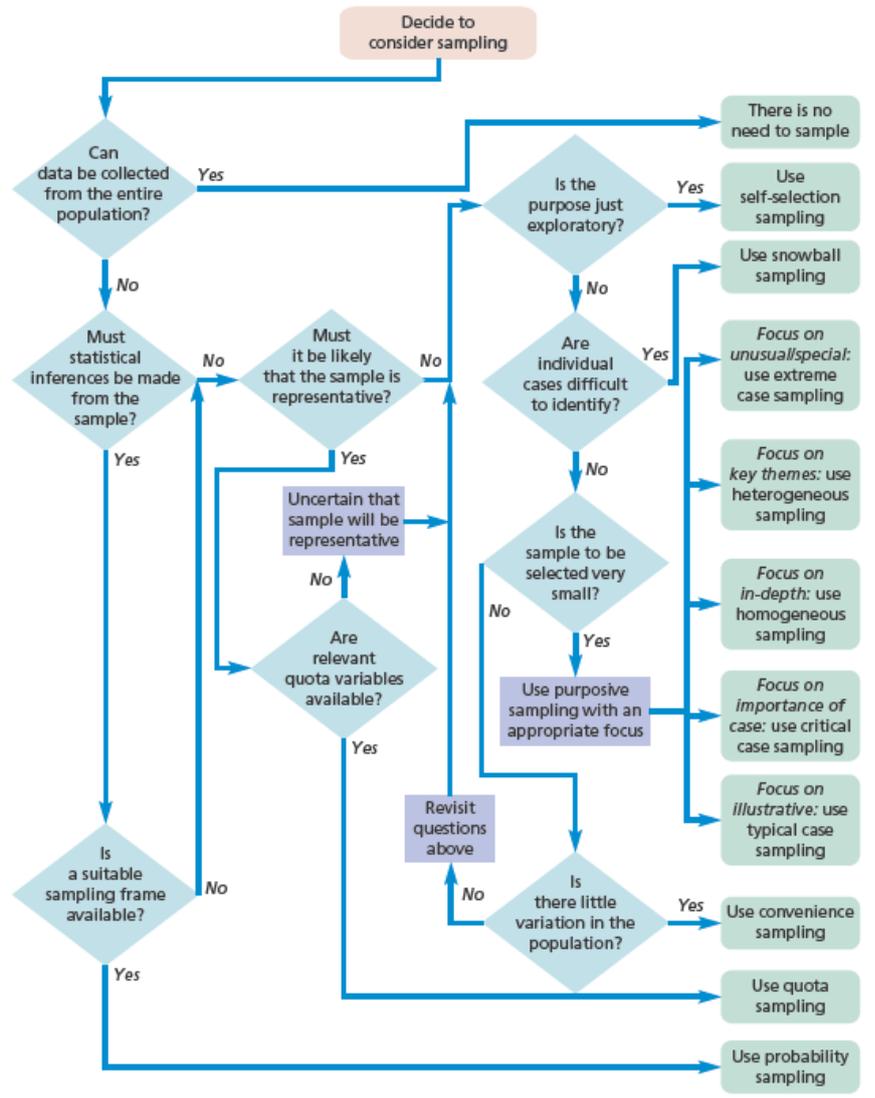
As previously mentioned in selected research methodology, the objective of interview will help to

1. Examine state of art about the research questions.
2. To validate framework by checking stakeholders understandability, if any ambiguity of attributes or questions and if there is missing attributes or questions.
3. To collect qualitative data from software project experts.

##### **4.2.2 Interview Design**

The researcher followed the guidelines from the previous definition of interview, characteristic, step to build successful interview and ethical issues. The interview was prepared to be semi-structured interview ("an individual interview with previously developed set of questions, but that allows for open-ended response, may also allow verbal interaction with interviewer" (Willo Pequegnat et al., 2011).

Selection process for interviewee was non random sampling passed on judgmental sample as the researcher have pre-determined criteria (WorldBank, 2013) and since the interview produce rich information and time consuming, so the number of interviewees selected were small and judgmental (Willo Pequegnat et al., 2011). In reference to Mark Saunders et al. (2009) Purposive sampling "enables you to use your judgment to select cases that will best enable you to answer your research question(s) and to meet your objectives." And the researcher know that this type of samples cannot be considered representative for population statistically (Mark Saunders et al., 2009), but as the researcher is not going to generalize depending on interview results so there is no problem for this concern (Mark Saunders et al., 2009). Furthermore many types of strategies represent purposive sampling, but selecting strategy should depend on how this strategy achieves research objectives. Therefore the researcher follows the guidelines in Figure (13) to select appropriate strategy which is Heterogeneous or maximum variation sampling that "enables you to collect data to describe and explain the key themes that can be observed" (Mark Saunders et al., 2009).



**Figure 13:** selecting non probability sampling technique

For the purpose of the research the researcher expected to reach saturation by doing 6 interviews with IT experts.

The interviews were with the following interviewees

1. CTO
2. Software development manager

3. Software development manager
4. Project manager
5. developer and sales man
6. Application Manager

The researcher started the arrangement for interview by email and after he found good response, he talked to interviewees to arrange for time and to deliver background about the subject.

And as mentioned before the interview was semi-structured and there was no time box for interview, Before starting the interview brief description about motivation, research questions and the objective of the interview were introduced, The interview questions were written before interview and discussion points and answers were registered, (Interview structure in appendix G). These questions were divided in to six groups. The first group was related to motivation of research. The second was related to interviewees background (position, experience), third related to software project management methodology and interviewee opinion about using agile manifesto to measure agility. The fourth was related to attributes that affect customer satisfaction. The fifth was related to research question if there is impact of project management methodology on customer satisfaction. Finally the six the group which was related to survey questions and this part will help to validate the survey. The results of all interviews

are discussed in chapter five. The interview questions were reviewed by experts, and also reviewed with my supervisor Dr. Baker.

### **4.3 Survey**

The researcher chose survey as one of research tools and as mentioned previously in (selected research methodology) this will help to perform backward- and/or a forward- looking investigation from a representative and unbiased sample as well as provide us with empirical data that will enable us to analyze it statistically. The target population should be relevant to survey subject and selected sample should be representative to the size of population.

#### **4.3.1 Objectives of the survey**

Objectives of the survey will be complement to the objectives of interview

1. To collect quantitative data that will be used to check the research hypothesis and help to answer research questions.
2. To identify relations between research variables.
3. To know which methodology is used in the West Bank from client perspective.
4. To analyze collected data to be able to generalize the results to all population.

### 4.3.2 Customer satisfaction measurement tool

Customer satisfaction measurement research methodology could be quantitative measurement (survey, structured questionnaire) to measure how much or could be qualitative (in-depth interview, focus group) to investigate the main attributes and features of subject from the perspective of stakeholders (Vavra, 2002).

According to Cacioppo (2013) customer answers are subjective answers and depend on the following:

- Moments of truth: The customer's own experience
- Word of mouth : The experience of other customers

Because the researcher is going to collect quantitative data as primary source of data, the survey will be the suitable instrument.

But is the customer satisfaction survey still suitable to measure customer satisfaction? According to ISO 9001: 2000 certified company, the customer satisfaction survey is required (Josu Takala, Amnat Bhufhai, Kongkiti Phusavat, 2006), also surveys are a commonly used instrument for evaluating customer satisfaction (Salwa Ammar et al., 2008) and as customer satisfaction is subjective and non quantitative state, Likert scale will be used to measure people attitude towards concepts or activities. The survey consists of series of statement, the respondent is asked to the level of agreement or disagreement to each statement. Each respond is given numerical score then scores are totaled to measure respondent's attitude

(Roger H et al., 1998). "often with five-ordered categories labeled 1 to 5— are typically defined by endpoints such as ‘not at all serious’ to ‘very serious’, ‘very unimportant’ to ‘very important’, or ‘strongly dislike’ to ‘strongly like’." (Regina Dittrich, Brian Francis, Reinhold Hatzinger, Walter Katzenbeisser, 2007).

The survey takers and their answers represent major attributes in the success of satisfaction survey process. Therefore it's very important for survey's designers to take the questions below into consideration:-

The first question is: How will the researcher use gathered information?

Any successful survey should have clear objective, the main objective is to provide an understanding expectations, requirements, satisfaction of customers. Additional objectives could be:

1. Send automated notifications to alert management to take corrective action after checking the trend over time and this can help to prevent the problem from elevating.
2. Determine what are the priorities and standards to follow to meet the findings.

The second question is: What should the researcher ask?

The question should yield accurate data to achieve the objective and help in making decisions. It should be specific and meaningful to determine dimensions of satisfaction to a specific product or service. If there are many

dimensions, they should be measured separately, as they can be aggregated later.

The third question is: What types of question should be included?

The questions should be able to examine and diagnose satisfaction gap between measuring perception of performance and expectation of performance by checking specific product or service attributes dimensions (Cacioppo, 2013; S. Aarthi, R. Sathiya Priya, 2012).

So the Survey should be able to measure:-

1. Overall satisfaction.
2. Satisfaction with individual attributes.
3. Satisfaction with the benefits of purchase.
4. Affective measures (like or dislike) for product or service from any information or experience about attribute.
5. Cognitive measures (fit or not fit) the requirements
6. Loyalty measure (likelihood of repurchasing)
7. Behavioral measures (consumer's experience and the probability to repeat that experience).

The above measurement should not be complex but easy to understand. The designer should avoid general questions. The measurement system

should be able to generate actionable reports for management and should be realistic to attach employee compensation with customer's satisfaction measurement results (Cacioppo, 2013).

### **4.3.3 Survey Design**

By taking the above advices into account and before publishing and delivering final questionnaire the researcher prepared a draft one as follow:

1. Questionnaire cover, after reviewed Bernard (2006) the cover consisted of

1.1.Purpose of the questionnaire is to explain the main idea of survey and to motivate the respondent to complete the survey and why the study is important.

1.2.Draw respondents attention to consider the following

1.2.1. Answer is for a single project.

1.2.2. Answer is for project a customer was involved in.

1.2.3. How long the respondents will take to complete the survey.

1.2.4. When the survey should be returned.

1.3.Ethical Issues (gratitude to participants and confidentiality of their information).

2. Survey Questions

The questionnaire consists of the following parts:

2.1.Participant's general information. This section contains data about participant's information and project.

This sections includes:

- The sector that the participants belong to.
- The role of participants in project.
- Type of project (customized or off the shelf).

(No need for personal information like gender, age, governorates, salary...etc as this data will not add value to results).

2.2. Check methodology adopted by checking level of agility in managing specific project as independent variable ((Buresh (2008) used Dummy variable 0 for plan driven and 1 for agile).

In this research agile manifesto was adopted to measure level of agility to be as independent variable. Measuring agility is considered a vital question in the survey, because the researcher is going to compare the results (level of satisfaction) with the type of methodology adopted.

2.3. The third part of the questionnaire will be used to measure customer satisfaction as dependent variable against four major customer satisfaction attributes (Quality, Team Stability, Team management effectiveness, and Project management effectiveness) that were discussed in literature review and interview.

3. The questionnaire was reviewed by experts and arbitrators in appendix E.

Final list of questionnaire was presented in appendix F.

Therefore, the first part of framework will contains questions based upon agile manifesto to know if the project developed based upon agile or waterfall methodology. The questions are presented below.

1. During project development you find the vendor concentrate more on team interaction and understanding than on procedures and tools.
2. During project development I was able to interact and communicate with vendor's project team by several ways (email, phone, face to face).
3. During project development, the vendor concentrate to deliver project achieve my requirements more than concentrate on what we agreed in documents when project started.
4. During project development, the company shares you with work details, achievements and obstacles.
5. During project development, development team accepted changes in requirements within project scope and handles them with concord on plan with business owner.

The second part consists of the following sections: (That their scales represent customer satisfaction).

1. Measuring software quality
2. Measuring team stability
3. Measuring project management effectiveness
4. Measuring team effectiveness

\*Note 1 In the survey the researcher concentrates on the main research question, the effect of project management methodology on major customer satisfaction attribute (Quality, team stability, Team effectiveness, project management effectiveness) so I recommended that other attributes that affect customer satisfaction are studied in a future research.

\*Note 2 There are many indicators and tools used to measure customer satisfaction like following sales volume, track and count complaints (Cacioppo, 2013). Also Key performance indicators for each department in companies can help in designing customer satisfaction measurement tool to highlight main attributes that achieve customer satisfaction (Reh, 2013).

#### **4.4 Research Population**

From the main research questions the researcher is going to find the impact of software project management methodology on customer satisfaction in the West Bank. Therefore the research population will be the clients who purchased customized software from IT companies in the West Bank, so to determine the population the researcher should know

1. The companies working in software industry in the West Bank.
2. Clients related to these companies.

#### **4.4.1 Companies working in software industry in the West Bank**

PITA as Palestinian Information Technology Association of Companies will be our data base for companies working in software industry.

As not all companies in PITA are interested in software development, the researcher adopted the following procedure to know the companies that work in software industry because their clients can answer the research questions.

1. The researcher studied list of firms registered in Palestinian Information Technology Association of Companies (PITA).
2. The researcher browsed business activities registered in PITA (Appendix A).
3. After he had reviewed the list and asked specialist in software industry, the researcher decided to exclude the companies related to business activities like outsource company, hardware distributers, internet...etc as companies under these titles are out of research scope and not interested in software development (Appendix B).
4. The available list of companies consists of 149 companies and after reviewing their profile in PITA site, their available websites, their clients and their specialty the researcher found 126 companies should be out of our study for the below reasons:
  - a. Companies belong to Appendix B.

- b. Companies registered under business activity related to software development but don't have clients in Palestine (outsource company)
  - c. Companies working specifically by selling off-the-shelf-products system.
  - d. The researcher excluded companies exist in Gaza strip because it's out of scope.
  - e. The researcher excluded the companies whose HQ are out Palestine.
5. After contact with passed companies by email, telephone or face to face, some companies replied and cooperated, some did not respond and some apologized for the below reasons:
- i. One company reported that it had bad situation and couldn't cooperate in the study.
  - ii. One company told me that it doesn't has clients in Palestine nowadays and the projects on their website were old projects.

So the final list of companies contained twenty one firm and these firms with their client's number are listed as A, B, C, D, etc in (Appendix C).

After the researcher knew the companies within the research scope, he should know the number of their clients and to accomplish this step, the researcher followed the below procedure:

- The researcher asked for this information from PITA, but they mentioned that these data are out of PITA mission scope.
- The researcher sent emails (Appendix D) to ask the companies about number of their clients who received customized software.
- The researcher received response from 15 companies.
- Regarding companies which did not respond to researcher's email, the researcher visited their web sites and counted their clients.

The final number of clients (research population) was 198 clients.

#### **4.4.2 Sampling Technique**

A common goal of quantitative research approach (survey) is to collect empirical and significant data representative for a population, and the researcher can generalize the collected data from a calculated sample back to a population (Jaames E. Bartlett et al., 2001.) And Jaames E. Bartlett, et al. (2001) cited from Ellood F. Holton and Michael F. Burnett (1997). “One of the real advantages of quantitative methods is their ability to use smaller groups of people to make inferences about larger groups that would be prohibitively expensive to study”.

And in reference to Marshall (1996) using probability sampling is the most common approach in quantitative research but the nature of population should be defined well and each elements should have the same chance of selection.

So determining sample size and dealing with non bias response are very important to enable reflecting the results to population (Jaames E. Bartlett et al., 2001) (Marshall, 1996).

In reference to Figure (14) below the data can be collected from the entire population so there is no need for sample. But to be more scientific and based on population size 198, confidence level 95% and confidence interval 5%. The accepted sample size will be 131 (Surveysystem, 2013).

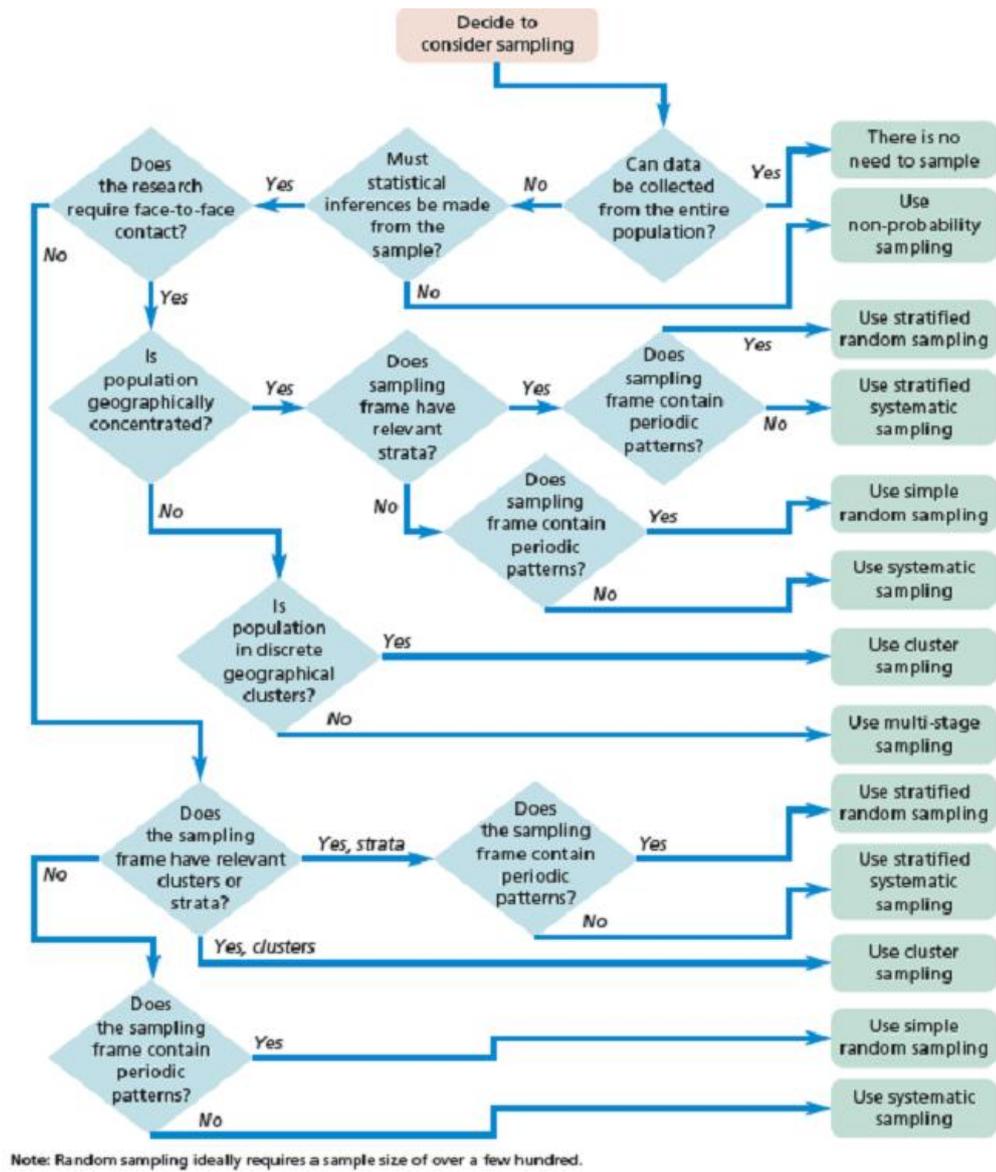


Figure 14 :selecting a probability sample (Mark Saunders et al., 2009)

## 4.5 Survey implementation

Based upon literature review and interviewees feedback the researcher had designed survey to pull the opinions of software customers about the methodology that IT firms adopted during project executions and how this methodology affected their client's satisfaction.

The researcher has implemented the questionnaire on internet, used electronic survey as the target respondents from different cities and in different sectors. He decided Google to implement the survey as it is a free tool and respondents didn't require any third application to fill the survey (only browser).

The researcher had arranged with firms to send survey to their customers. From 21 firms (whose customers represent population), 15 informed the researcher that they would cooperate by pass the survey to their customers. The other six firms didn't reply to his correspondence. So the researcher visited their web sites and collected all their customers and contacted them directly via phone, face book or email.

The researcher got 148 responses from 198 customers, this is an acceptable sample size and is considered representative at confidence level 95% and confidence interval 5% (Bilal M. Ayyub, Richard H. McCuen, 2003).

Data were collected smoothly and the respondent's confidentiality was taken in to account. The researcher followed up the survey daily to be sure that there were responses and that the survey was active for 30 days. And to increase response rate the researcher followed advices from (Mark Saunders et al., 2009) and (Martha C. Monroe, Damian C. Adams, 2012), like sending pre-survey contact, and avoiding any attached files to avoid viruses. The first follow up was in the first week. The second was after three weeks with rewording for email to emphasize importance of the

subject. The researcher also used social media to advertise by sending the hyperlink to Facebook and LinkedIn. (Appendix H for following survey).

#### **4.6 Response Rate**

Response rate is considered one of the questions that the researcher frequently asked, because high achieved response rate is considered more adequate to analysis and a less chance of significant response bias (Allen Rubin, Earl Babbie, 2009).

As mentioned before, the population was 198 customers and the needed sample size was calculated and was found to be 131.

The questionnaire was then forwarded to all population as the researcher could reach to all population (Figure 14), 148 customers filled in the survey, but only 133 were accepted. To be sincere all companies which produce only off-the-shelf product were excluded from population in the beginning, so to increase validity the researcher eliminated all participants who mentioned that they purchased off-the shelf products, and they were 15 responses.

Hence, the total response rate can be calculated by "Number of surveys returned divided by the number of survey that were set out and not returned as undeliverable" (Allen Rubin, Earl Babbie, 2009). It was found that the total response rate was 74% which is an acceptable response rate because Allen Rubin and Earl Babbie (2009) mentioned that 70% response rate consider very good in mail survey. Furthermore Michael D. Kaplowitz,

Timothy D. Hadlock and Ralph Levine (2004) in his study "A comparison of web and mail survey response rate" stated that online survey may be comparable to mail hard copy survey. So response rate 74% that was achieved on this research consider very well.

## **Chapter Five**

### **Analysis and Discussion**

The researcher adopted Qualitative and Quantitative research in this study. Therefore all the empirical data collected via the questionnaire and interviews is presented and analyzed to provide different points of view and complement each other.

#### **5.1 Interview Transcribe**

Documentation for data and process of data collection is the first guideline that is shared between different techniques for most approaches interested in analyzing qualitative data. The second guideline concentrates on categorization of data to concepts and theme. Finding the relation between concepts by connection of data is the third guideline. The fourth guideline is corroboration/legitimization by finding negative cases, searching and evaluating alternative explanations and disconfirming evidence. The fifth and last guideline is representing the report (Schutt, 2012).

The interviews were conducted over a period of one month. Before starting the interview, the researcher called suggested interviewees and introduced himself and clarified the objectives of the interview and the expected benefits from the results. The researcher called eight firms, six of them accepted and the interview scheduled one firm's representative apologize

because he was abroad and the other firm's representative told the researcher that he was busy and couldn't cooperate.

To be more flexible and uncomplicated the researcher will go through guidelines mentioned above to identify code, analyze and report the collected data.

The researcher transcribed the collected data and the main points jotted down during interviews as follow:

The first interview was with CTO with 18 years experience. The interviewee mentioned that his firm adopts methodology for management and he confirmed that management has impact on project success. He agreed with assumptions that software project differ from other projects because it's not tangible and it needs a lot of team work between supplier and customer.

Regarding risk management he confirmed that he has plan but not detailed (there is no clear procedure to evaluate risk and how to handle it).

When the researcher asked him about survey he agreed on the way of measuring agility based on agile manifesto. And also agreed on quality attributes and he confirmed that these attributes effect customer satisfaction, but he stated that some questions should be reviewed to be clearer for non technical persons and to understand better.

Regarding team stability, he agreed with assumption that the team should be stable because that affects customer satisfaction especially in agile methodology because the knowledge in agile is accumulative.

As for project management attributes, he added team coherence to other attributes which are scope, quality, plan and budget.

Regarding communication skills and communication channels, he confirmed that communication skills are very important attribute in both methodologies, and mentioned that the firm prefers formal communication channels because this keeps changes under control, while customer prefer informal communication.

The final questions was if he adopts a specific methodology because it achieves customer satisfaction, he mentioned and confirmed that selecting the right methodology from the beginning will lead to project success and customer satisfaction, so selecting the methodology depends on the characteristic of the project from the beginning.

In this interview the interviewee recommended that the researcher should distinguish between product and project, because project requirements are clear from the beginning and there is time frame, so he recommended using waterfall methodology. As the final functionalities in product are not clear from the beginning and time is flexible, the agile methodology will be the best choice.

The second Interview was with Software development manager with 13 years experience. The interviewee mentioned that his firm adopt methodology for management and confirmed that management has impact on project success and he also agreed with assumptions that software project differ from other projects because it's not tangible (service) and the final product is not clear from customer's perspective.

Regarding risk management he mentioned that he doesn't have a plan.

When the researcher asked him about survey he agreed with the researcher's way of measuring agility based on agile manifesto. He also agreed on quality attributes because they are standard. He confirmed that these attributes have effect on customer satisfaction, but he mentioned that some questions should be reviewed to be me clearer for non technical persons to understood better. He recommends translating the survey into participant's mother tongue.

And regarding team stability he agreed with assumptions that the team should be stable because that affect customer satisfaction.

And regarding project management attributes he agreed that the project manager should deliver project within agreed scope, quality, plan, and budget.

Regarding communication skills and communication channels, he confirmed that communication skills are very important attribute in both methodologies. He mentioned that the firm prefers formal communication

channels because this keeps changes under control. And regarding customer, he/she prefers informal communication channels.

In final question was whether he adopts a specific methodology because it achieves customer satisfaction. He mentioned and confirmed that selecting the right methodology from the beginning will lead to project success and customer satisfaction, so selecting the methodology depends on the characteristic of the project from the beginning.

The third interview was with software development manager with 8 years experience. The interviewee mentioned that his firm adopted a methodology for management and confirmed that management has impact on project success and that his firm adopted light methodology with pros of waterfall methodology. He also agreed with assumptions that software project differ from other projects because it's not tangible (service), there is higher customer involvement and management team needs soft skills, level of trust, marketing skills and knowledge base for HR issues related to resources.

Regarding risk management he mentioned that he doesn't have approach for risk management plan.

When the researcher asked him about survey he agreed with the researcher's way of measuring agility based on agile manifesto, but he asked for rewording of the questions related to communications attributes

because it differentiates between methodologies. The researcher updated the survey according to this note.

Regarding quality attributes he approved of them because they are standard. He confirmed that these attributes affect customer satisfaction. In addition to quality attributes he added informal communication, communication skills, customer involvement and delivery of product with agreed quality, cost and time as attributes which have effect on customer satisfaction.

And regarding team stability he agreed with assumptions that the team should be stable because it affect customer satisfaction.

Regarding communication skills and communication channels, he confirmed as company representative that the contact person should have very good communication skills. He mentioned that the customer prefers informal communication channels, but as a firm representative he prefers formal communication channels. He added that the professionalism of a team affects customer satisfaction, while development team communication skills do not affect customer because developers do not meet with customers.

The final question was whether he adopts a specific methodology because it achieves customer satisfaction, he confirmed that he selected agile methodology (Scrum) because there is more customer involvement, and so

there is more customer satisfaction. He argued that scrum methodology increases knowledge base.

In fourth interview the interviewee was a project manager with more than 10 years experience, After the researcher highlighted the purpose of the research and its importance, the interviewee mentioned that her firm adopted customized methodology for management because the market and management from customer's side doesn't follow the best practices in management all the time, and she agreed with assumption that management has impact on project success. She added that her firm adopts methodology close to agile because agile allows more customer involvement and avoids changes in last stage. She totally agreed with assumptions that software project differ from other projects because it's not tangible (service), and there is a lot of criss-cross in these types of projects and the customer doesn't know the real impact of the changes he asked. She stated that project manager should be able to react with these types of projects to win market and produce product.

Regarding risk management she mentioned that she has risk management plan starting from gathering products requirements, but the approach she adopted customized, not standard and depended on project.

When the researcher asked her about survey she agreed with him on the way of measuring agility based on agile manifesto.

Regarding quality attributes she approved of them because they are standard. She confirmed that these attributes affect customer satisfaction. In addition to quality attributes, closing the project within budget, scope and plan she added, the firm should take interest in customer's business and its continuity and that the relation with customer should be win-win. She also mentioned that the firm should concentrate on support and after sales service. She also provided the researcher with a survey she had used to measure customer satisfaction and most of the items support the survey that the researcher adopted.

Regarding team stability she agreed with assumption that the team should be stable during project life cycle because it affects customer satisfaction. Changes in the team are not plug\_and\_play, it have bad impact on project as whole and project manager can't replace resources easily as there are prerequisites to any resources like experiences, and sometimes project documents like (QA, SoW, Classes, and comments on code) may be unavailable or insufficient.

As for communication skills and communication channels, she confirmed their importance. She mentioned that the customer prefers informal communication channel and that she as PM can accept informal communications if there is no impact on project success factors otherwise she will ask for formal communications in a friendly way. Regarding the professionalism of team, it affects customer satisfaction, because it affects quality of product. She also mentioned that development team

communication skills also affect customer satisfaction because usually the developers not customer oriented.

The final question was whether she adopts specific methodology because it achieves customer satisfaction, she mentioned and confirmed that the methodology she adopted achieved customer satisfaction as she received positive feedback from customers and that she is working to improve it constantly based on customer feedback.

The fifth interview was with a developer (four years experience) and salesman (six years experience) who represent the same firm. After the researcher highlighted the purpose and importance of research, the developer claimed that his firm adopted agile methodology to manage projects as this methodology respond to changes in requirements. The software projects should have management methodology as any other project because methodology has impact on project success, but because software project has special characteristics, the agile will be the best methodology to manipulate these characteristics.

Regarding risk management he claimed that he has risk management but the approach he adopted was not standard and depended on project.

When the researcher asked about the way to measure agility, both the developer and the sales man agreed with researcher as this measurement tool depends on agile manifesto.

Regarding attributes that affect customer satisfaction, the sales man and the developer confirmed that functionality and quality of deliveries have major impact on customer satisfaction and should meet customer needs and that the customer will be more satisfied if the deliveries were more than customer expectations.

The interviewees approved of the quality attributes affect customer satisfaction because they are standard attributes.

They also agreed that the customer will be satisfied if the project is closed within budget, scope and plan.

As far team stability the developer and sales man agreed with assumptions that the team should be stable during project life cycle because it has effect on customer satisfaction.

Regarding communication skills the interviewee confirmed that they are very important and mentioned that a big customer prefers formal communication channel while a small customer prefer informal communication channel, but a sales man always tried to keep all communication formal.

Regarding the professionalism of team and its effect on customer satisfaction, it has effect on quality of product. And regarding team communication skills, they don't have direct impact on customer satisfaction because there is no direct communication between developers and customers.

As stated above, the interviewee claimed that the methodology he adopted achieved customer satisfaction and therefore he recommends it for other firms and added that he will adopt it for other projects. In the final question the interviewee didn't think that if he adopted another methodology he would achieve the same level of customer satisfaction as the feedback he received from customers showed that his customers were satisfied and he was always working to improve the methodology based on customer feedback to achieve more customer satisfaction.

In Sixth interview the interview was with Application manager with sixteen years experience. After the researcher highlighted the purpose of research and its importance the interviewee claimed that he didn't have a certain approach or model because each project has its nature. When the requirements are insufficient and time of project short he adopted methodology more close to agile (because from his point of view there are limitations in waterfall like long duration and inability to cover changes in requirements, so there is need for iterations, adopting special model and exit strategy), but when project is sensitive and high quality is needed he adopts methodology more close to traditional model.

So adopting any methodology depends on project drivers (quality, scope, and time) to deliver a successful project and to achieve customer satisfaction.

When asked if there are differences between software project and other projects type, the interviewee claimed that it is project, with special characteristics and it need deep background in software area.

Regarding risk management he claimed that he always has risk management but not always documented, and said that it's recommended to document it.

When the researcher asked him about the way to measure agility, he agreed with the researcher on the way of measuring agility based on agile manifesto. But he mentioned some points which are not clear and that they should be amended to be more specific so that a customer can understand them.

Regarding attributes that affect on customer satisfaction, he made a clear statement that to achieve customer satisfaction "Do it on time, every time and achieve business requirements with needed quality and this should be consistence and to achieve more customer satisfaction you should concentrate on quality of service (during the project and after the project)". So this is confirmation that quality is considered as main attributes for customer satisfaction. Regarding quality attributes that affect customer satisfaction the interviewee approved of that because they are standard attributes and they cover product and service.

The interviewee also agreed that the customer will be satisfied if the project is closed within budget, scope and plan.

Regarding team stability the interviewee agreed with assumptions that the team should be stable during project life cycle because it may affect customer satisfaction if project drivers were affected. (In agile no time to transfer knowledge but the risk may be minimum due to high communication between team) and also this risk depends on the role of team member.

Concerning communication skills the interviewee confirmed that they are very important during gather requirements, implementation and testing, especially after project delivery.

The interviewee claimed that customers prefer informal communications, but his firm and to achieve customer satisfaction, tends to formal communication like SLA, to set control to manage customer expectation.

He also mentioned that good communication skills and professional team affect customer satisfaction, as this reduces the number of conflicts and increases productivity, because the team will be more aligned with customers needs, increase understanding of requirements, understanding urgency of requirements, better for time to value and quality and reduce conflict between teams (that is mean more focus on productivity) and this has impact on project drivers.

As stated before, the interviewee claimed that he doesn't have a particular approach or model because each project has its nature. So he follows a certain procedure for selecting methodology which achieves customer

satisfaction, He recommends that for other firms and he will adopt it for other projects.

## **5.2 Interview Analysis**

After all interviews were transcribed, table 6 was built to categorize the main observations and concerns. Then the researcher moves to the centerpiece of analytic process which is checking the relation between concepts and setting an explanation for results as this will help to reach conclusions.

**Table 6 :Main observations and concerns in interview analysis**

Theme and Concepts	Interview #1	Interview #2	Interview #3	Interview #4	Interview #5	Interview #6
Adopt methodology	Yes	Yes	Yes	Yes(1)	Yes	Yes
Methodology impact on project success	Yes	Yes	Yes	Yes	Yes	Yes
Software project differ from other projects	Yes	Yes	Yes	Yes	Yes(2)	Yes(2)
Has risk management plan	Yes(3)	No	No	Yes(4)	Yes (4)	Yes (3)
Measuring agility based on agile manifesto	Yes	Yes	Yes	Yes	Yes	Yes
Agreed on customer satisfaction attributes	Yes(5)	Yes(5)	Yes(6)	Yes(7)	Yes(8)	Yes
Agreed on quality attribute	Yes	Yes	Yes	Yes	Yes	Yes
Quality attributes effect on customer satisfaction	Yes	Yes	Yes	Yes	Yes	Yes
Team should be stable during project development	Yes	Yes	Yes	Yes	Yes	Yes
Agreed on project management attributes	Yes	Yes	Yes	Yes	Yes	Yes
Communication skills effect on customer satisfaction	Yes	Yes	Yes(9)	Yes	Yes(9)	Yes
Customer prefer informal	Yes	Yes	Yes	Yes(10)	Depend s on	Yes(12)

communication skills					customer(11)	
Have specific methodology and adopt it for all projects	No	No	Yes(13)	Yes	Yes(13)	No

- (1) Use customized methodology because market and management from the customer side don't follow best practices in management all the time.
- (2) They mentioned that software project is like any other projects, but it has special characteristics.
- (3) Not always documented, and it's recommended to document it. So it not detailed plan.
- (4) Use customized approach.
- (5) Recommended to reword the questions to be clearer for non technical persons.
- (6) Added customer involvement and informal communication which can increase customer satisfaction.
- (7) Added that the relation should be win-win and the firm should concentrate on support and after sales service.
- (8) Added additional point that if the deliveries are more than customer expectations, then there is more customer satisfaction
- (9) Development team communication skills should not affect customer because developers should not have direct connection with customers.
- (10) Development firm can accept informal communications if there is no impact on project success factors otherwise she will ask for formal communications in a friendly way.
- (11) Big Customers prefer formal communications while small customers prefer informal communications
- (12) Customers prefer informal communications, but a company prefers formal communications to set control and manage customer expectations.
- (13) Use agile methodology.

Based on the above table and the above points, most of IT seniors have management methodology either agile or water fall, depending on type of project and project drivers (quality, scope, and time). One of them mentioned that she uses customized methodology because market and

management from customer's side don't follow the best practices in management all the time.

All of them confirmed that selecting methodology has impact on project success.

Most of the interviewees agreed that software project differs from other projects, while the other mentioned that it is a project but has special characteristic. So this confirms that software project should be managed in a different way.

Regarding risk management none of them follows standard approach in risk management, and even if they have risk management plan there are limitations in it like miss of documentations.

All of the interviewees agreed that the researcher can measure agility based on agile manifesto. They mentioned that if the company has agile principles, then sure we can consider that it follows agile approach in management.

And when asked about customer satisfaction attributes, interviewees agreed on attributes that are mentioned in the survey and some of them added points like support after sale and keep win-win relation with customer, keep customer more involved and try to deliver product and service beyond customer expectation.

When asked about quality and quality attributes all interviewees confirmed that quality affects customer's satisfaction and that the researcher can depend on quality attributes mentioned in the survey to measure product quality.

And as for the role of team stability, all interviewees advised that the team should be stable during project development, because experience plays a major role and has impact on many attributes.

When discussing project management attributes all interviewees agreed that plan, budget, scope and quality represent project management attributes.

Concerning communication skills three interviewees approved that communication skills are very important and that all project team should have good communication skills. Two interviewees mentioned that developer's communication skills should not affect customers because developers should not have direct connection with customers. The fourth interviewee raised the flag that mostly developers were not customer oriented.

Regarding preferable communication channels all interviewees mentioned that customers prefer informal communication skills, while firms prefer them formal communication to keep control on projects and attributes.

Concerning adopted methodology all interviewees used to adopt methodology in their projects. Two interviewees mentioned that they

adopted agile methodology in all their projects, while others argued that selecting methodology depends on type of projects. These highlight the notes below

- The interviewees don't adopt waterfall by default.
- Half of interviewees select the methodology based on project characteristics but they don't have measurement tool like AMI.

### **5.3 Survey Analysis**

In order to analyze the quantitative data the researcher will use SPSS. By using SPSS the researcher will be able to carry out the necessary descriptive and inferential statistics for quantitative information (DeCoster, 2013).

The researcher found that there are two different points of view between researchers about the best approach to analyze quantitative data that was collected by Likert scale and whether the best approach is using parametric analysis or non parametric analysis and if the researcher can consider collected data ordinal or interval (KNAPP, 1990). The researcher followed Labovitz's (1967) article as he mentioned that the researcher can use parametric statistical measures as rough approximations, even though normal distribution may not be met. Also Tom Tullis and Bill Albert (2008) in their book "Measuring The User Experience: Collecting, Analyzing, and Presenting Usability Metric" mentioned that many professionals treated Likert scale data as interval data and this common

practice among market research. Also William Zikmund, Barry Babin, Jon Carr and Mitch Griffin (2012) in their book "Business Research Methods" mentioned that business researcher can treat Likert scale that contains five or more categories of response as interval in general, and as the researcher has five categories, this assimilation is appropriate. Also Uma Sekaran and Roger Bougiev (2010) in their book "Research Methods For Business: A Skill Building Approach" and Malhotra (2009) in his book "Market Research" agreed with William Zikmund et al. (2012). Also Brwon (2011) agreed with above researchers that the researchers can apply descriptive statistics, factor analysis and variance procedure on Likert scale because the researchers can treat Likert scale as interval scales.

This chapter will show:

- The results of descriptive statistics to summarize, describe and identify patterns of major characteristics of measurements (Susan A. Nolan, Thomas Heinzen, 2008; William Mendenhall, Robert Beaver, Barbara Beaver, 2012).
- The results of inferential statistics by presenting the results of the hypotheses testing in order to be able to determine what relation exists between management methodology, customer satisfaction and customer satisfaction attributes, and furthermore to be able to generalize the results to population. And for this purpose the researcher will use simple linear regression and correlation

coefficient to measure the degree of relation (-1 to 1) between two variables and if there is no relation, correlation coefficient will be 0 (Susan A. Nolan, Thomas Heinzen, 2008).

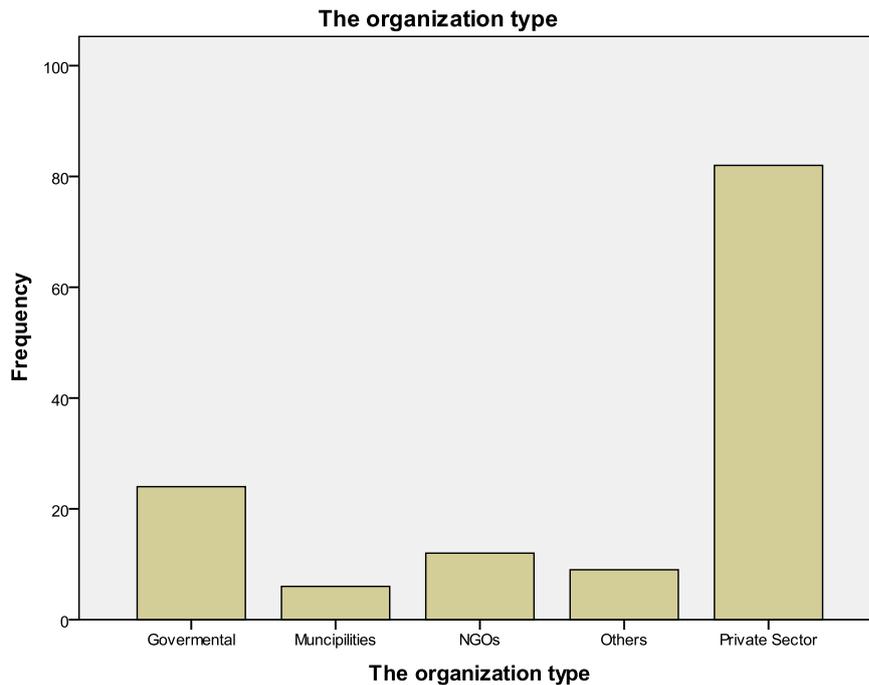
The researcher scheduled and published the survey from 05/12/2013 to 10/01/2014 (Due to New Year's holiday it was expanded to 10/01/2014).

The researcher started analysis with first section (survey consisted of six sections) that related to information about respondent which is about sector he belongs to, his role in the project and type of project implemented for him (customized or off-the-shelf product).

Respondents' answers indicate that private sector represents major clients of software firms 61.7% (these firms' are members in PITA). Table 7 and figure 15 illustrate the results.

**Table 7 : Clients Sector Frequency**

		<b>The organization type</b>			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Governmental	24	18.0	18.0	18.0
	Municipalities	6	4.5	4.5	22.6
	NGOs	12	9.0	9.0	31.6
	Others	9	6.8	6.8	38.3
	Private Sector	82	61.7	61.7	100.0
Total		133	100.0	100.0	



**Figure 15** :Distribution of clients per sector

Survey results with respect to role of respondent in project showed that the majority of respondents (47.4%) were involved in set and develop requirements of project and this indicates the importance and criticality of requirements in any project, the results showed also that 36.8 % of respondents were project managers and the last 15.8% were users. This diversity of level of respondents indicates that the researcher's survey penetrates three types of stakeholders (project manager, project owner and end users). Table 8 and Figure 16 illustrate these results.

Note: Risks related to users lie in third place between software risks frequency by dimension(users, organization, planning and control....etc), users risks like lack of adequate user involvement and cooperation, failure to gain user commitment and to manage end user expectation and failure to manage conflict between user departments (Arnuphaptrairong, 2011).

**Table 8: Role in Project**

		<b>Your role in project</b>			
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	End User	21	15.8	15.8	15.8
	I Shared in set and develop requirements	63	47.4	47.4	63.2
	Project Manager	49	36.8	36.8	100.0
	Total	133	100.0	100.0	



**Figure 16 : Role of respondents in projects**

Below, there is more descriptive analysis to evaluate customers' opinions regarding main variables in the survey. And as the researcher is interested in the combine scores that represents the characters of methodology as

independent variable and combine the scores that measure level of satisfaction as dependent variable, then the researcher calculated the Mean and standard deviation for the data.

The Mean, Standard deviation for respondents' answers regarding measure of agility (characteristic of methodology) were 3.729 and 0.614, respectively. This means that from clients point's of view, PITA's firms are more close to agile, as Mean higher than 3.

Also Mean, standard deviation for all considered customer satisfaction attributes were 3.408 and 0.83 respectively. This means that the clients were more close to satisfactions, as Mean higher than 3.

With reference to results of analysis regarding quality as major attributes for customer's satisfaction the mean was 3.44, standard deviation was 0.788, This indicate that the customers were more closer to satisfaction regarding quality attributes as Mean higher than 3.

After looking to the second customer satisfaction attribute in the survey, which was Team stability, the Mean was 3.199 and standard deviation was 1.046, as Mean equal 3.199 then satisfaction from team stability consider high as Mean higher than 3.

Also Mean, standard deviation for Team effectiveness as third attribute for customer satisfaction in the survey were 3.58 and 0.92 respectively. And this considers high satisfaction as Mean higher than 3.

The Mean, standard deviation for project management effectiveness as fourth attribute for customer satisfaction in the survey were 3.410 and 0.914, respectively. This indicates that projects are closer to success. And customer is more satisfied as Mean equal 3.41 and this consider high as Mean greater than 3.

Also the researcher checked statistical differences among answers to point out if there is statistical difference between participants' view of management methodology. For this purpose one-way ANOVA test to compare Means of independent variable (agility) with served sector variables to be as factor in SPSS and which has more than two levels. ANOVA test showed that there were no statistical differences between levels of agility for projects that were presented to different sector ( $P > 0.01$ ) (Table 9).

**Table 9: ANOVA test to compares means of agility and served sector****ANOVA**

Average agility

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	1.803	4	.451	1.200	.314
Within Groups	48.053	128	.375		
Total	49.856	132			

The researcher also checked statistical differences among answers to point out if there is statistical difference between participant's satisfactions. For this purpose the researcher used one-way ANOVA test to compares Mean of satisfaction and served sector variable to be as factor in SPSS which has more than two levels. ANOVA test showed that there were no statistical differences between level of satisfaction for projects that were presented to different sectors ( $P > 0.01$ ) (Table 10).

**Table 10 :ANOVA test between levels of satisfaction from projects that presented to different sector.**

## ANOVA

Average\_customer\_Satesfaction

	Sum of Squares	Df	Mean Square	F	Sig.
Between Groups	5.625	4	1.406	2.077	.088
Within Groups	86.664	128	.677		
Total	92.289	132			

One more point will help decision maker to know which agile attribute has the highest Mean, the researcher calculated the Mean for each agile attribute in the survey and the results were as below:

<b>Agile Attributes</b>	<b>Mean</b>
During project development you find the vendor concentrate on team interaction and understanding more than concentrate on procedures and tools.	3.496
During project development I was able to interact and communicate with vendor's project team by several ways (email, phone, face to face).	4.398
During project development, the vendor concentrate to deliver project achieve my requirements more than concentrate on what we agreed in documents when project started.	3.390
During project development the company shared you with work details, achievements and obstacles.	3.691
During project development, development team accepted changes in requirement within project scope and handle it with concord on plan with business owner.	3.66

From the above table, the researcher noticed that the attribute related to interaction and communication with vendor's team was the highest attribute that firms in the West Bank concentrate on.

## **5.4 Hypotheses Testing & Results**

As was mentioned in the beginning of this chapter, the inferential statistics will be used to test hypotheses in order to be able to generalize the results to population, so Simple Linear Regression was conducted to test hypothesis.

The analysis consisted of five different regression tests done for customer's satisfaction and its attributes. Firstly the relationship between management methodology and customer satisfaction was tested. Secondly the relationship between management methodology and customer satisfaction attributes was tested.

Simple Linear Regression will be used to test hypothesis number one as the researcher will check if there is a relation between project management methodology and customers satisfaction. In reference to r value measured in SPSS between independent variable (management methodology) and dependent variable customer satisfaction the r value was 0.612, and as P-value  $< 0.01$  then null hypothesis  $H_{10}$  which there is no relation between project management methodology and customer satisfaction rejected and alternative hypothesis number one was supported at 99% confidence level. (Table 11)

When Pearson correlation coefficient value was measured in SPSS between independent variable (management methodology) and dependent variable customer satisfaction the value was 0.612 this means that there is moderate positive relationship (Bogue, 2014).

**Table 11 : Hypothesis one Analyses**

Model Summary							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate			
dimension0 1	.612 <sup>a</sup>	.374	.369	.66411450926			
a. Predictors: (Constant), Average agility							
Coefficients <sup>a</sup>							
Model	Unstandardized Coefficients		Standardized Coefficients	T	Sig.	99.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
1 (Constant)	.305	.355		.859	.392	-.624-	1.234
Average agility	.832	.094	.612	8.846	.000	.586	1.078
a. Dependent Variable: Average_customer_Satesfaction							

Also the above table values shows that there is alignment between closing to agility in management and customer's satisfaction, r value equals 0.612 and this mean that there is relationship from customers point view, and as r value between 0.3 and 0.7 then the relation is considered moderate positive relation (Bogue, 2014).

And based on regression analysis of hypothesis, perceived satisfaction is predicted by closing to agility and explains 37.4% of the variance on perceived satisfaction as R<sup>2</sup> equals 0.374.

The alignment between closing to agility in management and satisfaction from quality attributes is positively associated from customers' point view , as r value was measured by SPSS was 0.585, and P-value was  $<0.01$  so there is positive relationship between closing to agility and enhancing quality attributes and this relation considers that moderate positive relation depends on r value. So null hypothesis  $H_{2_0}$  which was the alignment between closing to agility as management methodology and satisfaction from quality attributes is negatively associated from customer's point of view rejected and alternative hypothesis number two was supported at 99% confidence level (Table 12).

Based on regression analysis of hypotheses, perceived quality is predicted by closing to agility and explains 34.2% of the variance on perceived quality as  $R^2$  equal 0.342.

**Table 12 :Hypothesis Two Analyses**

<b>Model Summary</b>							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate			
dimension0 1	.585 <sup>a</sup>	.342	.337	.64202917110			
a. Predictors: (Constant), Average agility							
<b>Coefficients<sup>a</sup></b>							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	99.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
1 (Constant)	.644	.344		1.874	.063	-.254	1.542
Average agility	.750	.091	.585	8.249	.000	.512	.988
a. Dependent Variable: Avarage Quality							

Based on the results on (Table 13) the alignment between closing to agility in management and satisfaction from team stability is positively associated from customers' point of view.

**Table 13 : Hypothesis Three Analyses**

Model Summary							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate			
dimension0 1	.484 <sup>a</sup>	.234	.228	.91897932687			
a. Predictors: (Constant), Average agility							
Coefficients <sup>a</sup>							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	99.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
1 (Constant)	.127	.492		.258	.797	-1.159-	1.413
Average agility	.824	.130	.484	6.330	.000	.484	1.164
a. Dependent Variable: Avearege Team Stability							

If management methodology gets closer to agile, team is more stable and changes in team are done without impact on customer, the customer is more satisfied, therefore null hypothesis  $H_{3_0}$  which was the alignment between closing to agility as management methodology and satisfaction from team stability is negatively associated from customer's point of view, rejected and alternative hypothesis number three was supported at 99% confidence level with r value equals 0.484 and  $P\text{-Value} < 0.01$ . And as r value is between 0.3 and 0.7, the relation is considered moderate positive relation (Table 13).

And based on regression analysis of hypotheses, perceived satisfaction from team stability attributes is predicted by closing to agility and explaining 23.4% of the variance on perceived satisfaction from team stability as  $R^2$  equal 0.234.

The alignment between closing to agility in management and satisfaction from team management effectiveness is positively associated from customers point view because r value was 0.599 and this relation is considered moderate positive relation because r is value between 0.3 and 0.7. This raises a flag that more agility in project management will help project manager form development firm side to improve team management. And as P-value  $<0.01$  then null hypothesis  $H_{4_0}$  which was the alignment between closing to agility as management methodology and satisfaction from team management effectiveness is negatively associated from customer's point of view, rejected and alternative hypothesis number four was supported at 99% confidence level (Table 14).

And based on regression analysis of hypotheses, perceived satisfaction with team effectiveness is predicted by closing to agility and explains 31.2% of the variance on perceived satisfaction from team management effectiveness as  $R^2$  equals 0.312.

**Table 14 : Hypothesis Four Analyses**

<b>Model Summary</b>							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate			
dimension0 1	.559 <sup>a</sup>	.312	.307	.77102097150			

a. Predictors: (Constant), Average agility

<b>Coefficients<sup>a</sup></b>							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	99.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
1 (Constant)	.440	.413		1.066	.288	-.639-	1.519
Average agility	.842	.109	.559	7.715	.000	.557	1.128

a. Dependent Variable: Average Tema effectiveness

The alignment between closing to agility in management and satisfaction with project management concepts is positively associated with customers' point of view as r value was 0.612.

**Table 15: Hypotheses Five Analyses.**

Model Summary							
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate			
dimension0 1	.612 <sup>a</sup>	.375	.370	.72599795300			

a. Predictors: (Constant), Average agility

Coefficients <sup>a</sup>							
Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	99.0% Confidence Interval for B	
	B	Std. Error	Beta			Lower Bound	Upper Bound
1 (Constant)	.010	.389		.026	.980	-1.006-	1.026
Average agility	.912	.103	.612	8.867	.000	.643	1.180

a. Dependent Variable: Average Project Management

And based on results on (Table 15) null hypothesis  $H5_0$  which was the alignment between closing to agility as management methodology and satisfaction from project management concepts is negatively associated from customer's point of view rejected and alternative hypothesis five supported at 99% confidence level because  $P\text{-value} < 0.01$ , more close to agile more success in manage project drivers and more satisfaction from management of project. But the relation consider moderate because r value is between 0.3 and 0.7 (Table 15).

And based on regression analysis of hypotheses, perceived satisfaction from project management concept is predicted by closing to agility and

explains 37.5% of the variance on perceived satisfaction from project management concept as  $R^2$  equal 0.375.

## 5.5 Results reliability

Mark Saunders et al. (2009) stated that reliability "Refers to the extent to which your data collection techniques or analysis procedures will yield consistent findings." And reliability discussed above in details, the researcher will retest all survey responses by Cronbach alpha. (Table 16) Reliability Statistics (Cronbach's Alpha).

**Table 16 :Cronbach Alpha Results**

<b>Attributes</b>	<b>Cronbach's Alpha</b>	<b>N of Items</b>
Measuring Agility	0.704	5
Quality	0.928	13
Team stability	0.712	2
Team Management effectiveness	0.895	3
Project Management	0.840	9
All Items	0.966	32

And as Cronbach alpha is greater than 0.6 it is acceptable in many marketing studies (Aiken, 2006), so the reliability of research questionnaire is acceptable for all items as a total, measuring agility and customer satisfaction attributes.

## 5.6 Answer research question

The result of Buresh's (2008) study was that there are no significant statistically differences (when participants know the methodology) in customer satisfaction even in use or results of agile or plan-driven (traditional) methodology at the 95% confidence level (Buresh, 2008).

But the results in this thesis and based on correlation coefficient analysis showed that there is a relation between project management methodology and customers satisfaction and with reference to Pearson correlation coefficient value was measured in SPSS there was alignment between closing to agility in management and customer's satisfaction at 99% confidence level. But it's very important to mention this results should not be considered as contradiction to Buresh's (2008) results because he used dummy variable (zero for traditional methodology and one for agile) methodology in his survey, while the researcher in this study formulate scale to measure agility based on agile manifesto as discussed in "measuring agility" section.

And Mann C. and Maurer F. (2005) in their case study "A case study on the impact of scrum on overtime and customer satisfaction" showed that the empirical results from the case study introduce the customer satisfaction increased when using Scrum methodology that is considered as one of main lightweight methodology. Mann C. and Maurer F. (2005) results match with the researcher results that agile increases customer satisfaction.

Also Survey results confirmed that there is relation between closing to agility and project planning, communication effectiveness, and team stability. These empirical results match with results that mentioned by (Sriram Narayanan et al., 2011).

Also the empirical results match with many studies that mentioned that quality improved with agile practices (Ahmed A et al., 2010; Amran Hossain, Dr. Md. Abul Kashem, Sahelee Sultana, 2013; Sfetsos Panagiotis, Stamelos I, 2010).

Also M. Pikkarainen et al. (2008) results support the empirical findings that there is positive relation between team stability and team management effectiveness from one side and managing software with agile methodology from second.

## **5.7 Results discussion**

In the literature customer satisfaction is viewed as a critical factor to enhance a competitive position (Cengiz, 2010), generate repurchase action (Tam, 2011), positive impact on brand (Bloemer, J., Lemmink, J, 1992), long term customer behaviors (Chatura Ranaweera, Jaideep Prabhu, 2003). And with reference to Standish Group (2001) report, only 28 percent of software projects in 2000 succeeded (Stepanek, 2005).

And According PMBOK guide, success is measured by product and project quality, timeline, budget compliance and degree of customer satisfaction (PMI, 2008). So theoretically customer satisfaction is very important for

any firm and for any project to success, so research question is appropriate to find the relation and impacts of software project management methodology on customer satisfaction.

All interviewees agreed that management methodology has impact on customer satisfaction.

Theoretically the researcher set four factors which affects customer satisfaction (quality, Team stability, Team management effectiveness and project management effectiveness). The empirical results of interviewees confirmed these factors and added some points like more customer involvement, informal communication, after sales service and deliverables beyond customer's expectations.

Theoretically the researcher set quality factor depends on standards, and empirical results confirmed these factors, also empirical results met with other customer satisfaction factors and their attributes.

Asif et al (2011) mentioned that some software firms have their own customized methodology for developing and managing their software project, but most companies argue that there are two software project management methodology heavyweight methodology and light weight methodology. Empirical results confirmed that the software firms in West Bank consistent with Asif et al. (2011).

Stepanek (2005) mentioned that there are a lot of differences between software project and other projects, most of interviewees agreed with

Stepanek (2005), others interviewees mentioned that it is like any other projects but with special characters.

Arnuphaptrairong (2011) mentioned that "Software project risk management is crucial for the software development projects". The interviewees agreed with (Arnuphaptrairong, 2011). But some of the interviewees mentioned that they did not have document details plan and they wished they had documented one and some of them used customized approach.

There is more than one method to measure agility in software project (discussed in measuring agility section). The researcher built five questions to measure agility based on agile manifesto, and validated the questions by interviews results, and all interviewees accepted this approach.

When asking interviewees about formal and informal communications they mentioned that most customers prefer informal communications.

This might indicate that customers prefer agile in management, since agile manifesto are closer to individual interactions, collaboration and responding to change than following processes and without comprehensive documentation or contract negotiation.

As interview help to perform backward- and/or forward- looking investigation, there was also valuable information regarding developer communication skills, that developers should either have good communication skills or should not have direct connection with customers.

Based on empirical results of the survey, firms in the West Bank are closer to agile with Mean 3.729. This intersects with interviews results that one of interviewees adopted customized methodology more closer to agile, two out of six interviews always adopted agile methodology while the other three selected methodology depending on project characteristics.

The survey results also intersect with agile principles that believe in human role (Pekka Abrahamsson et al., 2002), highest priority is to satisfy, relationships and community over contracts, face to face communication over formal communication (Agilemanifesto.org, 2013; Pekka Abrahamsson et al., 2002).

The results also indicated that customers will be more satisfied with more close to agile methodology and this intersects with (Lowell Lindstrom, Ron Jeffries , 2004; Sheetal Sharma et al., 2012) who mentioned that XP programming focuses on customer satisfaction. So the principles of XP method met with survey results.

Survey results indicated that customers will be more satisfied with stable team during project life cycle and Scrum recommends that team member should not change during sprints (Marlon Luz et al., 2009) (Cervone, 2011)

## **Chapter Six**

### **Conclusion, Recommendation, Future work and limitation**

An empirical look at the findings of the impact of software project management methodology on customer satisfaction, it is interesting to note that there is a relation between software management methodology and closing to agile as independent variable from one side and customer satisfaction and its attributes from other side as dependent variables. Furthermore, from the results, the researcher noted that more close to agile it is the more satisfaction it will achieves. This mean more satisfy from satisfaction attributes. So based on Theory of Constraints (Asta Murauskaite, Vaidas Adomaskas , 2008) the researcher found one of constraints in software project which is selected the right methodology. Therefore project manager can optimize percentage of successful project and increase customer satisfaction by taking corrective actions through adopting a methodology more close to agile.

#### **6.1 Conclusion**

Based on researcher experience and literature review, there is low percentage of successful software project and there is great importance for software industry in Palestine. Therefore the researcher aims to investigate the relation between software project management methodology and customer satisfaction, in order to develop the software industry.

This research was formulated via reviewing related literature and listening to experts' opinions to build the needed tool to find the relation.

The main research tool was the survey that was consisted of six parts

1. General information
2. Management methodology
3. Quality
4. Team stability
5. Team management effectiveness
6. Project management effectiveness

The management methodology was based on agile manifesto and checked with interviewees for more reliability, customer satisfaction attributes was built based on literature review also checked with interviewees.

The quantitative data was gathered from a random sample that represents customers of firms registered in PITA. SPSS was used to analyze the collected data and to examine the relation between software project management methodology on one side, and customer satisfaction and its attribute on other side.

The results proved that there is relation between software project management methodology and customer satisfaction. Being more close to agile will increase customer satisfaction by positive impacts on satisfaction attributes.

This result was proved by employed statistical measures like Mean and coefficient analysis.

## **6.2 Recommendations**

For software manufacturers and software customers in the West Bank, to improve percentage of successful project and increase customer satisfaction and after heavy review for literature review and based on research results the research present the following advices and remedies to be taken by software project stakeholders:

1. Customer satisfaction is very crucial for firms to survive, so keep your customer satisfied and listen to the voice of customers constantly. Customer satisfaction should be in firms' vision, and in their mission should concentrate to achieve that.
2. The firm should adopt methodologies that more close to agile. And this should be in systematic way by following best practice for methodologies as these types of methodologies capable to produce successful project, handle software project risks like change in requirements and capable improve the relation with customer and produce win-win-win relation (company-customer, employee).
3. Software Quality represent major factor to accept any software, so software firms should be aware about quality attributes. And should adopt methodology more close to agile as this will enhance quality and increase customer satisfaction.

4. Project manager in software firm should concentrate on communications effectiveness as this very important to produce successful project and satisfy customers. So its recommended to adopt methodology that enhance communication and in reference to research results, agile methodology enhance communication effectiveness.
5. Keeping resources is very important for software firms, so firm should develop strategy to keep key employees as replacement of employee have bad impact on customer satisfaction. And in reference to the survey results adopting methodology more close to agile will increase team stability.
6. To produce successful project it s very important to handle project drivers (quality, scope, and time) successfully and this could be done by adopt methodology more close to agile.
7. Customer should be aware that software project differ from other type projects, so they should be able write sufficient requirements that cover scope, functions, constrains, dependences, interface requirements, non functional requirements, inverse requirements, data flow diagram...etc. Also there is major role for end users to accept software, so it's recommended to develop training programs by software firm for customer and end users about the differentiation between software project and other projects before start the project.

### **6.3 Suggestions for Future Research**

This research has pointed out that there is much more to investigate. But this study was set out with the specific objectives to explore the impact of software project management methodology as independent variable and customer satisfaction and its attributes as dependent variables. So it is considered a good milestone to investigate the relations between the above variables.

The research analysis, arguments and results of this study relies on quantitative analysis. For better understanding of the relation and its impact on customer satisfaction and to contribute in development software industry in Palestine, additional qualitative investigations on specific projects with different methodologies have to be studied, Furthermore, and based on empirical results and to move forward, it would be interesting to check which agile methodology achieve more customer satisfaction. And as empirical results mentioned that project in the West Bank are more closer to agile. This mean that the AMI is high for these projects, so it's recommended to check what is the highest dimension to tackle it in correct way.

It's also recommended to check the research results on specific type of projects like websites, CRM, ERP.

Moreover the researcher checked customer satisfaction against four attributes (Quality, Team stability, Team management effectiveness, and

Project management effectiveness), so it's recommended to do more investigation about other attributes that may affect customer's satisfaction.

## **6.4 Limitations**

The number of surveyed customers was limited to those who belong to PITA firms, but sure the data base of firms and customers is not limited to PITA. Furthermore the conclusions drawn in this research have been assessed for software project developed based on customer needs, so the results are not applicable for off-the shelf-products or for project developed by outsourcing company, the research was carried out in the West Bank so the researcher have limitation to generalize the results to Palestine or to other countries.

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## Appendices

### Appendix A: Business activities available in PITA

Computer programming
Mobile Gaming
Mobile Application Development
Enterprise Solutions
SaaS
E-Health Care Systems
Web portals
E-Education
E-Government
Application Service Provider
Custom Software Development
Information Communication
Software publishing
Wired telecommunication activities
Wireless telecommunications activities
Satellite telecommunications activities
Other telecommunications activities
Computer hardware consultancy and computer hardware facilities management activities
Data processing, hosting and related activities
Wholesale retail trade
Wholesale of telephone and communications equipment
Wholesale of computer, peripheral equipment and software
Administrative support service activities
Outbound call center
Inbound call center
Other services activities
Repair of carrier equipment modems
Repair of communication transmission equipment
Repair of computer and peripheral equipment

**Appendix B: Removed business activities**

Wired telecommunication activities
Wireless telecommunications activities
Satellite telecommunications activities
Other telecommunications activities
Computer hardware consultancy and computer hardware facilities management activities
Data processing, hosting and related activities
Wholesale retail trade
Wholesale of telephone and communications equipment
Administrative support service activities
Outbound call center
Inbound call center
Other services activities
Repair of carrier equipment modems
Repair of communication transmission equipment
Repair of computer and peripheral equipment

**Appendix C: Number of firm's customers**

<b>Company Name</b>	<b>Number of Customers</b>
Company A	14
Company B	4
Company D	9
Company E	6
Company F	4
Company G	7 from company site
Company H	5
Company I	7
Company J	23
Company K	5 from company site
Company L	13
Company M	6
Company N	4
Company O	12 from company site
Company P	31 from company site
Company Q	7
Company R	3
Company S	11 from company site
Company T	17
Company U	4
Company Y	6 from company site

## Appendix D: Correspondences to firms

السادة شركة \*\*\*\*\* المحترمين

انا فارس تيسير فقها طالب ماجستير في جامعة النجاح الوطنية واقوم بعمل دراسة بعنوان:

Impact of software project management methodology on customer satisfaction

ولقد اعددت كتاب ل PITA للتم مخاطبة الشركات من خلاله وذلك التنسيق مع السيد \*\*\*\*\* من PITA لكن انا الان في مرحلة اعداد مجتمع الدراسة و العينات لذلك اقوم بمراسلة الشركات العاملة في قطاع البرمجة لمعرفة العدد التقريبي للزبائن في الضفة الغربية يرجى ان امكن الافادة برقم تقريبي للزبائن الذين قمتم بتطوير برمجيات لهم . او ارسال رقم هاتف للتواصل معكم لتوضيح الامر .

**Appendix E: Arbitrators and Experts who reviewed the  
questionnaire**

Dr. Hussam Arman	Associate Research Specialist at Kuwait Institute for Scientific Research (KISR)
Dr. Ayham Jaaron	Head of Industrial Engineering Department, An-Najah National University, Palestine.
Mr. Ahmad Alrefa'e	Application and Development Manager at Hulul company
Mr. Asem Masri	Application manager at ArtTech company
Mr. Yahya Kittaneh	Technology Consultant Management Technologies
Mr. Mohammad Helaly	Software Developer & System Analyst in IT department at Nablus Municipality

## **Appendix F: Questionnaire Structure**

*Impact of software project management methodology on customer satisfaction*

*Dear Sir/Mrs.*

*My Name Faris Taysier Foqha, I'm currently a student at An-Najah National University and I'm working on my master degree which investigate the impact of software project management methodology on customer satisfaction on firms clients registered in PITA in West Bank , also how Quality, Team stability, Project management effectiveness and Team effectiveness attributes affected by project management methodology.*

*We believe that you, as senior in your field, we believe that you will be the best source to reach the required information, which serve software industry and its development.*

*Compiling this questionnaire will take about 15 minutes. We all hope to find cooperation from you through answering the questions contained in this survey by 10 January. And we are ready to send you the survey results and recommendations.*

*We pledge not to enclose the identity of participants to third party, as well as all the data collected in this questionnaire will be treated as confidential and not use this information in any field except scientific research.*

*I'm very thankful for your willingness to fill in the form. If you have questions, please don't hesitate to contact me @faris.alfqha@gmail.com*

*Best Regards,*

*Researcher*

**Kindly to answer the below questions about your organization and your role in project**

*Your Role in Project was*

*Project Manager      End User      shared in set and develops project requirements*

*Type of Organization*

*Governmental      Private sector      Municipalities      NGOs      Other*

*The software or project was*

*Customized project for your organization      On the shelf project*

**Note: Kindly fill the Survey based on specific IT project delivered to your organization**

**Measure Project Management methodology**

*During project development you find the vendor concentrate more on team interaction and understanding than on procedures and tools*

SD (strongly disagree)					SA (Strongly agree)
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	

*During project development I was able to interact and communicate with vendor's project team by several ways (email, phone, face to face).*

SD (strongly disagree)		SA (Strongly agree)		
1	2	3	4	5

*During project development, the vendor concentrates to deliver a project that achieves my requirements more than concentrate on what we agreed in documents when project started*

SD (strongly disagree)		SA (Strongly agree)		
1	2	3	4	5

*During project development the company shared you with work details, achievements and obstacles.*

SD (strongly disagree)		SA (Strongly agree)		
1	2	3	4	5

*During project development, development team accepted changes in requirement within project scope and handled it with concord on plan with business owner.*

SD (strongly disagree)		SA (Strongly agree)		
1	2	3	4	5

***Rate Satisfaction level based on Quality attributes.***

*Response time for software in performing functionality (needed tasks) was as my expectation and better than similar software*

SD (strongly disagree)					SA (Strongly agree)
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	

**The software was flexible as I can modify it easily**

SD (strongly disagree)					SA (Strongly agree)
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	

**Internal module and component in the software was easily integrated and configured with each other**

SD (strongly disagree)					SA (Strongly agree)
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	

**The software was able to integrate with other system easily**

SD (strongly disagree)					SA (Strongly agree)
1	2	3	4	5	

**Testing plan was organized**

SD (strongly disagree)					SA (Strongly agree)
1	2	3	4	5	

**The software delivered was reliable and performed intended functions correctly**

SD (Strongly disagree)					SA ( Strongly agree)
1	2	3	4	5	

**Understanding and learning system modules and functions in software was easy and friendly**

SD (strongly disagree)						SA ( Strongly agree)
1	2	3	4	5		

**The software was complete and provided all the functions required and me my expectation**

SD (strongly disagree)						SA ( Strongly agree)
1	2	3	4	5		

**Response time to following and fix bugs in software was suitable**

SD (strongly disagree)						SA ( Strongly agree)
1	2	3	4	5		

**User Manual and Documentation delivered with software was complete and useful**

SD (strongly disagree)	SA ( Strongly agree)			
1	2	3	4	5

**Software was protected against attacks and hacking risks by activate standard security control**

SD (strongly disagree)	SA ( Strongly agree)			
1	2	3	4	5

**I'm happy because only authenticated users can log to the software and they can access system reference to their privileges**

SD (strongly disagree)	SA ( Strongly agree)			
1	2	3	4	5

**Overall, I'm happy with software and I'm ready to repurchase it with same vendor**

SD (strongly disagree)		SA ( Strongly agree)		
1	2	3	4	5

***Rate Satisfaction level based on Team Stability***

**I'm happy because replacement for project team handles smoothly and without impact on project execution**

SD (strongly disagree)		SA ( Strongly agree)		
1	2	3	4	5

**I'm happy because I didn't feel that the project team changed during project development**

SD (strongly disagree)		SA ( Strongly agree)		
1	2	3	4	5

***Rate Satisfaction level based on Team Management.***

**Vendor's team has good communication skills**

SD (strongly disagree)		SA ( Strongly agree)		
1	2	3	4	5

**I'm happy because I was able to contact team easily to answer my inquires**

SD (strongly disagree)		SA ( Strongly agree)		
1	2	3	4	5

**Overall, I'm happy because the team was managed successfully**

SD (strongly disagree)		SA ( Strongly agree)		
1	2	3	4	5

**I'm happy because project was initiated by gathering needed information successfully and it involved of stakeholders**

SD (strongly disagree)					SA ( Strongly agree)
1	2	3	4	5	

**Project was finished according project plan**

SD (strongly disagree)					SA ( Strongly agree)
1	2	3	4	5	

**Project was completed according to agreed budget**

SD (strongly disagree)					SA ( Strongly agree)
1	2	3	4	5	

**Project manager monitored the projects and provided needed support for project activities**

SD (strongly disagree)	SA ( Strongly agree)			
1	2	3	4	5

**Project objectives and scope are achieved when closing the project**

SD (strongly disagree)	SA ( Strongly agree)			
1	2	3	4	5

**Project manager from vendor side was able to identify and assess risks**

SD (strongly disagree)	SA ( Strongly agree)			
1	2	3	4	5

**Project manager from vendor side was able to overcome risks that phase project**

SD (strongly disagree)					SA ( Strongly agree)	
1	2	3	4	5		

**Project was closed successfully**

SD (strongly disagree)					SA ( Strongly agree)	
1	2	3	4	5		

**Overall, I'm happy with this Project**

SD (strongly disagree)					SA ( Strongly agree)	
1	2	3	4	5		

## **Appendix G: Interview Structure**

### Motivation of Research

- Software industry is very important in Palestine
- We should consider producing successful software projects that achieve customer satisfaction.
- Standish Group (2001) research, only 28 percent of Software projects in 2000 succeeded outright in the USA
- According to interviews with software project stakeholders, the researcher found that the software project management in Palestine face problems and this have effects on customer satisfaction,
- According to PMBOK guide (PMI, 2008) success is measured by product and project quality, timeline, budget compliance and degree of customer satisfaction,
- The goal of this study is to provide empirical evidence of the relation between software project management methodology and customer satisfaction.

### Interviewee profile

1. What is your position in the company, work duties?
2. How long you have been working in this field?

### Software Project management

1. Do you have project management approach?
2. Software project management differs from other projects, do you agree with this statement? And why?

3. There are mainly two approaches in software project management heavyweight approach and lightweight approach do you adopt one of them?
4. Do you have risk management plan by identifying, analyzing, mitigating, monitoring, and responding to a risk?
5. In our survey we are going to measure agility based on Agile manifesto by asking the customer the below questions, do you think this will be valid to measure the agility?
  - A. *During project development, do you find development Team communication open, trusted face to face, cross functional, self organized?*
  - B. *During project development, did the company provide Working software without concentrating on documentation?*
  - C. *During project development, did the company ask you about details or share you its achievements or obstacles?*
  - D. *New requirements ordered from you during project development, did the vendor accept and handle them with agreed plan?*
  - E. *During project development, development team accepted changes in requirement within project scope and handled it with concord on plan with business owner.*

#### Customer Satisfaction

1. What are the attributes that affect customer satisfaction?
2. Does software Quality affect customer satisfaction?
3. What are quality dimensions in software?

4. Do you believe that team should be stable during project life cycle?
5. Won't unstable team during project life cycle affect customer satisfaction?
6. Would the customer be satisfied if the project finished according plan, Budget, Quality and scope?
7. Would Team communication skills affect customer satisfaction?
8. Do customers prefer formal or informal communication channels?
9. How do you find capability (professionalism and communications skill) of team effect on customer satisfaction?

#### Software project management methodology and Customer satisfaction

- Do you find that the approach you adopted achieved customer satisfaction?
- Do you recommend this management approach to other companies, and are you going to adopt it in another project?
- If you adopt another approach, do you think you will achieve the same level of customer satisfaction?

I am going on the below survey to answer the main research questions. Your evaluation of the whole survey questions is highly appreciated.

## Appendix H: Following Survey

2013/12/26

&lt;faris.alfqha@gmail.com&gt; faris rajeh

info

انا فارس فقها طالب ماجستير في جامعة النجاح الوطنية  
أعمل على بحث بخصوص أثر طريقة ادارة مشاريع البرمجيات في الضفة الغربية وعلاقته برضى الزبائن  
وانتم احدى الشركات الرائدة في الوطن فتم بتطوير برامجكم الحاسوبية مع شركات برمجة في الضفة الغربية  
لذلك يرجى مساعدتكم لي بتحويل الاستبيان الى الدائرة المعنية وتعبئة الاستبيان ادناه ولكم جزيل الشكر

[https://docs.google.com/forms/d/1sKD\\_VP99cL4tyiNvV-sIE9ZIJFugFEKcF5r4aMITx\\_Y/viewform](https://docs.google.com/forms/d/1sKD_VP99cL4tyiNvV-sIE9ZIJFugFEKcF5r4aMITx_Y/viewform)

وتشكرا لدعمكم مسيرة التعليم

حضرة الاخ فارس راجح المحترم

الموضوع: المساعدة في تعبئة استبيان خاص بطريقة ادارة مشاريع البرمجيات

تحية طيبة وبعد،

متابعة لمراسلتكم لنا هذا اليوم 2014/01/02، بخصوص الموضوع المشار اليه أعلاه، نود اعلامكم بان قد استوفى الاستبيان وفق المعلومات المتوفرة لديه حول برنامج ، ولا يتوفر أي معلومات حول أي برامج اخرى يمكن افادتكم بها.

وتفضلوا بقبول فائق الاحترام

جامعة النجاح الوطنية

كلية الدراسات العليا

## أثر طريقة إدارة مشاريع البرمجيات على رضى الزبائن في الضفة الغربية

إعداد

فارس تيسير فارس راجح فقها

إشراف

د . بكر عبد الحق

قدمت هذه الأطروحة استكمالاً لمتطلبات درجة الماجستير في الإدارة الهندسية بكلية الدراسات العليا في جامعة النجاح الوطنية في نابلس، فلسطين.

2014

أثر طريقة إدارة مشاريع البرمجيات على رضى الزبائن في الضفة الغربية

ب

إعداد

فارس تيسير فارس راجح فقها

إشراف

د . بكر عبد الحق

الملخص

إن قطاع تكنولوجيا المعلومات من القطاعات المهمة في رفد الاقتصاد الفلسطيني، لذلك تنميته تعتبر ضرورة ملحة ولقد درس الباحث وبين أهمية رضى الزبائن لتطور أي صناعة.

وبناءً على ما أشارت له الدراسات فإن مشاريع البرمجيات تتعرض لنسب ابتعاد عن النجاح أكثر من غيرها من المشاريع، وبعد البحث في إدارة مشاريع البرمجيات وجد الباحث ان هناك نموذجان شهيران لإدارة المشاريع وهما طريقة الشلال او ما يعرف ب Waterfall Methodology أو Heavyweight Methodology وطريقة البرمجة الرشيقة او المرنة أو ما يعرف ب Agile Methodology .

ولأن رضى الزبائن يعتبر من عناصر نجاح المشروع، اختار الباحث ان يدرس أثر طريقة ادارة مشاريع البرمجيات على رضى الزبائن والعناصر المكونة له . وذلك بعد ان قام الباحث بوضع آلية لمعرفة طريقة إدارة المشاريع تتناسب مع الفئة المستهدفة من الدراسة وهي الزبائن وهذه الفئة قد لا تكون ملمة بمفاهيم ادارة المشاريع المشار اليها اعلاه .

الآلية تعتمد على اعلان أجايل او ما يعرف ب Agile Manifesto وذلك بعد مناقشة هذه الآلية مع أصحاب الاختصاص.

ولقد قام الباحث بدراسة العناصر التي تساهم في رضى الزبائن في مشاريع البرمجيات وتم تحديدها في اربعة عناصر رئيسية وهي الجودة وثبات فريق العمل في الشركة المزودة و كفاءة ادارة فريق العمل و كفاءة ادارة المشروع.

وبتحديد أثر طريقة ادارة مشاريع البرمجيات على رضى الزبائن والعناصر المكونة له تمكن الباحث من الخروج بتوصيات تفيد صانع القرار والشركات العاملة في قطاع البرمجة والزبائن المعنيين بتطوير برامج على اتخاذ خطوات تصحيحه تعمل على زيادة نسبة نجاح المشاريع وزيادة رضى الزبائن.

ولتحقيق ما سلف ذكره قام الباحث بتحديد مجتمع وعينة الدراسة بإتباع منهجية واضحة وذلك بالإعتماد على البيانات المتوفرة لدى إتحاد شركات أنظمة المعلومات الفلسطينية (بيتا).

وقد استخدم الباحث أدوات بحثية مختلفة بدءاً بالمراجعة لأدبيات عناصر البحث ومروراً بمقابلات كأداة بحثية نوعية وانتهاءً بالإستبانة كأداة بحثية كمية تم تمريرها بإستخدام موقع Google الإلكتروني. ولقد تم توظيف الوسائل الاحصائية المختلفة لتحليل البيانات كالتحليل الوصفي للنتائج والتحليل الاستنتاجي لفرضيات الدراسة.

ولقد أشارت النتائج النهائية الى وجود علاقة بين طريقة إدارة المشاريع ورضى الزبائن، حيث كلما اقتربنا من الطريقة المرنة في الإدارة زاد رضى الزبائن عن طريق زيادة الرضى عن العناصر التي تشكل الرضى وهي الجودة و ثبات فريق العمل وكفاءة إدارة فريق العمل وكفاءة إدارة المشروع، لذلك يوصى بتبني المنهجيات الحديثة (Agile) في ادارة مشاريع البرمجيات لما لها من أثر ايجابي في نجاح المشاريع وزيادة رضى الزبائن.

ومن الجدير ذكره ان المواضيع المتعلقة بالبرمجة الرشيقة لم يتم دراستها في فلسطين حتى تاريخ 2010 ولقد دُرست في العالم العربي بشكل محدود جدا.