FACULTY OF ENGINEERING AND TECHNOLOGY

MASTER OF SOFTWARE ENGINEERING

MASTER THESIS

The Impact of Developers' Turnover on Software Maintenance and its Effect on Customer Satisfaction

تأثير دوران المطورين على صيانة البرمجيات وأثرها على رضا الزبائن

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This Thesis was submitted in partial fulfillment of the requirements for the Master's Degree in Software Engineering from the Faculty of Graduate Studies at Birzeit University, Palestine

May 28, 2020

جامعة بيرزيت
BIRZEIT UNIVERSITY

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Declaration of Authorship

I, Tarik Hannoun, declare that this thesis titled, **"The Impact of Developers' Turnover on Software Maintenance and its Effect on Customer Satisfaction"** and the work presented in it are my own.

I confirm that:

- This work was done wholly or mainly while in candidature for a master degree at Birzeit University.
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- Where I have consulted the published work of others, this is always clearly attributed.
- Where I have quoted from the work of others, the source is always given. With the exception of such quotations, this thesis is entirely my own work.
- I have acknowledged all main sources of help.
- Where the thesis is based on work done by myself jointly with others, I have made clear exactly what was done by others and what I have contributed myself.

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Abstract

Studies investigating the issue of Developer Turnover and its impact on the software development process, either negatively or positively, have been in advancement for years due to the researchers' perception of the extent of this issue and the need to be mitigated or avoided if possible. Most of these studies focused on investigating the factors that drive a developer to leave the team, as well as the effects of developer turnover on the development team. Moving from this point, this study aims to research the problem of Developer Turnover as well but in terms of the relationship between the absence of the main developer, and the impact on software maintenance and customer satisfaction, it also, focuses on investigating the factor of knowledge loss and its effect on maintenance. Then, it attempts to define guidelines that are drawn from the study to avoid or reduce the impact on software maintenance and reduce customer dissatisfaction. To achieve this approach, the author relies on a sample of software projects and members of the development team in Palestinian IT companies. The author followed exploratory research based on multiple case studies. Used the interview as a method of data collection and thematic analysis methodology to analyze these interviews, in addition to a questionnaire as the second method of data collection based on the results of the interviews.

It is evident from the analysis of the interviews, that there is a negative impact of the developer's turnover on the development team that influences customer satisfaction for a reason related to the Palestinian region, especially the effect of "outsourcing" companies, as these companies have capabilities that are not present in other companies that rely on local business. The second reason is the precautions taken to avoid this problem, as it is not sufficient in terms of compensation for the loss of knowledge and

the circulation of information between team members and documentation. On the other hand, the absence of this phenomenon is positively reflected in the development team and customer satisfaction. The customer remains concerned that the developer responsible for maintenance will leave the team at any time; however, some elements lead to customer satisfaction, even with the frequent rotation of developers. But it must be taken seriously and with interest in the software company. As for the questionnaire, all the responses of the participants were positive, the percentage of "Strongly Agree" and "Agree" metrics was 70%, which indicates an agreement with the themes resulting from the analysis of the interviews. Accordingly, the author drafted guidelines that address factors from interviews with development team members and customers to avoid or reduce the problem of switching a team member.

ملخص الدراسة

في السنوات الاخيرة كان هناك تقدم في عدد و نوعية الدراسات التي تبحث في مسألة أثر دوران المطورين على عملية تطوير البرمجيات سواءا بشكل ايجابي او سلبي، وذلك بسبب تصور الباحثين لمدى أهميت هذه المسألة وضرورة التخفيف من آثارها السلبية ان وجدت أو تجنبها إذا أمكن .ركزت معظم هذه الدراسات على بحث العوامل التي تدفع العضو إلى مغادرة الفريق وايضا الآثار التي يخلفها المطور التارك للفريق على فريق التطوير. إنطلاقا من هذه النقطة، تهدف هذه الدراسة إلى البحث في مشكلة دوران المطورين أيضًا ولكن من ناحية العلاقة بين غياب المطور الرئيسي وصيانة البرمجيات ورضى العملاء. تركز هذه الدراسة على البحث في عامل فقدان المعرفة وتأثيره على الصيانة، أيضًا، التحقق من تأثير دوران المطورين على أعضاء فريق التطوير والصيانة ، والذي من خلال تأثيره على الصيانة يمتد إلى رضى العملاء. بعد ذلك، تم وضع إرشادات مستخلصة من الدراسة لتجنب أو تقليل التأثيرات على صيانة البرمجيات وتقليل استياء العملاء. لتحقيق هذا النهج، يعتمد المؤلف في دراسته على عينة من مشاريع البرمجيات وأعضاء فريق التطوير في شركات تكنولوجيا المعلومات الفلسطينية، عمد المؤلف إلى دراسة عدة مشاريع حيث قام بإستخدام المقابلات كوسيلة لجمع البيانات، واستخدم منهجية التحليل المواضيعي (Thematic Analysis) لتحليل هذه المقابلات، بالإضافة إلى إجراء استبيان كطريقة ثانية لجمع البيانات من اعضاء فريق التطوير بناءا على نتائج المقابلات.

يتضح من تحليل المقابلات أن هناك تأثير سلبي لدوران المطور على فريق التطوير والذي يؤثر بدوره على رضا العملاء لسبب يتقلق أولا بالمنطقة الفلسطينية وخاصة تأثير شركات "الاستعانة بمصادر خارجية" حيث ان هذه الشركات عندها امكانيات غير موجودة لدى الشركات المحلية. ثانيا هو الاحتياطات المتخذة لتجنب هذه المشكلة و معالجتها غير كافي من حيث التعويض عن فقدان المعرفة و تدوير المعلومات بين اعضاء الفريق والتوثيق. من ناحية أخرى ، ينعكس غياب هذه الظاهرة بشكل إيجابي على فريق التطوير ورضا العملاء. مع ذلك لا يزال العميل قلقًا بشأن مغادرة المطور المسؤول عن الصيانة للفريق في أي وقت. مع العلم انه لا تزال هناك عناصر تؤدي إلى رضى العملاء ، حتى مع تكرار دوران المطورين. ولكن يجب أن تؤخذ على محمل الجد وباهتمام من شركات البرمجيات. و بالنسبة للاستبيان نجد ان جميع ردود المشاركين كانت إيجابية حيث كانت النسبة المئوية للمقاييس "أوافق بشدة" و "أوافق" هي 70٪. مما يشير إلى اتفاق مع المواضيع الناتجة من تحليل المقابلات. ووفقًا لذلك ، صاغ المؤلف قواعد ارشادية تتناول عناصر من المقابلات مع أعضاء فريق التطوير والعملاء لتجنب أو تقليل مشكلة تبديل عضو في فريق.

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Acknowledgements

Praise and thanks to Allah, who guided me in my life and helped me to do this thesis. I wish to express my sincere appreciation to my supervisor, Dr. Yousef Hassouneh. Without his persistent help, suggestions, and encouragement, this thesis would not have been accomplished.

I wish to acknowledge the support and great love of my parents, my wife, and my friends. They kept me going on my studies.

My thanks and appreciation to all the people who supported me.

Chapter 1 Introduction

1.1 *Introduction and Motivation*

Software maintenance is an essential stage in many aspects of the software development cycle; one of these aspects is the key to the relationship between developer and customer. Any adverse effects on the developer or customer will experience a maintenance issue and influence the relationship between them, such as the issues of Developer Turnover and customer satisfaction, which are the factors that were investigated in this study. Maintainability is defined according to the IEEE standard as "The ease with which a software system or component can be modified to correct faults, improve performance or other attributes, or adapt to a changing environment" [25], [26]. This definition inspires us about the relationship between the knowledgeable and experienced developer who performs fault correction, improvement, or any other changes to satisfy or dissatisfy the customer who influenced by the maintenance. Developer Turnover is a phenomenon of frequent leave and joins of the developers in a software project. Developer Turnover affects the relationship between a developer, maintenance, and customer satisfaction. A dissatisfied developer leaves the project with valuable knowledge that influences the maintenance negatively and leads to low customer satisfaction. Hurley et al. [19] explored the relationship between employee satisfaction, employee turnover, and customer satisfaction, the lower turnover achieved by higher levels of employee satisfaction, which leads to high customer satisfaction and eventually influences consumer relationship and profitability.

Several studies were investigating the issue of Developer Turnover and its negative impact on software maintenance. They are interested in investigating the factors that lead the member to leave the team. The author is interested in these factors as well. Still, in a different concept, these factors were used in our study to look at the relationship between the absence of key developers, the software maintenance and customer satisfaction, which how the impact of Developer Turnover on software maintenance influences customer satisfaction among a sample of IT projects and team members in the Palestinian IT firms. The author categorized the factors that have been investigated in previous studies and their effect on Developer Turnover. From these factors, knowledge loss is a related factor in the teams of developers in our region of Palestine since the number of members of the team is relatively small, so there is clear dependence on the developer and the knowledge he owned as a key person. Since there is no policy to document members' knowledge, when one of these members leave, knowledge cannot be compensated. This study focused on this factor as well as other related or close factors and their impact on maintenance in addition to highlight another related factor, which is the behavior of the developer to see if this affects the developer stability in the team. The author claims that there is a direct impact of Developer Turnover on customer satisfaction, and an indirect impact, which is by its effect on maintenance that influences customer satisfaction.

This exploratory research started by conducting face-to-face semi-structured interviews – as a method of data collection- with development teams and customers for multiple case studies consisting of various projects, some having Developer Turnover issues and others without Developer Turnover issue. Then,

based on a qualitative analysis of these interviews, a questionnaire was prepared as a second way to collect data to find out the degree of agreement with the results of the analyzed interviews. Interview questions were made in the form of groups based on the research questions. The development team has two sets of questions for the team leader and the developer. As for the customers, they have one set of questions. The questions classified based on the utilized factors in each group, such as team leader questions (A policy to encourage developers to stay in the team, developer Turnover impact on maintenance, bug tracking, customer satisfaction, knowledge loss, and developer behavior) as well as developer (Difficulties encountered when joined the project, the impact of joining an existing project on maintenance, compensation of the lost information, customer satisfaction, and developer behavior).

1.2 *Contribution*

- Investigating the relationship between different aspects, Developer Satisfaction, Developer Turnover, Software Maintenance, and Customer Satisfaction
- New factor related to the specificity of this study in the Palestinian territories (Palestinian IT Firms)
- Drawing some tips and guidelines to reduce the impact of the Developer Turnover phenomenon.
- Using Qualitative analysis method (Themes) to analysis interview questions

1.3 *Research Objectives*

The output of this study is to define a guideline for managing developers' turnover. And highlight the causes of the phenomenon of turnover of developers in Palestine. Therefore, the objectives, in addition to answering the other research questions are to determine a developers' turn over management guideline to minimize the customer dissatisfaction and minimize its effects in software maintainability.

1.4 *Research Questions*

RQ1: - How developers' turnover affect software maintainability?

RQ2: - How developers' turnover affect customer satisfaction?

RQ3: - Why is there a Developer Turnover in Palestine?

RQ3: - What are the factors that should be managed during the software development process and maintenance that contribute to minimizing the effects of Developer Turnover?

1.5 *Overview of this report*

In the next chapter Background and Literature Review, initially introducing some of the developers' turnover definitions from related works, then present a summary of the factors utilized in several studies. Then, present the relationship between those studies and this proposed study, focusing on the factors that were used in this research study.

Chapter 3 Research Methodology, present the used methodology, the method to collect data through conducting face-to-face interviews, include the projects, the

teams, and the customers that participate the Interview and the proposed interview questions, the questionnaire and questionnaire's questions. Also, to show the method used to analyze qualitative data. Chapter 4, shows the collected data through the used methodology, the results, and analysis of these results. Chapter 5, discussion about threats to validity, difficulties and obstacles the author faced during this research, it also includes the guidelines as the outcome of this research, then finally the conclusion and future.

Chapter 2 Background and Literature Review

In this section, the author makes an itemized review of related works as well as introducing definitions and make a classification for the factors that influence the Developer Turnover issue.

Initially introducing some of the developers' turnover definitions in the related works, then present a summary of the factors used in several studies that were to demonstrate and study the phenomenon of developers' turnover. This summary focuses on the main idea, classifying factors, results and conclusion, and makes a simple comparison between these researches. Finally, present the relationship between those studies and this proposed study, focusing on the factors that were used in our research study.

2.1 *Definition*

Through the long work of the author in the field of software development in different software organizations, there was always a problem that most software development teams suffer from, that is one of the team members leaves the work in the maintenance period or before the end of the project, which affects the team and the project and influences the customer's satisfaction negatively and in sometimes positively. It is a development team challenge in almost every project. The best expression that describes it, is the 'Developer Turnover'.

According to Foucault et al. [1] they considered Developer Turnover as a phenomenon, in which the developers keep joining and leaving the project through its evolution in the form of continuous nonstop flood and retreat of human resources. They also defined it as a rate in which a member leaves a

project as an external change (outside the team), or internal by changing the role in the team.

In terms of Software Engineering risk factors, Ebert el al. [2] found that staff turnover is a rate of outsourcing developers leaving the stuff as a direct risk for allocating global talent in global software development.

In terms of employee retention, Bass et al. [3] identified staff turnover the same as Ebert et al. [2] in global software development. Still, from another point of view related to the employment environment, they called it “Poor employee retention” as a (high staff turnover) that has a negative impact on software development other than considering it as an essential risk factor that is one of the top five risks.

In terms of knowledge loss, when senior developers leave the project, they leave a knowledge gap [7]. Deny others the knowledge of the decisions they have made [5]. Pose a threat to the project that newcomer does not understand the code written by the leaving developers [6]. This knowledge loss, knowledge gap has to be managed [7].

Another definition, which is, a high frequent influx and retreat of software developers through the improvement of an IT company [10].

As of Hynninen et al.[12] Voluntary turnover that is deliberately leaving the organization has been accounted for to be a cost factor in the software companies. From recruitment point of view, Weller et al. [16] explained the voluntary turnover as starting point after the job dissatisfaction to look for a new job.

The author categorized the definition in this research into two terms, explicit developer turnover and implicit developer turnover, where explicit turnover corresponds to the previous definitions where the developer leaving and joining

software projects, while implicit turnover means when modifying old code, the developers will face a problem of remembering what they wrote previously and feel as if they modifying a code written by someone else, this leads to the issues of the developer turnover, but simpler, especially in the absence of documentation.

2.2 *Background*

According to the author search for Developer Turnover related studies, many studies from different countries all over the world have conducted to investigate the phenomena using various factors. Studies that feature the issue of Developer Turnover in our region, and in particular Palestine is scarce or modest. There is a study in the Palestinian IT firms, but it does not address what this study is looking for directly. However, still, it addresses one of the factors that other studies used to investigate the phenomenon, addressing the relationship between job satisfaction and turnover [18].

Related studies on Developer Turnover conducted on more than one axis:

- External/ Internal turnover
- Knowledge loss
- Sourcing Strategy (In-house, Offshore, off-site)
- Employee retention
- Using the machine learning/ statistical model
- Developer behavior
- Customer Satisfaction

Each of these axes has been investigated based on several diverse factors to feature and recognize the issue of Developer Turnover. The final results of these related works demonstrate the various impacts of Developer Turnover phenomenon.

Related works have been conducted in different environments such as Global Software Development GSD, Open Source Software OSS, non-OSS communities, which help us to lead a more extensive and comprehensive investigation of the phenomenon in our region by using distinctive factors from these studies as a projection on our research.

It's worth mentioning that some of these related works tried to make a comprehensive study by including factors from different axes like what Sharma et al. [11] did. He included factors related to the developer's behavior as well as factors related to the project to predict the issue of turnover.

In this research, the author made a general comparison for the outcomes and factors from related works, which help in addressing the issue in the Palestinian software market. The author objective is to study the phenomenon in general, and its effect on software maintenance, and customer satisfaction. On the other side, the author investigated the influence of employee turnover on customer satisfaction, claim there is a negative correlation between employee turnover and customer satisfaction.

More employee turnover means less customer satisfaction and vice versa [20]. Hurley et al. [19] recommends that employee turnover can likewise be a strong predictor of employee satisfaction that affects to customer satisfaction.

The next section is a summary of these axes and factors through related studies.

2.3 *Classification of Developer Turnover factors*

This section classified the factors studied in the related works into seven axes, each axis contains various factors and more than one axis can appear in the same study.

Also, include a simple comparison between these studies.

1. External and Internal turnover

The approach for Foucault et al. [1] study is to investigate the ideas of both external turnover and internal turnover:

- External turnover: the mobility of the developers in and out of the project
- Internal turnover: the mobility of the developers inside the project modules

they found that external turnover has a negative impact on the quality of the modules while internal turnover has almost no effect, also newcomers have a negative impact on the quality of the software while leavers don't have. The study was on an open source project, their strategy was to observe the turnover in two levels, on the level of the project itself named external turnover and on the level of the module inside the project named internal turnover, they looked deeply on the module level trying to find a patterns for turnover, then they present the relationship between turnover and software quality by finding the number of changes on the code by the leavers or the new developers and measured the density of bug-fixing comments.

Mockus's [4] research was inverse of what Foucault et al. [1] found, he found that newcomers had not to effect on the product quality while developers leaving the venture negatively affected the project.

The reason behind this distinction is that Foucault et al. [1] results demonstrate that newcomers have an association with quality and leavers don't have such relationship, in light of the action of developers on the source code and the bugs as the action of newcomers have a more grounded association with quality, Mockus [4] results demonstrate that new members not allocated to significant changes, On the other hand, takeoffs from the organization make gaps in knowledge and experience left by the withdrawing members.

Mockus [4] objective was the organization productivity and components that expansion productivity and quality of the product, one of these elements is the organizational volatility or the Developer Turnover, his study relies upon the elements:

- Joining (coming in) of new members into a team in an organization
- The take-off (leaving) of developer from the organization;
- The change of the developer’s organization.

he hypothesizes that new experienced developers would find better approaches to improve quality. He measures the organization change by time (the quantity of new members coming in and leaving the organization) and their impact on product quality by estimating the modifications on files and LOC.

Also, Lin et al. [9] bolster this idea, frequent Developer Turnover leads to lacking relevant knowledge and investing additional time figuring out how project work which in turn may prompt loss of productivity.

2. Knowledge Loss and productivity

Knowledge Loss axis is the most important among others, it’s the major influence that makes high turnover as a serious issue.

Rigby et al. [5] created a quantitative knowledge loss model to find the size of the source file that modified by a developer, they used two metrics, value at risk and expected shortfall, the case studies were two large software projects. The idea here, to measure the susceptibility of the project against Developer Turnover based on the abandoned source file size.

They found that the two projects are liable to losses more than three times (or 3.6) the expected losses. Also, they found that newcomers that are modifying abandoned code are more expected to make errors and have reduced productivity, same as what Foucault et al.[1] found and the inverse of what Mockus 's [4] found as clarified earlier in this section. But Donadelli [13] found that instead of newcomers, developers who have the knowledge take over the abandoned code, also they found that to relieve code abandonment, the project manager can encourage developers to stay in the team.

To mitigate the impact of loss due to turnover developers, they recommend having a backup developer 34% to 48% of the time which reduces the expected loss by up to 15%. And increase productivity as of Mockus [8].

Nassif et al. [6], extended Rigby et al.[5] work. They studied the phenomenon in term of knowledge loss. The main idea of the study is the size of knowledge loss through time (the very high loss that forms a serious threatens). When a developer leaves a project, his knowledge may be lost when a new developer joins the team

and do not understand the code and the design produced by the leaving developer. They depend on the size of the abandoned file. While another study done by Izquierdo-Cortazar et al. [7] studied the abandoned code at the line-level.

Rigby et al. [5] model of knowledge loss was to measure the knowledge loss size by finding the number of files that have been modified or written by the developers who left the project or the development team.

Compared to what Rigby et al.[5] did, Nassif et al. [6] extended their work, they found that their knowledge loss model deals with each file evenly or equally which overestimate the losses so they weigh each file in a project in proportion to its size, they fully re-implemented and tested with extra metrics to find the knowledge loss, by providing a more deep analysis, they used the original approach of Rigby et al.[5] work, which is the factors:

- Value at risk
- Expected shortfall

They added to it:

- The time factors
- Period over the calculated loss of knowledge
- They studied the location
- The persistence of abandoned files in the organization of the projects

They also mentioned that maintenance may be affected until recover the lost knowledge. This point is related to one of our questions in this thesis (How developers' turnover affect customer satisfaction?)

Very important facts have been established in this study, such as, abandoned files often remained in the system for long periods. Each developer joins the project and adjusts or adds to a file, adding something of the knowledge he owns. Ultimately, the maintenance of the program is negatively affected by the number of developers who participated and then left the team. Even with good documentation, cannot surround every idea used by the developer.

Investigate the damage due to turnover and successors to undertake abandoned files, were the factors studied by Donadelli [13]:

- They found that instead of newcomers, developers who have the knowledge should take over abandoned code.
- They found that to relieve code abandonment, project manager can encourage developers to stay in the team.
- They found that to prevent or decrease the impact of leavers on the project, spreading the knowledge more among successors is a solution.

3. Sourcing Strategy

Sourcing strategy has an important influence on Developer Turnover, cannot be ignored in this circumstance. Studies that utilizing sourcing strategy factors such as Bass et al. [3] shows - In general - that staff turnover has a negative impact on software development. This is the same conclusion Foucault et al.[1] reached in his study of the External and Internal turnover axis.

The approach of Bass et al. [3] study was to explore development turnover through sourcing strategies. As their study is gone for global software development, they were:

- In-house staff development
- Offshore outsourcing (it maybe a third-party vendor)

They focus on employee retention and claim that high staff turnover is a result of poor employee retention whereas employee retention affected by many factors, they studied both approaches in term of development environment factors like employment policies, workplace, product quality, long working hours, developer experience…etc. many ways used to collect data for analysis (observe Team activities, documentary Sources, On-site visits, audio-conferencing, face-to-face interviews) from two case studies and cross-case analysis to explore similarities and differences among cases.

They found, on the one hand, that outsource developers needs to achieve customer satisfaction by being a client facing and work for long hours, this environment is inconvenient to work and the results are a high staff turnover, and according to

Mockus [8], less developer productivity as a result of the succession in offshoring projects, also, affected by the complexity of the transferred knowledge.

on the other hand, In-house development environment is much more comfortable as developer focus on the product and quality in a family-friendly environment, no need to be a client-facing.

Back to Mockus [8] and productivity, in offshoring and outsourcing as a sourcing strategy for commercial projects (Outsourcing is the transfer of internal operations to a third party or obtaining services from a third party company. Outsourcing helps complete multiple jobs at a faster rate and cut costs. Offshoring is to get services or get work done in a different country to save costs due to lower prices from skilled workers in a different country but other than outsourcing, offshoring allows you to retain control of the business process) , the succession (the author suggest another abbreviation which is a backup developer) becomes more important to increase productivity, this is also recommended by Rigby et al.[5].

In another context, code ownership transfer, or succession can play an essential factor to increase developer productivity, measuring this factor show us the impact of succession on productivity [8]. It should pay attention that productivity reduced in specific circumstances such as a large project with offshoring succession and overloaded mentors. However, still, proper succession increases productivity, and it is essential in the offshoring and outsourcing projects [8].

Which means it can be considered to solve the issue of knowledge transfer from the leaving developer to the newcomers as Rigby et al.[5] recommended.

Another two important factors have been introduced by Hynninen et al. [12] in GSD which is off-site and commitment and the relation between them, these two factors seem to coincide. In addition, from my point of view, turnover in Offshore outsourcing, Bass et al. [3], intersect with off-site commitment, but certainly, it must be investigated.

High turnover which is a result of low commitment, can cause an additional cost so that it affects the main goal for which the off-site was used to reduce costs.

Off-site commitment affected by factors such as (level of work autonomy and given challenges, job stability).

Suggested ideas to overcome the issue of off-site commitment is to enforce the on-site and off-site employees to have more collaboration, organizing the project in a way allowing off-site to have more impact over their work.

4. Employee retention

Studies show that high staff turnover is a result of poor employee retention whereas employee retention affected by many factors (development environment factors like employment policies, workplace, product quality, long working hours, developer experience…etc.) [3].

In a study conducted among a sample of IT employees in the Palestinian IT firms by Murrar et al. [18] they found that job security, pay, and coworkers are among the most important factors that affect job satisfaction and extended to influence Developer Turnover. The aim of the study is to investigate the extent to which job satisfaction affects turnover and the search for the reason for job dissatisfaction in Palestine to improve opportunities for retention of highly skilled and knowledgeable staff.

Ebert et al. [2] and Bass et al. [3] both studied turnover in global software development, while Bass focus on employee retention, Ebert et al. [2] considered that Developer Turnover is one of the top five risks in Global Software

Engineering projects from management perspective, he claimed that the reason is the abundant job opportunities in the respective economies, Elbert et al. present some ideas (out of box ideas) to limit the effects of Developer Turnover, he recommend to deal with this risk in advance such as:

- Create a plan to have a buffer of developers.
- Deal with retention dependent on a model like a loyalty reward.
- Also, prescribe conducting a questionnaire for employee commitment to improving the workplace.

Developer dissatisfaction: one of the most important factors influence Developer Turnover, as of Yu et al. [15], to show this influence he investigating whether turnover influenced by hygiene factors (factors that portray the situation or condition of an individual's work). They identified the hygiene factor in a search model to validation their impact on turnover. Some of the hygiene factors included in this study (Project regulation and Administration, Support, Working relationship with other members, Future rewards, Personal needs for software functionalities)

They found that “project regulation and administration” is the most noteworthy factor of dissatisfaction, followed by future rewards and personal needs for software functionalities

From our point of view, employee retention is considered a very important factor and can be the most important factor if it is studied beside the employee's behavior, especially in our region.

One of these studies that are the closest to our research is Hurley et al. [19], they explored the relationship between employee satisfaction, employee turnover and customer satisfaction, the lower turnover achieved by higher levels of employee satisfaction which lead to high customer satisfaction, and eventually influence consumer relationship and profitability.

5. Using the machine learning/ statistical model

Using the machine learning or a statistical model is creative idea as a proactive action to predict which developer will leave the project or even the factors that lead the developer to leave the project.

Boa et al. [10] built a prediction module, to predict whether the developer will leave the company or not after one year from the beginning of his work.

They used various classifiers that are used in software engineering research, Naive Bayes, Support Vector Machine (SVM), Decision Tree, K-Nearest Neighbor (kNN), and Random Forest. These classifiers trained by using a proposed factor from a monthly reports data to predict whether the developer will leave the company after entering it within one year.

They have directly analyzed data from the monthly work report in non-open source companies, this report contains the activities of the developer per hour over a month, many factors extracted from this report, around 67 factors to include them in the analysis process. The report of first six month from the beginning of the developer's work in the company has been used, these reports taken for around 6 years of monthly reports data for first six monthly reports.

At the end and after studying the relationship between the factors used and developers' departure. They found - for their prediction module - the most important factors that provide an indication of who or which potential developer will leave the project.

These important factors are:

- The tasks in monthly reports
- Working hours
- Working hours in the first month for project members

Calculating the standard deviation for these hours shows a clear indicator of the variation of the characteristics between leavers and stayers (retained and non-retained developers) to be used in the prediction model.

Sharma et al. [11] In an earlier study, analyzed turnover in open source software projects by including both individual developer level factors and project level factors. Their analysis suggested that factors from both levels (the influence of the developer and project variable on turnover) are important predictors of turnover.

They used different statistical models that allowed them to examine the factors that affect developer turnover as well as how these factors differ between developers and projects. Use logistic models to measure the effect of variables at the developer level on turnover behavior, and Hierarchical Linear Models (HLM) unconditional and conditional models to estimate the effects of both the variables at the developer and project level on turnover.

They used and analyzed archival sample data, contained data for 40 active projects and 201 developers.

Sharma et al. [11] had applied an idea that brought together factors that investigated later by Boa et al. [10] in the prediction model and Lin et al. [9] on developer behavior.

from our point of view, the idea came in three dimensions:

It was considered that:

1- The inclusion of factors that belong to the developer behavioural
2- The inclusion of factors related to the project itself

Is very important to:

3- Predict turnover.

Why he came out with this argument? Because, on the one hand, he contends that based on the fact that the developer is inserted in the project activities it is basic to incorporate the two points of views to create a model to predict turnover.

On the other hand, it leads to a more comprehensive study of the issue of turnover

Factors were used in this study:

- Developer Factors: (Active developer (currently – a period of 2months), Active developer (in the past - previous 10 month), Role of the Developer, Number of Projects, the time to join the project)
- Project Factors: (Project Age, Project Size)

6. Developer behaviour

In the research that done by Lin et al. [9], they introduced a factor related to the developer behavior itself, that may affect the Developer Turnover, that is, to what extent the developer survives in the project, such as:

- The time to join the project
- The rate of maintaining own files
- The main action type such as adding files or modifying files
- The main job types

They found that the higher survival rate affected by:

- The earliest to join the project the higher survival
- Developer who Modify files stay longer than who create files.
- Developer who write code stay longer than who managing documentation.

There are many other behavioral factors can be considered to investigate the effect of these human behaviors in Developer Turnover expectation, such as identification of participants, leadership, management style, and the sentiments of developers.

Behavioral factors introduced in Belbin roles for building innovative teams, Belbin used to empower individuals to learn about themselves by helping them to discover the behavioral strengths and weaknesses of the team member [14].

Belbin categories the roles in three groups, each of three roles [17]:

1. People Oriented Roles (Coordinator, Team Worker, Resource Investigator)
2. Action Oriented Roles (Shaper, Implementer, Completer-Finisher)

3. Thought Oriented Roles (Plant, Monitor-Evaluator, Specialist)

To bring the picture closer to the idea discussed in this study, the author can mitigate job dissatisfaction introduced by Weller et al. [16] by finding a space in the team to apply Belbin roles, by starting to study the personality of each member in according the roles in the theory until the arrival of the stage of developer satisfaction for himself. Actually, these factors can be utilized in a study to improve developer retention.

Next section shows how these factors intersect with this proposed study.

7. Customer Satisfaction

Yang [24] studied the turnover in agile teams in term of speeding up the process of integrating the newcomer into the team to become a productive team member which known as “onboarding”, if this process takes a long time it will negatively affect the productivity.

In term of customer satisfaction, the low productivity during the replacement period for the employee who left the team will cause a decrease in customer satisfaction.
to minimize this effect, they introduce the onboarding mechanism to help the new team member adapt to the team quickly.

Based on the research that they have done, the period of engagement with the work takes from four weeks to three months, so that it can meet the expectations of the customer, and this period depends on the level of experience of the new developer.

The influence of employee turnover on customer satisfaction, there is a negative correlation between employee turnover and customer satisfaction. More employee turnover means less customer satisfaction and vice versa [20].

As of Hurley et al. [19], Employee turnover can likewise be a strong predictor of employee satisfaction that affects to customer satisfaction, they explored the relationship between employee satisfaction, employee turnover and customer satisfaction, the lower turnover achieved by higher levels of employee satisfaction which lead to high customer satisfaction, and eventually influence consumer relationship and profitability. More attention should be given to managing customer satisfaction through managing employee turnover.

Rigby et al.[5], Nassif et al. [6] mentioned that maintenance may be affected until recover the lost knowledge. When maintenance affected this means that customer satisfaction may be at risk.

2.4 *The Proposed Study In this Thesis*

Related works section shows how researchers look at the issue of Developer Turnover, through a variety of factors, each study introduced its approach to investigating Developer Turnover, utilized specific factors to achieve its approach. A similar way the author worked on this research:

- To have an approach and to use factors to investigate the approach.
- To have factors from the classification process in the previous section.

1. Developer Turnover - Utilized Factors:

Knowledge loss is one of the factors that classified and investigated in previous studies through their effect on Developer Turnover. Knowledge loss is a related factor in the Development Teams in the region of Palestine. Since the number of members of the team is relatively small, so there is clear dependence on the developer and the knowledge owned as a key person. Since there is no policy to document members' knowledge, that when leaving one of these members cannot be compensated. So, this is one of the factors considered in this study and its impact on maintenance, besides, to investigate other related factors such as the behavior of the developer to see if the developer is satisfied with his job and position in the team.

The use of factors from a variety of related work, as these factors were investigated in many studies, and most of the similar work was referring to the same of these factors so that it can be used in this research but another context:

- The author relied on these studies to make sure that the conducted investigation is comprehensive. Did not follow the trend of the LOC and files

size in the study because the team is possible to consist of non-developers such as team leader, coordinator, QA. This study was at the team management level and the developers in software companies. The study was held for a number of projects that suffer from the issue and others do not. Was also at the level of the customers involved in the project.

- The inclusion of several factors from related works into a single study enriched this study and make it comprehensive since the objective here is not to prove that the factor exists and has an effect, the objective is to prove that this phenomenon exist in Palestine, why it is in Palestine?, and negatively influence the software maintenance and the satisfaction of customers. This is the contribution the author provides in this study, in addition to drawing some tips and guidelines to reduce the impact of this issue.

Using Region factor in this study (as mentioned above “Palestine”), thought to be one of our contributions, all the related works found in the literature review were from countries all over the world, Italy, India, Sweden, USA, Austin, Shanghai, Spain, Argentina, Germany, Canada, Netherlands, in addition to a one study in the Palestinian IT firms. This can be identified as a gap between the previous studies and our study. Therefore, while these studies were selected from several regions around the world as a generalization of the problem which gives the author the advantage to adopt their factors, region can be used as a factor related to the specificity of this study in the Palestinian territories, where the economic, political and cultural factors influence this phenomenon significantly.

2. Developer Turnover vs. Customer Satisfaction:

The relation between Developer Turnover and customer satisfaction has been given little attention in practical in the software companies' literature.

Any shortage to provide maintenance to the customer or any inconvenience in dealing with the customer leads directly to the customer's dissatisfaction, including the customer forced to deal with new developers frequently because of the developer's turnover.

The investigation of customer satisfaction in this study considered a contribution to the field.

Chapter 3 Research Methodology

In order to achieve our approach, we followed exploratory research based on multiple case studies consisting of multiple projects from software companies with Developer Turnover and others without Developer Turnover, utilizing face-to-face semi-structured interviews as a method of data collection, focused on understanding the issue by discussing the roles of the participants in the development team. Interviews with customers took place as well as the development team. After completing interviews and collecting data, the author proceeds to analyze data using one of the most common methods of qualitative data analysis (Thematic Analysis).

Based on the qualitative analysis of these interviews, a questionnaire was prepared as a second method of data collection to determine the degree of compatibility with the results of the analyzed interviews. Please see (**Figure 1**), which provides a brief overview of what explained in the methodology section.

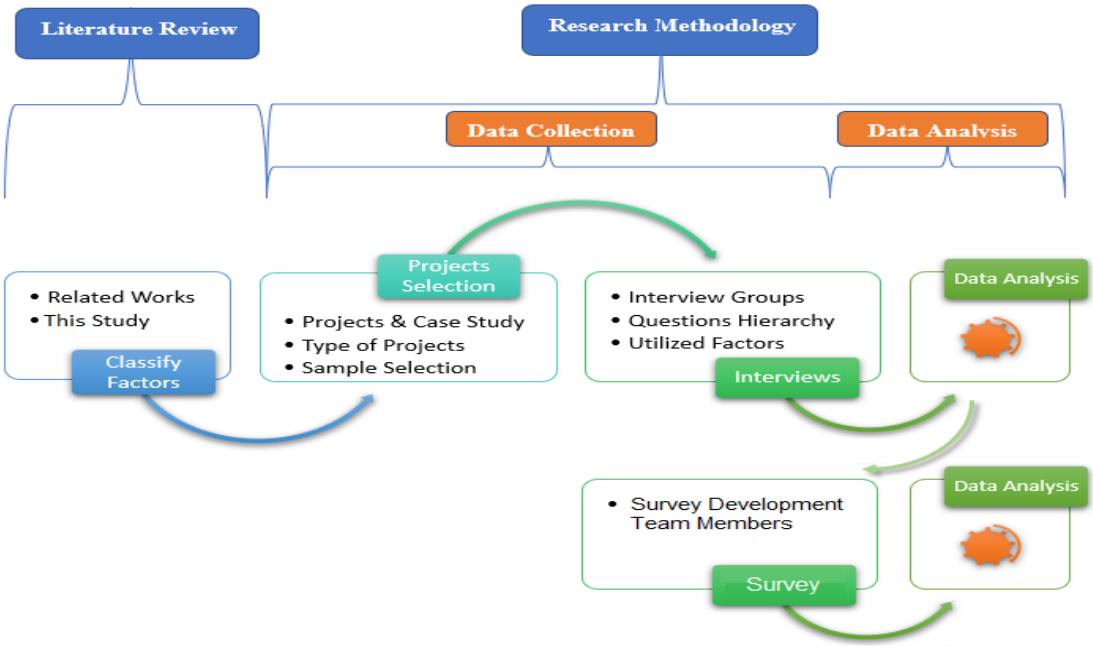


Figure 1 A brief overview of research methodology section

3.1 *Sample Selection*

Several projects were selected from several companies for this study, considered a case study with multiple cases as the case study can involve multiple cases or single case [22] . The study was designed based on those cases. The author used a case study in this research as it inspects a phenomenon in its common setting, and utilizing several methods of data collection [21].

1. Sample Selection Criteria for Software companies

Initially, the companies selected are based on the willingness of their top management, availability of projects and availability of developers. So that the companies that expressed their desire to participate are subject to the following conditions:

1- The company must be local, i.e. its headquarters and the development team are local, the software are fully built in these companies and the customers are local, meaning that they are in the same market as the software company in order to collect data and feedback directly from members of the development team and customers.

2- The age of the company in the market is not less than 10 years so that it has projects that have been built and sold and have a maintenance period.

3- Companies with projects that serve the subject of the study.

4- Companies with more than one project and it continued for a period, during which a succession of more than a developer.

Four software companies participated with total of 15 interviewees; 9 interviewees related to projects with Developer Turnover, 6 interviewees related to project without Developer Turnover.

2. Sample Selection Criteria for Projects

a. Project with Developer Turnover:

- The development team must have at least one developer
- The software should be running at the customer's site and have regular maintenance
- The Developer Turnover must have occurred in the project after it has been implemented at the customer site and during the maintenance period

b. Project without Developer Turnover:

- The development team must have at least one developer
- The software should be running at the customer's site and have regular maintenance
- The developers who perform maintenance for the software are the same since the beginning of the maintenance and have not been replaced.

The Customers chosen are mostly the clients of the projects discussed.

3.2 *Interviews*

In this study, the first procedure for collecting data was the interview. The interview is considered one of the most used research methods in qualitative research, It is used to reach areas that cannot be accessed by quantitative research, as they provide a deeper understanding of the factors affecting a particular phenomenon than what can be accessed from quantitative methods, as knowing little about a particular phenomenon needs a method Convenient to form a detailed view of the participants [23]

This is what the author needs in this research. Try to explore perspectives from experiences, and discuss individuals in detail about the factors that affect a particular phenomenon

The Interviews were Semi-structured because [23]:

- Mainly it gives the interviewer (The research author) a chance to delve deeper into questions in order to investigate in more detail of a specific idea.
- In the interview, there are key questions that help in determining the areas to be investigated
- Interviewee can realize what to discuss by giving them some directions.
- It allows addressing some of the topics that are believed to be not important for the interviewer but important to the Interviewee

These interviews were conducted in different forms: face-to-face (whenever possible), online, or by phone.

1. **Interview Groups:**

   Designed three groups of interviews based on two types of Interviewees:

   - Development Team Interviewees: Two groups (Team leaders, and Developers)
   - Customer Interviewees

2. **Utilized Factors**

   Interview question designed to collect data related to the research questions. They must be useful in the analysis to answer the **Research Questions**, to achieve this, The author uses some of the factors mentioned in the previous chapter (**The Proposed Study In this Thesis**) in the interview questions:

   - Knowledge loss
   - Impact on Maintenance
   - Customer satisfaction
   - Developer behaviour
   - Factors related to the specificity of this study in the Palestinian territories, where the economic, political and cultural factors influence this phenomenon significantly.

3. **Hierarchy for Interview Questions**

   The Interview Questions begin from the **Research Questions** down the hierarchy through the interview groups and the used factors to reach a specific question directed to a specific interview (**Figure 2**).

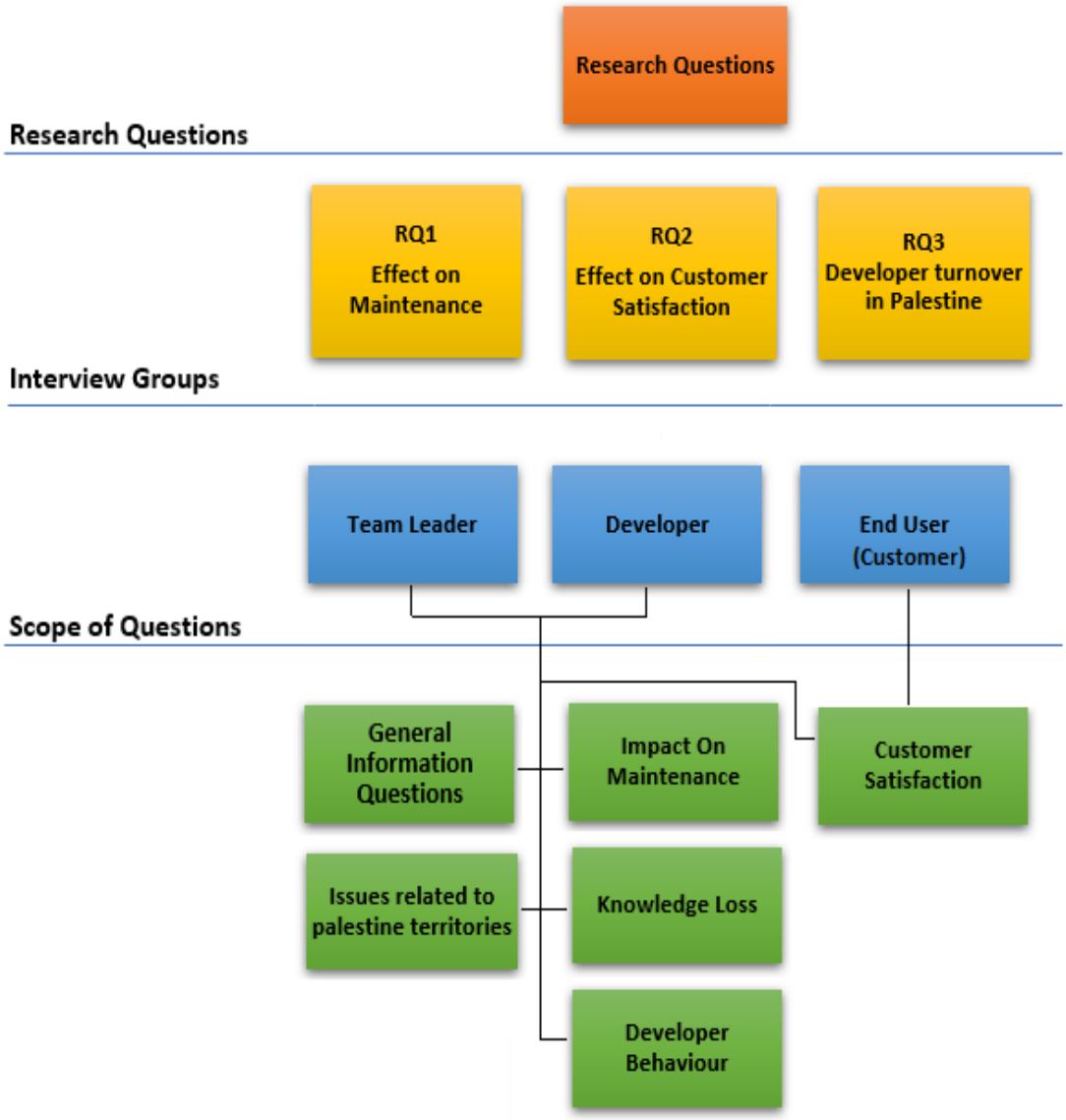


Figure 2 Hierarchy for interview question

1) Interview Questions:

The questions were formulated based on the **Research Questions** according to the group being interviewed.

These are a qualitative question, so some questions derived during the discussion with interviewee

A) Development Team

a. Project Include Developer Turnover

i. Team Leader Questions

Table 1 Team Leader Questions

About the project	
Q1	Could you give an idea about the project and its development?
Developer Turnover	
Q2	From your point of view what is Developer Turnover?
Q3	A policy to encourage developers to stay in the team?
Q4	What its effect on the project maintenance?
Q5	Is there an increase in number of complaints and the time to fix the problem due to Developer Turnover and from your point of view why this increase happened?
Q6	Is there an impact on bug tracking after the developer has changed?
	• What did you do to handle the effects (how turnover was handled in the team)? • How the team was managed to circulate information among its members? • What happened when you faced the problem of knowledge loss that cannot be solved through the previous points?
Q7	Clarify what is the effect of not circulating information among team members which leads to knowledge loss on maintenance?
Q8	What is the acceptable number of problems per year or when a change of developer is considered a risk to the project in terms of maintenance and customer satisfaction?
Customer Satisfaction	
Q9	How could you describe the customer satisfaction with the maintenance considering the existence of Developer Turnover?
Developer Behavior	
Q10	Where you find yourself on the team, can you explain how you interact with the nature of your work and position or roles

ii. Questions derived during the team leader interview

The following questions from team leaders' questions in **Table 1** were derived during the interview and discussion with the interviewees **Table 2**

Table 2 Derived Team Leader Questions

Developer Turnover	
Q3	A policy to encourage developers to stay in the team?
Q6	Is there an impact on bug tracking after the developer has changed?
	• What did you do to handle the effects (how turnover was handled in the team)? • How the team was managed to circulate information among its members? • What happened when you faced the problem of knowledge loss that cannot be solved through the previous points?

iii. Developer Questions

Table 3 Developer Questions

About the project	
Q1	Could you give an idea about the project and its development?
Developer Turnover	
Q2	Can you explain your role and your work in the team and whether you have involved from scratch and/or you have involved in the change request and maintenance on the existing modules or one of the other team members modified your work?
Q3	What difficulties did you encounter when you joined the project (in case you were not in the project from the beginning)?
Q4	How would you describe the impact of joining an existing project or leaving a project on the required modifications and maintenance?
Customer Satisfaction	
Q5	How could you describe the customer satisfaction with the maintenance in general?
Q6	How did the customer react in the first time you joined the project (in case the project already started before you joined it) and in the first problem you encounter?
Developer Behavior	
Q7	Where you find yourself on the team, can you explain how you interact with the nature of your work and position or roles?

iv. Questions derived during the developer interview

The following questions from developers' questions in **Table 3Table 1** were derived during the interview and discussion with the interviewees **Table 4**

Table 4 Derived Developer Questions

Developer Turnover	
Q4	• What difficulties did you encounter when starting work? • How do you address the issue? • Why is there no documentation? • Do you think that the lost information can be compensated? • Complexity of maintenance? • Could the change be positive? • What are the reasons that make the employee leave?

b. Project not Include Developer Turnover

These questions for both team leaders and developers, because the purpose here to compare this type of projects to the project with developer turnover.

Table 5 Questions for projects without Developer Turnover

About the project	
Q1	Could you give an idea about the project and its development?
Developer Turnover	
Q2	How you descript a maintenance in a system that you worked in without Developer Turnover?
Q3	How you descript the Maintenance Complexity in a system that you worked in without Developer Turnover?
Customer Satisfaction	
Q4	How could you describe the customer satisfaction when there is no Developer Turnover?
Developer Behavior	
Q5	Where you find yourself on the team, can you explain how you interact with the nature of your work and position or roles?

B) Customer Questions

Measure customer satisfaction, how customer see frequent change of development team members.

Table 6 Customer Questions

Q1	Could you explain to me how the maintenance and modifications to the project are done and how satisfied you are?
Q2	Can you give me a good idea of the points that make you satisfied or dissatisfied with the services and maintenance provided by the team members?
Q3	Do you prefer to deal with a team member involved in the project from the beginning or a newcomer and why, and how satisfied with dealing with them?
Q4	Did you notice in this project a change in the way maintenance is provided and the time provided for maintenance?

3.3 *Questionnaire*

After the author analyzed the interview responses using Thematic analysis method (Clarified in section **3.5 Thematic Analysis Method**), a questionnaire was prepared based on the resulted themes to find out the degree of agreement with these themes.

The outcome form the Thematic analysis are 21 themes, 10 themes for project with Developer Turnover, 6 themes for project without Developer Turnover and 5 themes for Customer.

According to these themes, 19 questions were prepared (**Table 7**). The questionnaire targeted the development team members and to be published in IT social groups, private messages, emails for IT individuals and for some of the Software companies in Palestine.

Note that questionnaire do not targeted same participant as interviews.

Also, 2 general information questions added at the beginning of the questionnaire to measure the experience of the participants.

1. **Answers criteria**

   The scale scored from 1 for “Strongly Agree" to 5 for "Strongly Disagree "

   (1) Strongly Agree

   (2) Agree

   (3) Neutral

   (4) Disagree

   (5) Strongly Disagree

2. **Questionnaire Introduction**

   A message was prepared at the beginning of the questionnaire, which sets out what is required of the questionnaire and explains some concepts as follows:

   - **Introduction to Developer Turnover**

   “Developer Turnover: one of the development team members left the work before the end of the project or even after the project completed, particularly

in the period of maintenance, which leaves an impact on quality reaches customer satisfaction and adversely or positively affects it.

Developer Turnover become a phenomenon, in which the developers keep joining and leaving the project through its evolution in the form of continuous nonstop flood and retreat of human resources

In this questionnaire the author are going to highlight some factors that affect Developer Turnover phenomenon in Palestine, such as; Actions to encourage developers to stay in the team, Developer Turnover (Reasons, Impact On Maintenance, Handle Developer Turnover, New developer difficulties), Risks, Customer (anxiety, satisfied, dissatisfied)"

- **Instructions for Undertaking this questionnaire**

"DEFINITIONS:

1- Developer Turnover: one of the development team members left the work and a new member joined to replace her/him.

2- New Developer: Developer joined the team to replace the old developer

3- Old Developer: Developer left the team

4- knowledge loss: the knowledge that the developer had when he was in the team (code or business) and the team lost it when this developer left the team

Use the following scale:

(1) Strongly Agree

(2) Agree

(3) Neutral

(4) Disagree

(5) Strongly Disagree

This questionnaire is for a master's thesis to study the problem of the frequency of maintenance team members leaving the team and their impact on the customer and finding solutions to remedy this problem. So take as much time as you need and please pay attention to the answer seriously and objectively to help solve the problem.

Firstly, please complete the general information about you as a development team member in the below section "General Questions".

In the second section please rate how much you agree or disagree with these statements, based on your work experience and your view of the impact of the developer leaving the team on a daily basis on maintenance and on the customer. Whether you are a developer who left a team or a new developer, receive a new job"

3. Questionnaire Questions

Table 7 Questionnaire Questions

No	Main Question	Sub Question
1	Do you think encouraging developers with one of the following points could reduce Developer Turnover?	Doing activities outside of work
		Increasing the salary
		Increasing the flexibility of work roles, such as (attendance time and work place)
2	Do you agree that Palestine Territory is a reason for the Developer Turnover?	Outsource companies in Palestine offer better job roles and salaries than the locals' companies
		Developer look for better Job opportunities outside Palestine
		Salaries are limited in Palestine market
3	Do you think work roles such as responsibilities, nature of tasks, relationship with management is a reason for the Developer Turnover?	
4	Do you agree that the following points have a direct and negative impact on maintenance due to the new developer?	Additional time to solve problems
		Creates a new problem
		Redundancy in work
		Hard to update old code and Inability to continue in the project
		Reduce problem solving quality
		Hard to Learn New Technology
		Bad communication with the customer
5	Do you think that knowledge loss (as a result of Developer Turnover) is a negative impact on maintenance?	
6	Do you think that comments on code and business documentation are sufficient to make up for the lost knowledge?	
7	Do you think that the Developer Turnover increases the number of maintenance tickets?	
8	Do you think Developer Turnover affect bug tracking by making it more difficult?	
9	Do you agree that the following points can handle Developer Turnover effects?	Circulate information among team members
		Use standard development lifecycle operations
		Allocate additional time to maintenance issues
		Postpone other tasks with less priorities

		Documentation
10	Do you think that using comments on code and business documentation will NOT help to handle Developer Turnover effects and lost knowledge?	
11	Do you think it's NOT difficult to update an old code by a new developer?	
12	Do you agree that Knowledge loss cannot be compensated	
13	Are the following points considered as a risk on the project maintenance and customer satisfaction?	Size and type of problem
		Customer complaint
		Complexity of the maintenance issue
		Number of developers who update the same code
14	Do you agree that the following customer questions are concerns (anxiety) for him when turnover the developer?	Who will follow up maintenance!
		Did the old developer solve all the current problems!
		Will the new behave like the old
		Will there be a familiarity (علاقة ألفة) with the new as it was with the old
		The customer considers the old Developer as a source of trust!
15	Do you think that the following facts positively affect customer satisfaction when there is a Developer Turnover?	The new developer is better
		Spend additional time to solve problems
		Problems solved
		Familiarity relation can overcome the delay (علاقة ألفة مع الزبون)
		Not a severe problem
16	Do you think the following points negatively affect customer satisfaction when there is a Developer Turnover?	The developer is not responding
		Customer complains because of abandoned a reliable developer (التخلي عن مطور كفؤ)
		Frequent developer change
		New developer has less knowledge
		New problems due to new developer
		Customer don't want to deal with the new developer
17	In your opinion, is the customer satisfied with the developer turnover in general?	
18	Do you agree that customers may abandon the project due to Developer Turnover?	
19	When trying to update an old code that you wrote yourself from a long period of one or two years or more, do you face a problem, even a simple thing, in remembering what you wrote previously? or feel like you are editing a code written by someone else?	

3.4 *Validate Interview and Questionnaire Questions*

During the preparation of interview questions and questionnaire questions, and before they were published to the participants, the process of verifying these questions was through several scenarios, as follows:

3.4.1 Interview Validation

The process of verifying interviews' questions went through several stages, according to what the author deemed appropriate and based on the observations in the interviews:

- Initially, the interview questions were modified to suit the qualitative analysis. Then the supervisor professor consulted and took some notes and amended. The author consulted another professor, took some notes, and discussed them with the supervisor, later on, questions were modified permanently before starting the interviews.
- Based on the first group of interviews with the first company, a preliminary analysis of the interviews was made, then presented to the supervisor to verify the progress of the interviews and the questions asked. Some corrective notes were put, in other words, supplementary notes to some questions based on what was observed from the answers.
- An approach was developed to deal with questions in all interviews where actual questions were asked according to the progress of the interview, some questions may not be answered, and other new questions may be derived through the interview.

3.4.2 Questionnaire Validation

The process of verifying the questionnaire questions was carried out in several stages, and by consulting experts in this field. The verification process was as follows:

- Consultation of two people, the first is a Ph.D. student, and the second has a master's degree, both of them work in the IT field. They commented that the number of questions is many; the questions' sentence is long; the participating audience may find these sentences hard to read. Also, they suggested adding or translating some questions to the Arabic language to be more understandable.
- Consultation of the supervisor professor, the verifying points as follows:
    - These are multiple-choice questions, this makes it easier for the participant to answer, so there is no need to reduce the number of questions.
    - Use Positive Negative approaches to avoid dishonest answers.

      The answers tend to be positive, which means agreeing with the questions.
    - Remove unnecessary words to simplify the sentence and make it readable
    - Add validation questions, two or three:

      The validation question is a question that is opposite to a question in the questionnaire; from its answer, it can be known if the participant answered the questions honestly.

- Run a Pilot Test:

  The author requested from one of the participants to start the questionnaire as a test to see the extent of his understanding of the questions.

  The result of the test was finding a problem in the form of one question.

Based on the above, the following modifications were made to the questionnaire:

- Kept the number of questions as is
- Added some definitions at the beginning of the questionnaire
- Added some clarifications in Arabic
- Rephrased the question with fewer words and more unambiguous words
- Used Positive Negative approaches to avoid not honest answers
- Split some questions into two questions to apply Positive Negative approaches
- Added verification questions as shown in the questionnaire questions (**Table 7**) in yellow and beige
- Corrected the form of one question based on the Pilot Test

3.5 *Thematic Analysis Method*

3.5.1 Thematic analysis

Thematic analysis used in this research to analyse the qualitative data, it is one of the most common and widely used methods, it is theoretically-flexible which mean it can be used to answer different type of questions.

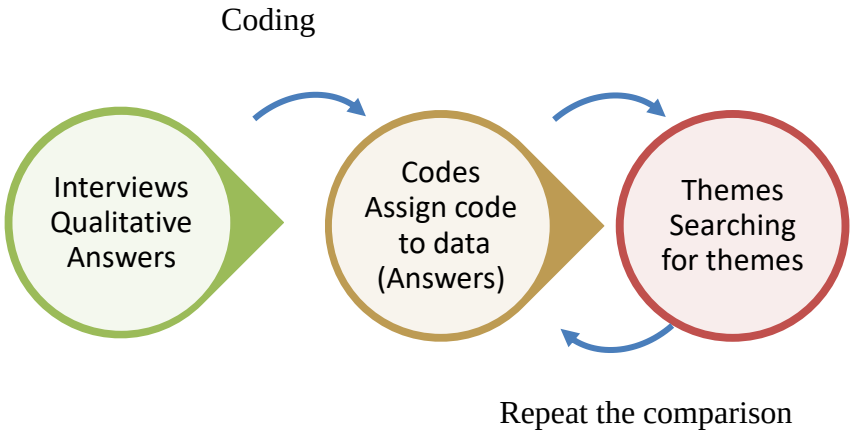


Figure 3 Thematic Analysis

3.5.2 Advantages of using Thematic Analysis

The following points show the advantages of using Thematic Analysis [28]:

- A flexible method to work with and to used immediately after or during the learn.
- Authors with little or no experience are accessible to use. Also, results are available to the educated public.
- Can summarise key features of data set, which simplify the analysis process by extracting a valuable achievement systematically from a large body of data.
- Also, it gives the ability to find the similarities and differences in an extensive collection of a data set.

3.5.3 Phases of Thematic Analysis

Several ways used in Thematic analysis; an approach includes six phases used in this research (**Figure 4**).

This section shows a brief explanation of these steps and how to use them in this research. The next chapter (Chapter 4) explains the practical steps taken for the analysis, which was done based on the results of the interview.

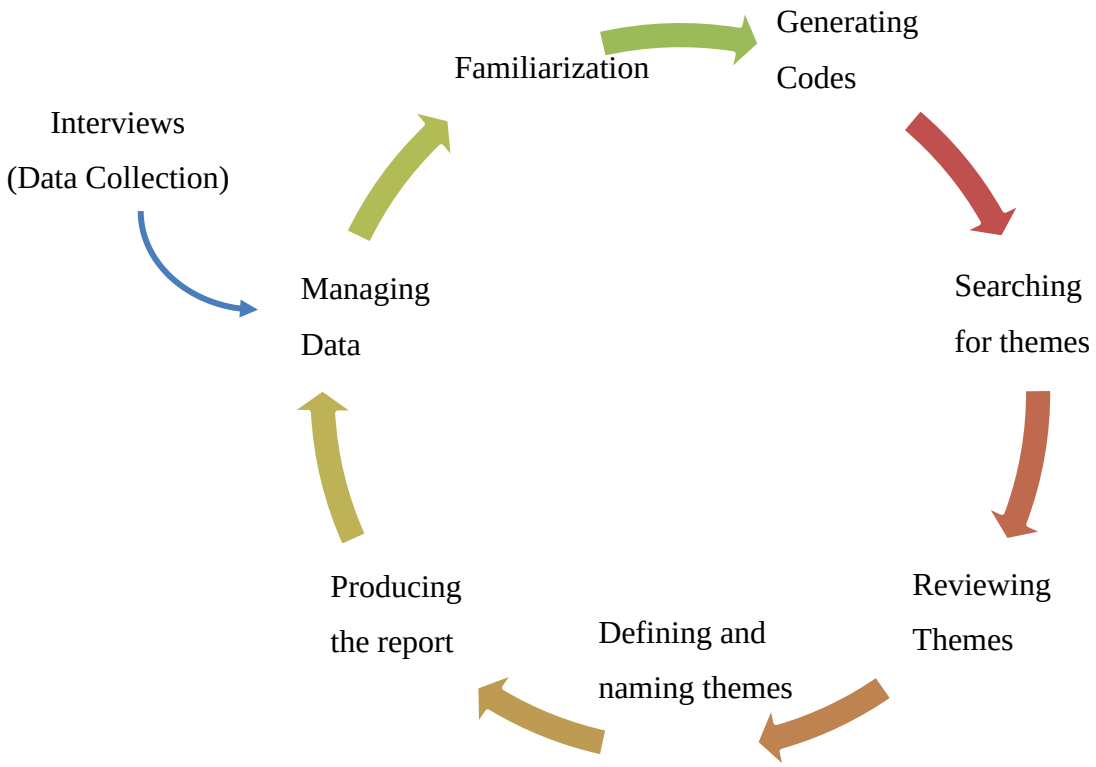


Figure 4 Phases of Thematic Analysis

The following points clarify each phase: [28], [29]

1. **Familiarization:** To be familiar with the collected data, need to overview all the data that collected before start the analysis.
2. **Coding:** To identify an important feature of the data stat by highlighting sections of the text (the sentence) and assign a label to it that describe the content. This label or code can be used in other similar sentences with the same meaning in the data set [27].

   Figure 5 shows an example of the assigned codes to interview data in this research

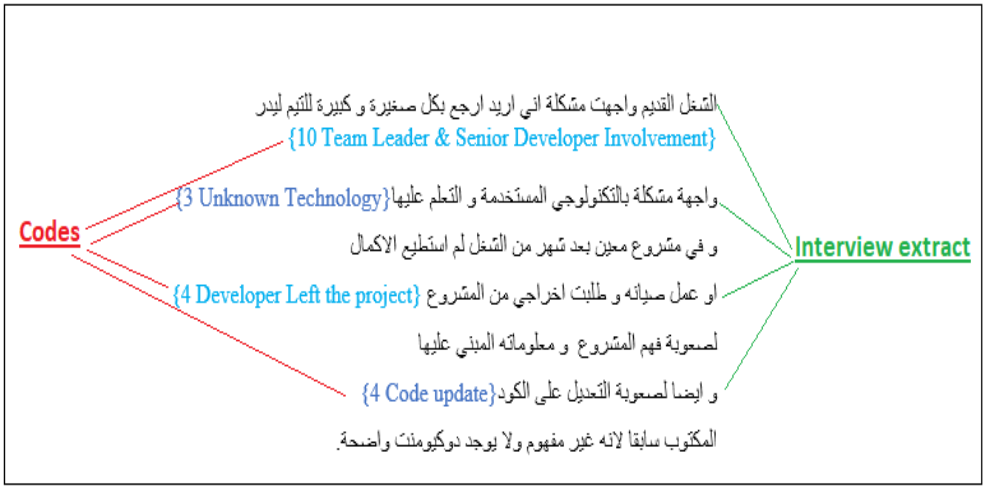


Figure 5 Generate Code

3. **Generating themes:** Based on the codes, the analyst (Author) starts searching for a theme (this is an iterative process). Code might become a theme, but themes are usually more general than codes. So, the analyst may combine several codes into a single theme. In some cases, code might fit into multiple themes, so a subtheme can be created to prevent them from becoming incoherent. **Figure 6** shows an example of the generated themes in this research

Code	Sub Theme	Theme
10 Positive to change the developer	Positive Issues	Decrease Difficulties (Handle Turnover effects)
14 No problem in new models		
16 Code standardization Helps		
5 No Code Documentation	Documentation	
15 Business Document		
6 Documentation need time		
11 Work roles & responsibilities	Work roles & responsibilities	Developer Turnover Reasons
17 New Opportunity	New Opportunity	
18 Salary Issue	Palestine Territory	
12 Palestine Territory 19 Not Outsource companies		
12 Palestine Territory 13 Job opportunities outside th		

Figure 6 Generate Themes

4. **Reviewing themes:** Refine the themes that created in the previous phase; this is to make sure that the generated themes are accurate and present the data set correctly. In this phase, some not useful codes can be removed, added subthemes, and changed some themes descriptions.
5. **Defining and naming themes:** In this phase, the analyst looks deeper into the themes and tried to find an appropriate name that best descript them.
6. **Writing up:** In this phase, the author starts writing the report. This chapter (**Chapter 3** Research Methodology) is the first part of the theme's analysis report. It includes enough information about the analysis process and what has done. The next chapter (**Chapter 4**) are also part of this report as they show the data collection process, the analysis results (addressing each theme in turn), and a discussion explains themes and shows how the analysis answered the research questions.

Chapter 4 Data Collection, Results and Analysis

This chapter describing how the data collection and analysis process took place practically based on the methodology described in **Thematic Analysis Method**, starting with interviews, data collection, and analysis. The outputs of interview analysis are inputs to form the questionnaire questions.

4.1 *Interviews Data Collection and Results*

4.1.1 Data Collection

4.1.1.1 Software Companies

The data collection process started by interviewing candidates from development team members in each company.

In **Sample Selection Criteria for Software companies** the author shows how companies selected. After contacting several companies, four companies responded positively .

In **Sample Selection Criteria for Projects** the author shows how projects selected, where were clarified the nature of the projects and team members that are looking for.

The interviews started by asking some questions related to the project itself and the team to ensure that the project met the specifications needed in the research, such as "Can you give an idea about the project and its development?". Question about the number of team members from the beginning of the project "As a life product at the customer side." Whether there were versions of the project, the period for each release, the size of the development, and change requests. Frankly, some of these questions not answered because most of the interviewees warned against giving undesirable information not allowed by the company management. Still, the fewest answers gave a good idea if this project is suitable for study. Several times the author changed to another project because the proposed project did not fit the research. For example, the project is not a life product, and still, the

maintenance period not started, the project is small, and it does not have the developers' turnover. This is in the interview for a project that contains a Developer Turnover.

The data collection process started with interviewing the team members nominated for the interview by the company's management, beginning with the team leader and then the team members and developers or according to the available members at the time that determined for the interviews by the software company. The first interviews belong to members of the project team that contains developer's turnover, and then interviews for members of the team that do not contain developers' turnover. Noticed that it was challenging to find projects that do not include developer's turnover so that these projects were mostly small and belong to a specific customer, which gives the software company the possibility of assigning one or two developers to maintain the software for this customer.

Some interviews were recorded, and some interviews were taken in writing only because the interviewee did not allow the recording.

The duration of the interviews per person ranged from half an hour to an hour, as companies did not allow more than this time, justifying this by lack of time. One of the four companies has its headquarter located outside the city, and it was difficult to arrange a meeting with them at a specific time inside the company's office; hence, the interview took place by phone and recorded.

It was noticeable that companies were worried about giving more information than they were supposed to provide in order not to harm their interests, as the topic of the research deals with the relationship with the customer.

So, one company requested to include the team leader when meeting one of the members, the beginning of the interview was difficult because the developer warned against giving additional undesirable information to be provided. Still, after an attempt by the author to simplify things and clarify the nature of the information he is looking for, the interview completed in the right way.

Each interview starts by introducing the interviewer (The author) and introducing the research without giving details about the study in a way that does affect the impartiality of the answers, as the questions are qualitative,

their response is not specific but depends on discussing the opinion of the interviewee. Then, the interviewer reassured the interviewee that the author does not seek confidential or sensitive information; therefore, no need to mention the name of the project, and it is sufficient to give technical details that help in knowing if this project suits the target type in the research.

According to the observations, touching on any information related to the customer constitutes a high sensitivity or confidentiality based on an alert from the company's management to the interviewees, so there were no identifiable information questions about the customer, and they were limited to what is related to the research.

On the other hand, the request to interview the client of the project discussed in the interview rejected.

The interviews reviewed, checked and verified in order, as follows:

1. **The first company:**
    - Two projects with a Developer Turnover: A team leader and developer from the first project were interviewed and a team leader from the second project. In the developer interview from the first project, the team leader also attended (not interviewed). So, the total is three interviews with two team leaders and one developer
    - Two projects without a Developer Turnover: A developer from the first project were interviewed, and a developer from the second project. In the developer interview from the first project, the team leader also attended. So, the total is two interviews with two developers

After the interview, the data was documented from the recordings and then managed, first according to the questions asked from the author, secondly based on the discussion progress. Because of the nature of the interview, the author asked some questions related to the topic and not previously planned.

Then the supervising professor was consulted (**Interview Validation**), and the answers reviewed with him. The questions were modified by adding new sub-questions based on our observations from the group of interviews that took place, and from the supervisor notes.

2. **The second company:**
    - Two projects with a Developer Turnover: One developer from each project was interviewed, and a project manager interviewed (responsible for maintenance in these two projects). Total of three interviews with three developers.
    - One projects without a Developer Turnover; the main developer was interviewed.

Same as what done for the first company, after the interview, the data was documented from the recordings and then managed using the same approach. Then the supervising professor was consulted **(Interview Validation)**, and the answers reviewed with him, and questions modified.

The same approach was implemented for the remaining interviews (3rd and 4th Companies)

3. **The third company:**

One projects with a Developer Turnover and One project without a Developer Turnover.

In the first project a team leader and a developer were interviewed, also in the second projects a team leader and a developer were interviewed. So, the total is two interviews with 2 team leaders and 2 developers.

4. **The fourth company:**

A team leader was interviewed for a project with a Developer Turnover, this interview took place on the phone and recorded.

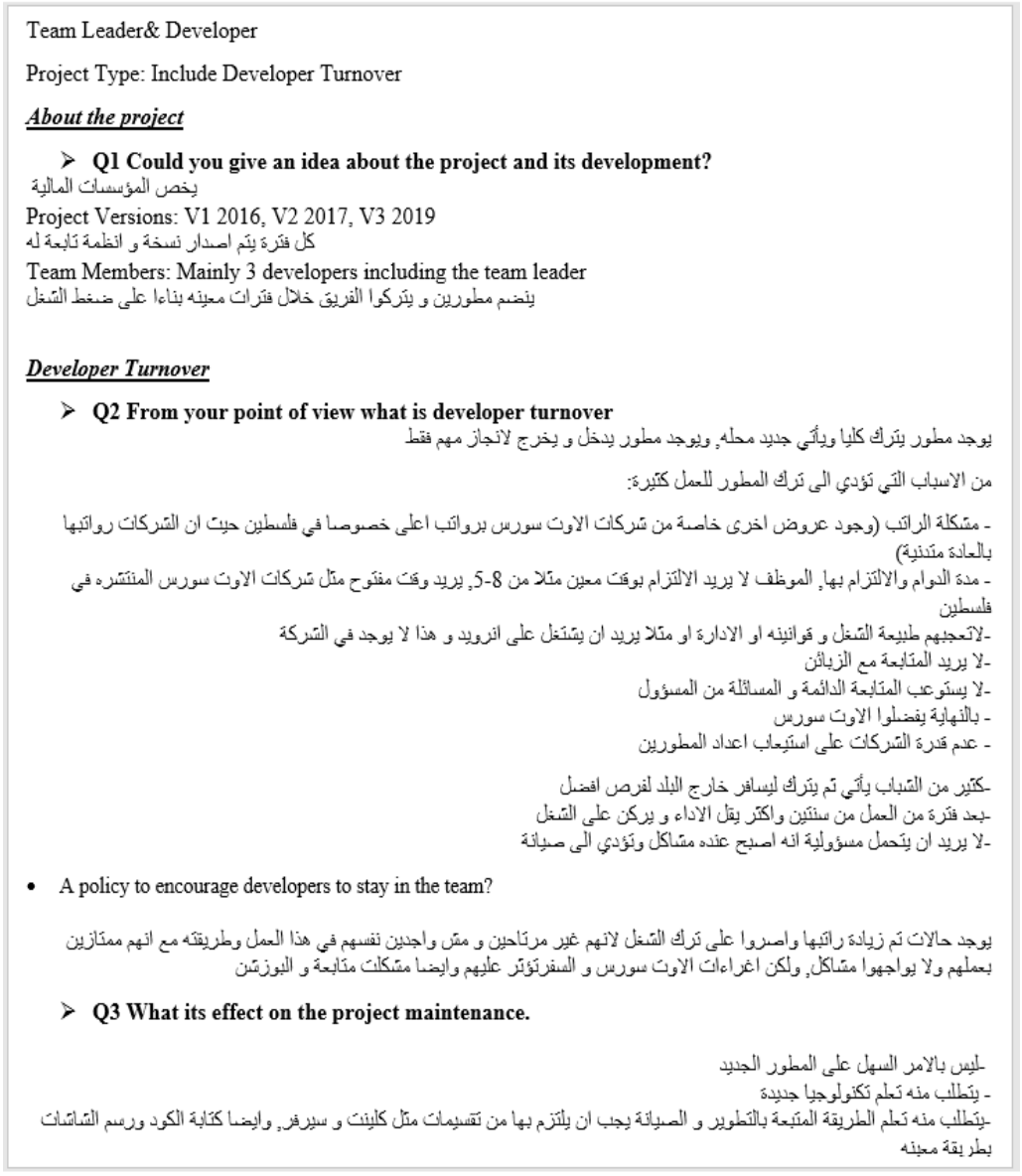
The following table summarizes the companies and participants:

Table 8 Software companies and interviewees

Software Company	Project with Turnover		Project Without Turnover	
	Team Leader	Developer	Team Leader	Developer
A	2	1		2
U		3		1
H	1	1	1	1
I	1			
Total Interviewees	14			

Documenting and managing the data was done immediately after the interviews so that no details that occurred during the interview are forgotten. The prevailing atmosphere during the interview affects the nature of the answers, and this can be overlooked if the data is not directly documented even if there is a recording.

Following is an example of an interview and its answers (**Figure7**), (See all interviews in **Appendix A Raw Collected Data**)



Team Leader& Developer

Project Type: Include Developer Turnover

About the project

- **Q1 Could you give an idea about the project and its development?**

يخص المؤسسات المالية

Project Versions: V1 2016, V2 2017, V3 2019

كل فترة يتم اصدار نسخة و انظمة تابعة له

Team Members: Mainly 3 developers including the team leader

ينضم مطورين و يتركوا الفريق خلال فترات معينه بناءا على ضغط الشغل

Developer Turnover

- **Q2 From your point of view what is developer turnover**

يوجد مطور يترك كليا ويأتي جديد محله, ويوجد مطور يدخل و يخرج لانجاز مهم فقط

من الاسباب التي تؤدي الى ترك المطور للعمل كثيرة:

- مشكلة الراتب (وجود عروض اخرى خاصة من شركات الاوت سورس برواتب اعلى خصوصا في فلسطين حيث ان الشركات رواتبها بالعادة متدنية)
- مدة الدوام والالتزام بها, الموظف لا يريد الالتزام بوقت معين مثلا من 8-5, يريد وقت مفتوح مثل شركات الاوت سورس المنتشره في فلسطين
-لاتعجبهم طبيعة الشغل و قوانينه او الادارة او مثلا يريد ان يشتغل على انروبد و هذا لا يوجد في الشركة
-لا يريد المتابعة مع الزبائن
-لا يستوعب المتابعة الدائمة و المسائلة من المسؤول
- بالنهاية يفضلوا الاوت سورس
- عدم قدرة الشركات على استيعاب اعداد المطورين

-كثير من الشباب يأتي تم يترك ليسافر خارج البلد لفرص افضل
-بعد فترة من العمل من سنتين واكثر يقل الاداء و يركن على الشغل
-لا يريد ان يتحمل مسؤولية انه اصبح عنده مشاكل وتؤدي الى صيانة

- A policy to encourage developers to stay in the team?

يوجد حالات تم زيادة راتبها واصروا على ترك الشغل لانهم غير مرتاحين و مش واجدين نفسهم في هذا العمل وطريقته مع انهم ممتازين بعملهم ولا يواجهوا مشاكل, ولكن اغراءات الاوت سورس و السفرتؤثر عليهم وايضا مشكلت متابعة و البوزتس

- **Q3 What its effect on the project maintenance.**

-ليس بالامر السهل على المطور الجديد
- يتطلب منه تعلم تكنولوجيا جديدة
-يتطلب منه تعلم الطريقة المتبعة بالتطوير و الصيانة يجب ان يلتزم بها من تقسيمات مثل كلينت و سيرفر, وايضا كتابة الكود ورسم الشاشات بطريقة معينه

Figure7 Example of Development Team Interview data

4.1.1.2 Customers

Concerning customer interviews, the object is to find out how the developer's turnover affects customer satisfaction with maintenance, and how the customer sees the frequent change of members of the development team. At first, the author tried to communicate with customers through the software companies listed in the interviews; they refused because of the sensitivity of the issue for these companies as it relates to the customer's satisfaction.

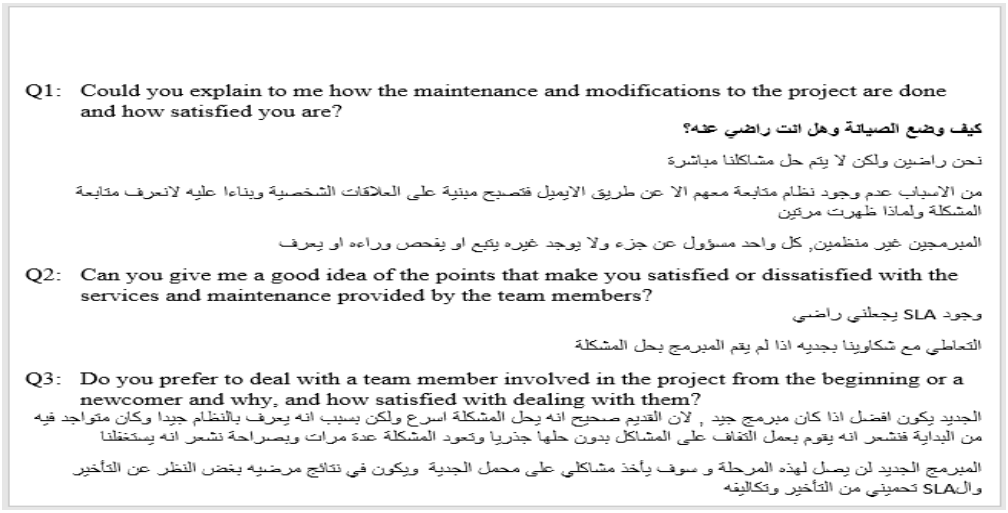
That is why the communication with customers of the same software companies done without linking the interviews between both parties. On the one hand, this decision was made because it is difficult to reach customers through software companies; on the other hand, it is necessary to avoid biasing answers during interviews.

The author was able to interview four clients, three of them who were related to three of the previous software companies. The results were initially consistent with the developers and customers.

Customer interviews are simpler than software companies, as the questions (

Customer Questions) focus only on how satisfied they are with maintenance. The beginning was with a question about maintenance in general, to see how satisfied they are with it before they became aware of the substance of the research, which is its relationship to the developer's turnover.

Following is an example of an interview and its answers (**Figure 8**), (See all interviews in **Appendix A Customer - Interviews and Codes**)



Q1: Could you explain to me how the maintenance and modifications to the project are done and how satisfied you are?

كيف وضع الصيانة وهل انت راضي عنه؟

نحن راضين ولكن لا يتم حل مشاكلنا مباشرة

من الاسباب عدم وجود نظام متابعة معهم الا عن طريق الايميل فتصبح مبنية على العلاقات الشخصية وبناءا عليه لانعرف متابعة المشكلة ولماذا ظهرت مرتين

الميرمجين غير منظمين, كل واحد مسؤول عن جزء ولا يوجد غيره يتبع او يفحص وراءه او يعرف

Q2: Can you give me a good idea of the points that make you satisfied or dissatisfied with the services and maintenance provided by the team members?

وجود SLA يجعلني راضي

التعاطي مع شكاوينا بجديه اذا لم يقم الميرمج بحل المشكلة

Q3: Do you prefer to deal with a team member involved in the project from the beginning or a newcomer and why, and how satisfied with dealing with them?

الجديد يكون افضل اذا كان ميرمج جيد , لان القديم صحيح انه يحل المشكلة اسرع ولكن بسبب انه يعرف بالنظام جيدا وكان متواجد فيه من البداية فتشعر انه يقوم بعمل التفاف على المشاكل بدون حلها جذريا وتعود المشكلة عدة مرات وبصراحة تشعر انه يستغفلنا

الميرمج الجديد لن يصل لهذه المرحلة و سوف يأخذ مشاكلي على محمل الجدية ويكون في نتائج مرضيه بغض النظر عن التأخير والSLA تحميني من التأخير وتكاليفه

Figure 8 Example of Customer Interview data

4.1.2 Results

After completing all the interviews, documenting and managing data, the stage of data analysis started using the thematic analysis method, which explained in chapter 3 (**Thematic Analysis Method**). This section details the steps of data analysis in this research based on the stages of thematic analysis.

4.1.2.1 Familiarization

In this phase, the author needs to be familiar with the data. Data documenting, managing, and processing after each interview is part of this stage because it deals strictly with the data, line by line. The author needs to overview the data again before starting the analysis to remember what did previously.

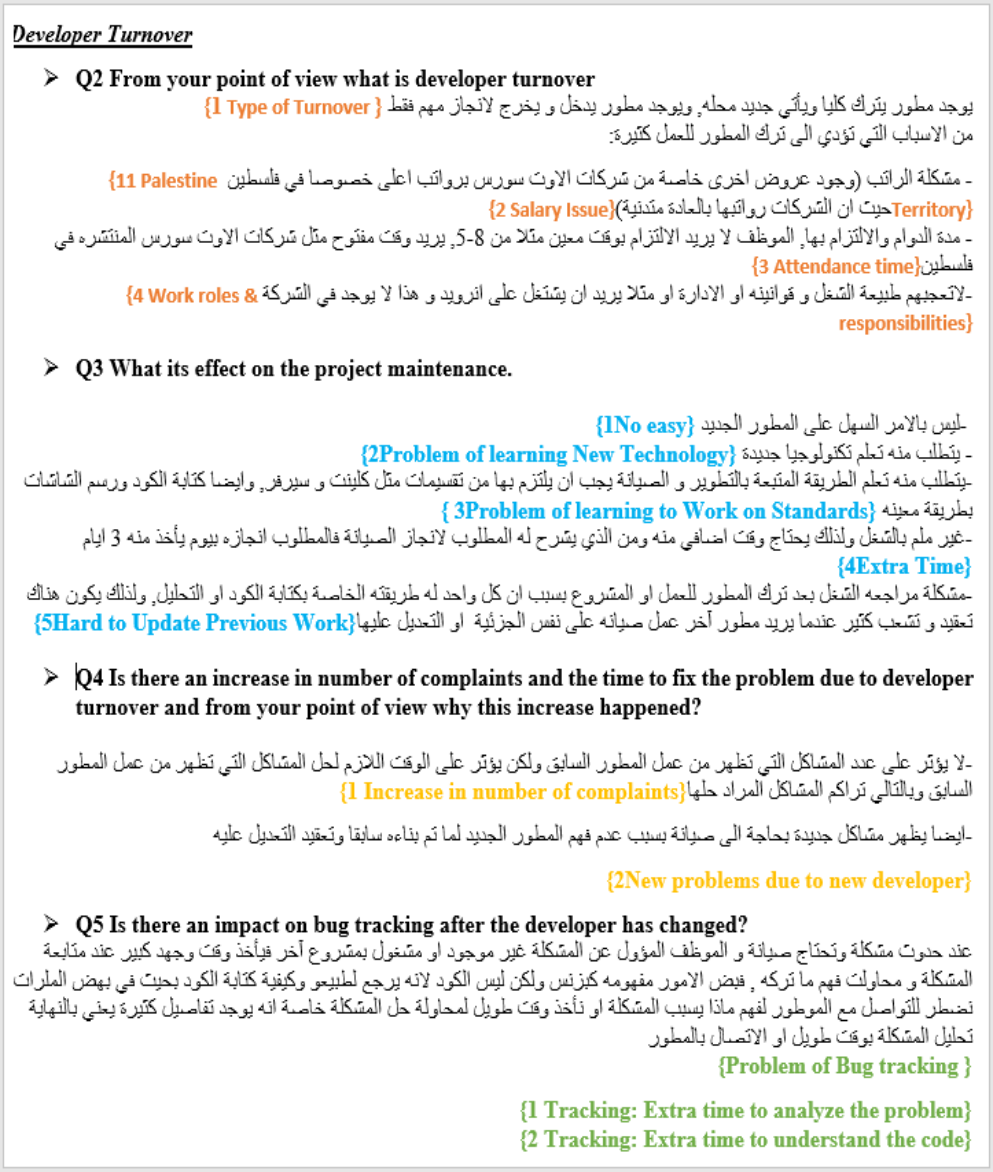
4.1.2.2 Coding

In this phase, as described in **(2 Coding)** the author identifies an essential feature of the data.

- **The first step**

  Accordingly, each sentence was tracked in the answers to the interview questions, and a code was placed for the phrases that bear a specific idea or feature, the same code is given to the phrases that have the same meaning or significance in the interview or the answers to other interviews, and each code was given a specific number and each group of codes given a colour to facilitate tracking it in data.

Following is an example of the codes for an interview (**Figure 9**), (See all interviews codes in **Appendix A Raw Collected Data**)



Developer Turnover

- **Q2 From your point of view what is developer turnover**

يوجد مطور يترك كليا ويأتي جديد محله, ويوجد مطور يدخل و يخرج لانجاز مهم فقط {1 Type of Turnover }
من الاسباب التي تؤدي الى ترك المطور للعمل كثيرة:

- مشكلة الراتب (وجود عروض اخرى خاصة من شركات الاوت سورس برواتب اعلى خصوصا في فلسطين {11 Palestine Territory}حيث ان الشركات روابها بالعادة متدنية){2 Salary Issue}
- مدة الدوام والالتزام بها, الموظف لا يريد الالتزام بوقت معين مثلا من 8-5, يريد وقت مفتوح مثل شركات الاوت سورس المنتشره في فلسطين{3 Attendance time}
-لاتعجبهم طبيعة الشغل و قوانينه او الادارة او مثلا يريد ان يشتغل على انروبد و هذا لا يوجد في الشركة {4 Work roles & responsibilities}

- **Q3 What its effect on the project maintenance.**

-ليس بالامر السهل على المطور الجديد {1No easy}
- يتطلب منه تعلم تكنولوجيا جديدة {2Problem of learning New Technology}
-يتطلب منه تعلم الطريقة المتبعة بالتطوير و الصيانة يجب ان يلتزم بها من تقسيمات مثل كلينت و سيرفر, وايضا كتابة الكود ورسم الشاشات بطريقة معينه { 3Problem of learning to Work on Standards}
-غير ملم بالشغل ولذلك يحتاج وقت اضافي منه ومن الذي يشرح له المطلوب لانجاز الصيانة فالمطلوب انجازه بيوم يأخذ منه 3 ايام {4Extra Time}
-مشكلة مراجعه الشغل بعد ترك المطور للعمل او المشروع بسبب ان كل واحد له طريقته الخاصة بكتابة الكود او التحليل, ولذلك يكون هناك تعقيد و تشعب كثير عندما يريد مطور آخر عمل صيانه على نفس الجزئية او التعديل عليها{5Hard to Update Previous Work}

- **Q4 Is there an increase in number of complaints and the time to fix the problem due to developer turnover and from your point of view why this increase happened?**

-لا يؤثر على عدد المشاكل التي تظهر من عمل المطور السابق ولكن يؤثر على الوقت اللازم لحل المشاكل التي تظهر من عمل المطور السابق وبالتالي تراكم المشاكل المراد حلها{1 Increase in number of complaints}

-ايضا يظهر مشاكل جديدة بحاجة الى صيانة بسبب عدم فهم المطور الجديد لما تم بناءه سابقا وتعقيد التعديل عليه

{2New problems due to new developer}

- **Q5 Is there an impact on bug tracking after the developer has changed?**

عند حدوث مشكلة وتحتاج صيانة و الموظف المؤول عن المشكلة غير موجود او مشغول بمشروع آخر فيأخذ وقت وجهد كبير عند متابعة المشكلة و محاولت فهم ما تركه , فبض الامور مفهومه كبزنس ولكن ليس الكود لانه يرجع لطبيعو وكيفية كتابة الكود بحيث في بعض الملرات نضطر للتواصل مع الموطور لفهم ماذا بسبب المشكلة او نأخذ وقت طويل لمحاولة حل المشكلة خاصة انه يوجد تفاصيل كثيرة يعني بالنهاية تحليل المشكلة بوقت طويل او الاتصال بالمطور
{Problem of Bug tracking }

{1 Tracking: Extra time to analyze the problem}
{2 Tracking: Extra time to understand the code}

Figure 9 Example of assigning codes to sentences

- **The second step**

  These codes and their sentences were moved to Excel tables to facilitate their review and verification, as well as to prepare them for the next stage, which is the themes (**Figure 10**), (See full data in Appendix B **Codes and Sentences (Interview extract)**)

Position	Q	Interview	Interview extract	Code
TL	2	A1	يوجد مطور يترك كليا ويأتي جديد محله ويوجد مطور يدخل و يخرج لانجاز مهم فقط	1 Type of Turnover
	2	A1	مشكلة الراتب خصوصا في فلسطين حيث ان الشركات رواتبها بالعادة متدنية	2 Salary Issue 11 Palestine Territory
	2	A1	مدة الدوام والالتزام بها الموظف لا يريد الالتزام بوقت معين مثلا من 8-5	3 Attendance time
	2	A1	لاتعجبهم طبيعة الشغل و قوانينه او الادارة	4 Work roles & responsibilities
	2	A1	لا يريد المتابعة مع الزبائن	4 Work roles & responsibilities
	2	A1	لا يستوعب المتابعة الدائمة و المسائلة من المسؤول	4 Work roles & responsibilities
	2	A1	يفضلوا الاوت سورس	11 Palestine Territory 5 Outsource companies
	3	A1	ليس بالامر السهل على المطور الجديد	1No easy
	3	A1	يتطلب منه تعلم تكنولوجيا جديدة	2Problem of learning New Technology
	3	A1	يتطلب منه تعلم الطريقة المتبعة بالتطوير و الصيانة يجب ان يلتزم بها	3Problem of learning to Work on Standards
	3	A1	غير ملم بالشغل ولذلك يحتاج وقت اضافي منه ومن الذي يشرح له المطلوب لانجاز	4Extra Time
	3	A1	مشكلة مراجعه الشغل بعد تركك المطور للعمل او المشروع بسبب ان كل واحد له طر	5Hard to Update Previous Work
	4	A1	يؤثر على الوقت اللازم لحل المشاكل التي تظهر من عمل المطور السابق وبالتالي تر	1 Increase in number of complaints
	4	A1	يظهر مشاكل جديدة بحاجة الى صيانة بسبب عدم فهم المطور الجديد لما تم بناءه	2New problems due to new developer
	5	A1	فيأخذ وقت وجهد كبير عند متابعة المشكلة و محاولت فهم ما تركه فيض الامور مفهومه كبزنس ولكن ليس الكود لانه يرجع لطبيعو وكيفية كتابة الكود	1 Tracking: Extra time to analyze the problem
	5	A1	عند متابعة المشكلة يوجد تفاصيل كثيرة يعني بالنهاية تحليل المشكلة بوقت طويل	2 Tracking: Extra time to understand the code
	6	A1	يتم عمل نقل للشغل من المطور التارك للمطور الثابت	1Handover
	6	A1	رئيس الفريق يحاول دائما ان يشغل بديل لاي مطور في الفريق قدر الاستطاعة	2 Team Leader & Senior Developer Involvement
	6	A1	دائما نطلب من المطور ان يكتب كومنت مفصله لما تم انجازه ولكن ليس الجميع يلتز	3Code Comments
	6	A1	كتابة الكومنت ليس بشكل نظامي	4Not Systematic Documentation
	6	A1	البزنس كله موجود و مكتوب	5Business Documented
	7	A1	يعتمد على طبيعة وحجم المشكلة	1 Risk depends on size of problem
	7	A1	يعني هل المشكلة عملت كارثة وايضا من شكوى الزبون	2 Risk depends on customer complaint
	7	A1	مجرد خروج موظف و ظهور مشكله في شغله يعتبر تعقيد لانه لا يوجد احد يحل هذ	3 Turnover considered a complex maintenance

Figure 10 Example of codes and sentences

- **The Third step**

  Codes are grouped together and the repeated or similar ones that lead to the same meaning are removed (**Figure 11**), (See full data in **Appendix B Grouping Codes**)

Summary of Code

With Developer Turnover			Without Developer Turnover			Customer Satisfaction		
Q.	Code		Q.	Code		Q.	Code	
2	1	Type of turnover	1	1	Less Maintenance	1	1	Satisfied Generally
	2	Salary Issue		2	Efficient Maintenance		2	Dissatisfied - Delay in Maintenance
	3	Attendance time					3	Dissatisfied - No Tracking system
	4	Work roles & responsibilities		4	No Code Document		4	Dissatisfied - No QA or review
	5	Out source companies		5	Email as Document		5	Dissatisfied - No developer backup
	6	Job opportunities outside the country		6	Same Developer write, update the code			
	7	Increase Salary		7	Strong knowledge			
	8	Level of Turnover		8	Extra time to remember old code	2	1	Satisfied - SLA
	9	Job Environment		9	Controlled Maintenance		2	Satisfied - Consider complaints seriously
	10	Off work Activities		10	Less Maintenance Time		3	Satisfied - Better Communication
	11	Palestine Tero		11	More comfort to the developer		4	Satisfied - Understand Requirements
				12	Controlled Code		5	Dissatisfied - Late response
3	1	Not easy for new developer					6	Satisfied - developer backup
	2	Problem of learning New Technology					7	Familiarity Relationship
	3	Problem of learning to Follow Standards	2		No Complexity in the Normal situation		8	Satisfied- Ticketing system help
	4	Extra Time			Complexity - Frequent updates			
	5	Hard to update previous work				3	1	New developer - better
	6	Main team member left					2	Old developer - uncooperative
	7	Business loss					3	New developer - take problems seriously
	8	Document is not enough	3	1	Try to attract the developer		5	Old developer - better
	9	Knowledge loss		2	Customer dissatisfied – delay		6	Old developer – better dealing with problems
	10	New problems due to new developer		3	Customer Satisfied		7	Old developer – save time
	11	Cannot make a decision in Maintenance		4	Familiarity Relationship		8	New developer - Better Communication
	12	redundancy in work					9	New developer - Understand Requirements
	13	Affect other team members maintenance	4	1	Likes current job		10	New developer - Better cooperation
	14	Communication with Customer					11	Old Developer – Understand Business
				3	Finds himself in other positions		12	Old Developer – Understand Code
4	1	Increase in number of complaints						
	2	New problems due to new developer						
5	1	Tracking:Extra time to analyze the problem						
	2	Tracking:Extra time to understand the code						
	3	Tracking:Rearrange the priorities						
	4	Tracking: more difficult to track problems						

Figure 11 Example of grouping codes

The results of coding phase were 117 codes for the interviews with development team about projects with Developer Turnover, 21 code for the interviews with development team about projects Without Developer Turnover, and 50 codes for interviews with customers. These codes distributed per interview questions, as the codes assigned to the answer of each question in the interview.

Codes grouped into one sheet and tried to find the similar ones in the same question answer and between questions answers. On the one hand, some similar codes within the same question answer were removed, and others between questions were kept such as {Extra time to solve the problem,

Extra time to analyze the problem, Extra Time to handle the maintenance} since they are present to serve the goal of the question, and therefore they produce a different theme. On the other hand, similes code between different interview groups kept such as {Customer is dissatisfied, Customer Satisfied, Likes current job}, since also, they produce a different theme. In the end, the themes were grouped and then discussed together to find the comparison between both interview groups.

Next step to generate themes from these codes.

4.1.2.3 Generating themes

Based on the codes from previous step, the analyst (Author) started searching for a theme

This step was made in the sheets that contains codes and sentences so that the analyst can search in codes, sentences, and assign themes at the same time. When generating themes, it was considered that the code might become a theme, but themes are usually more general than codes (**3 Generating Themes**). So, several codes combined into a single theme. In some cases, code might fit into multiple themes, so a subtheme created to prevent them from becoming incoherent.

An example of this: Code (work roles and responsibilities) is a standalone sub-theme, while the Codes (Salary), (Palestine Territory), (Job opportunities outside the country) and (Outsource companies) belong to the same sub-theme "Palestine Territory". Both sub-themes are belonging to one theme which is Developer Turnover reasons. (**Table 9**), (See full data in **Appendix B Generating Themes).** Final themes showed in **Table 10**, **Table 11**, and **Table 12**, (**Appendix B**

Final Themes)

This is the approach in Generating Themes phase that followed in this analysis.

Table 9 Generating themes

Interviewee	Interview extract	Code	Sub Theme	Theme
A2	السفر خارج البلاد لايعتبر مشكلة لترك المبرمج حاليا	11 Palestine Territory 6 Job opportunities outside the country	Palestine Territory	Developer Turnover Reasons
I	الout source اقوى من السفر, السفر محدود	11 Palestine Territory 6 Job opportunities outside the country		
H	السفر ليس رئيسي	11 Palestine Territory 6 Job opportunities outside the country		
A1	كثير من الشباب يأتي ثم يترك ليسافر خارج البلد لفرص افضل	11 Palestine Territory 6 Job opportunities outside the country		
I	شركات الout source منافسه	11 Palestine Territory 5 Outsource companies		
H	Outsource companies	11 Palestine Territory 5 Outsource companies		
A1	يفضلوا الاوت سورس	11 Palestine Territory 5 Outsource companies		
A2	وحصوله على عرض مغري من شركات اوت سورس	11 Palestine Territory 5 Outsource companies		
A1	مشكلة الراتب خصوصا في فلسطين حيث ان الشركات رواتبها بالعادة متدنية	2 Salary Issue 11 Palestine Territory		
I	عرض افضل براتب احسن	2 Salary Issue		
H	سبب مالي	2 Salary Issue		
A1	سبب مادي	2 Salary Issue		
A1	مدة الدوام والالتزام بها, الموظف لا يريد الالتزام بوقت معين مثلا من 8-5,	3 Attendance time	Work roles and responsibilities	
A1	لاتعجبهم طبيعة الشغل و قوانينه او الادارة	4 Work roles and responsibilities		
A1	لا يريد المتابعة مع الزبائن	4 Work roles and responsibilities		
A1	لا يستوعب المتابعة الدائمة و المسائلة من المسؤول	4 Work roles and responsibilities		
A1	بعد فترة من العمل من سنتين واكثر يقل الاداء	4 Work roles and responsibilities		
A1	لا يريد ان يتحمل مسؤولية	4 Work roles and responsibilities		
A2	عدم الاتفاق مع التيم او الادارة	4 Work roles and responsibilities		
A2	البعض ممكن ان يتصعب من الشغل نفسه	4 Work roles and responsibilities		
I	ليس مرتاح بالشغل	4 Work roles and responsibilities		
I	طبيعة شغل افضل وميزات اكثر	4 Work roles and responsibilities		
H	lack of engagement	4 Work roles and responsibilities		
H	تجربت تكنولوجي جديدة	4 Work roles and responsibilities		

Table 10 Themes and Sub Themes (with Developer Turnover)

With Developer Turnover							
Position	Q. No.	No. Of agreements per theme	No. Of agreements per sub theme	No. of codes	Related Codes	Sub Themes	Themes
TL	2	4	4	2	1,8	Types of Turnover	Types of Turnover
	2	2	2	3	10,9,7	Encourage developers	Encourage developers
	2		4	4	2,5,6,11	Palestine Territory	Developer Turnover Reasons
	2	8	4	2	3,4	Work roles & responsibilities	
	3		4	12	1-12	Impact on maintenance	Turnover Impact On Maintenance
	4		4	2	1,2	Impact on Number of Tickets	
	5	12	4	4	1,2,3,4	Impact on Bug Tracking	
	6		4	3	1,2,19	Circulate information	Handle Turnover effects
	6		3	4	6,7,8,21	Handle Turnover	
	6	11	4	4	3,4,5,20	Documentation	
	6		1	10	9-18	Problems in Circulate information	New developer difficulties
	6	2	1	4	11,16,17,18	Other difficulties	
	7	3	3	4	1,2,3,4	Turnover Risk	Turnover Risk
	8	4	4	7	1,2,3,4,5,6,10	Customer anxiety	Customer anxiety
	8		2	3	12,13,14	Customer is satisfied	Customer Satisfaction
	8	5	3	4	7,8,9,11	Customer is dissatisfied	
	9	3	3	3	1,2,3	Developer Behaviour	Developer Satisfaction
Dev	2		4	5	1,2,3,7,8	knowledge loss	New developer difficulties
	2	7	3	2	4,9	Codo Issues	
	2		3	3	10,14,16	Positive Issues	Decrease Difficulties
	2	6	3	3	5,6,15	Documentation	(Handle Turnover effects)
	2		2	1	11	Work roles & responsibilities	Developer Turnover Reasons
	2		2	1	17	New Opportunity	
	2	6	2	4	12,13,18,19	Palestine Territory	
	3	4	4	9	1,2,3,4,5,7,8,9,10	Turnover Impact On Maintenance	Turnover Impact On Maintenance
	4,5	2	2	2	6,10	Customer anxiety	Customer anxiety
	4,5		3	3	2,5,11	Customer is satisfied	Customer Satisfaction
	4,5	7	4	7	1,3,4,7,8,9,12	Customer is dissatisfied	
	6	4	4	2	1,3	Developer Behaviour	Developer Satisfaction

Table 11 Themes and Sub Themes (without Developer Turnover)

Without developer Turnover							
Position	Q. No.	No. Of agreements per theme	No. Of agreements per sub theme	No. of codes	Related Codes	Sub Themes	Themes
Mix	1	7	4	8	1,2,6,7,9,10,11,12	The advantages of no developer turnover	Impact of no developer turnover
	1		3	1	8	Implicit turnover of the developer	
	1	2	2	2	4,5	Documentation	Documentation
	2	3	1	1	2	Complexity	Complexity
	2		2	1	1	Less Complexity	
	3	1	1	1	1	Customer anxiety	Customer anxiety
	3	4	1	1	2	Customer is dissatisfied	Customer Satisfaction
	3		3	2	3,4	Customer is satisfied	
	4	3	3	2	1,3	Developer Behaviour	Developer Satisfaction

Table 12 Themes and Sub Themes (Customer)

Customer Satisfaction							
Position	Q. No.	No. Of agreements per theme	No. Of agreements per sub theme	No. of codes	Related Codes	Sub Themes	Themes
	1		3	1	1	Satisfied	Satisfaction with maintenance in general
	1	5	2	4	2,3,4,5	Dissatisfied	
	2		4	7	1,2,3,4,6,7,10	Satisfied	Issues lead to Satisfaction, Dissatisfaction
	2	6	2	2	5,9	Dissatisfied	
	3		3	5	1,3,4,8,9	New developer - evaluation	Old - New Developer evaluation
	3	7	4	6	2,5,6,7,11,12	Old developer - evaluation	
	4.1		4	10	1,3-6,8-12	New Developer - Negative	New Developer Impact
	4.1	5	1	2	2,7	New Developer - Positive Impact	
	4.2		4	8	1-5,8,9,10	Dealing with Turnover problem	The customer deals with the turnover problem
	4.2	8	4	3	6,7,11	Not Dealing with Turnover	

Table 13 Rearranged themes based on No. of agreements

With Developer Turnover							
Position	Q. No.	No. Of agreements per theme	No. Of agreements per sub theme	No. of codes	Related Codes	Sub Themes	Themes
TL	3		4	12	1-12	Impact on maintenance	Turnover Impact On Maintenance
TL	5		4	4	1,2,3,4	Impact on Bug Tracking	
TL	4	12	4	2	1,2	Impact on Number of Tickets	
TL	6		4	4	3,4,5,20	Documentation	Handle Turnover effects
TL	6		4	3	1,2,19	Circulate information	
TL	6	11	3	4	6,7,8,21	Handle Turnover	
TL	2		4	4	2,5,6,11	Palestine Territory	Developer Turnover Reasons
TL	2	8	4	2	3,4	Work roles & responsibilities	
TL	8		3	4	7,8,9,11	Customer is dissatisfied	Customer Satisfaction
TL	8	5	2	3	12,13,14	Customer is satisfied	
TL	8	4	4	7	1,2,3,4,5,6,10	Customer anxiety	Customer anxiety
TL	2	4	4	2	1,8	Types of Turnover	Types of Turnover
TL	7	3	3	4	1,2,3,4	Turnover Risk	Turnover Risk
TL	9	3	3	3	1,2,3	Developer Behaviour	Developer Satisfaction
TL	2	2	2	3	10,9,7	Encourage developers	Encourage developers
TL	6		1	10	9-18	Problems in Circulate information	New developer difficulties
TL	6	2	1	4	11,16,17,18	Other difficulties	
Dev	4,5		4	7	1,3,4,7,8,9,12	Customer is dissatisfied	Customer Satisfaction
Dev	4,5	7	3	3	2,5,11	Customer is satisfied	
Dev	2		4	5	1,2,3,7,8	knowledge loss	New developer difficulties
Dev	2	7	3	2	4,9	Code Issues	
Dev	2		3	3	10,14,16	Positive Issues	Decrease Difficulties (Handle Turnover effects)
Dev	2	6	3	3	5,6,15	Documentation	
Dev	2		2	4	12,13,18,19	Palestine Territory	Developer Turnover Reasons
Dev	2		2	1	11	Work roles & responsibilities	
Dev	2	6	2	1	17	New Opportunity	
Dev	3	4	4	9	1,2,3,4,5,7,8,9,10	Turnover Impact On Maintenance	Turnover Impact On
Dev	6	4	4	2	1,3	Developer Behaviour	Developer Satisfaction
Dev	4,5	2	2	2	6,10	Customer anxiety	Customer anxiety
Without developer Turnover							
Position	Q. No.	No. Of agreements per theme	No. Of agreements per sub theme	No. of codes	Related Codes	Sub Themes	Themes
Mix	1	7	4	8	1,2,6,7,9,10,11,12	The advantages of no developer turnover	Impact of no developer turnover
	1		3	1	8	Implicit turnover of the developer	
	3	4	3	2	3,4	Customer is satisfied	Customer Satisfaction
	3		1	1	2	Customer is dissatisfied	
	4	3	3	2	1,3	Developer Behaviour	Developer Satisfaction
	2	3	2	1	1	Less Complexity	Complexity
	2		1	1	2	Complexity	
	1	2	2	2	4,5	Documentation	Documentation
	3	1	1	1	1	Customer anxiety	Customer anxiety
Customer Satisfaction							
Position	Q. No.	No. Of agreements per theme	No. Of agreements per sub theme	No. of codes	Related Codes	Sub Themes	Themes
	4.2		4	8	1-5,8,9,10	Dealing with Turnover problem	The customer deals with the turnover problem
	4.2	8	4	3	6,7,11	Not Dealing with Turnover problem	
	3		4	6	2,5,6,7,11,12	Old developer - evaluation	Old - New Developer evaluation
	3	7	3	5	1,3,4,8,9	New developer - evaluation	
	2		4	7	1,2,3,4,6,7,10	Satisfied	Issues lead to Satisfaction,
	2	6	2	2	5,9	Dissatisfied	
	4.1		4	10	1,3-6,8-12	New Developer - Negative Impact	New Developer Impact
	4.1	5	1	2	2,7	New Developer - Positive Impact	
	1		3	1	1	Satisfied	Satisfaction with maintenance in general
	1	5	2	4	2,3,4,5	Dissatisfied	

In tables **Table 10**, **Table 11**, and **Table 12**, additional columns added, "No of agreement per theme", "No of agreement per sub theme", and "No. of codes". These columns used to rearrange factors based on their importance, it determined by the agreement received in the interview **Table 13**, this helped us in arranged the Guidelines based on the importance of themes and codes.

Also Columns Question Number and Related Codes, to make it easy for the phase (**4 Reviewing Themes**) in which the analyst can back to a sentence that belongs to a specifics code in a question for the developer and reviews that sentence. Or comparing codes together and see if they relate with the same sub-themes. This describes what done in the 4th Phase, "Reviewing Themes."

In the 5th Phase (**5 Defining and Naming Themes**), nothing a lot added because, from the beginning, the author tried to use the best appropriate names for themes. The definition of these themes was discussed in the next chapter.

4.2 *Questionnaire Data Collection and Results*

4.2.1 Data Collection

As clarified in the research methodology (**3.3Questionnaire**), a questionnaire questions prepared based on the resulted themes to find out the degree of agreement with these themes.

The questionnaire targeted the development team members and was published in IT social groups such as University of Birzeit, Facebook, Twitter and LinkedIn, also sent in a private message, emails for IT individuals and for some of the Software companies in Palestine.

The questionnaire did not target same participant as interviews. The participants of the interviews were excluded from the survey because obviously the aim of the survey is to know the extent to which the respondents agree with the opinions of the participants in the interviews.

Google forms used to implement the questionnaire questions, the questionnaire link (form) sent to the previously mentioned candidates.

The questions and sub-questions showed in chapter 3 **(Questionnaire Questions)**. This section shows the main questions and how they related to themes (**Table 14**) from the previous section (**Generating themes**) .

The number of participants was 43.

Table 14 Questionnaire Questions and Themes

Theme	No	Main Question
Encourage developers	**1**	Do you think encouraging developers with one of the following points could reduce Developer Turnover?
Developer Turnover Reasons	**2**	Do you agree that Palestine Territory is a reason for the Developer Turnover?
	3	Do you think work roles such as responsibilities, nature of tasks, relationship with management is a reason for the Developer Turnover?
Developer turnover Impact on Maintenance	**4**	Do you agree that the following points have a direct and negative impact on maintenance due to the new developer?
	5	Do you think that knowledge loss (as a result of Developer Turnover) is a negative impact on maintenance?
	6	Do you think that comments on code and business documentation are sufficient to make up for the lost knowledge?
	7	Do you think that the Developer Turnover increases the number of maintenance tickets?
	8	Do you think Developer Turnover affect bug tracking by making it more difficult?
Handle Developer Turnover effects	**9**	Do you agree that the following points can handle Developer Turnover effects?
Decrease Difficulties (Handle Developer Turnover effects)	**10**	Do you think that using comments on code and business documentation will NOT help to handle Developer Turnover effects and lost knowledge?
New developer difficulties	**11**	Do you think it's NOT difficult to update an old code by a new developer?
	12	Do you agree that Knowledge loss cannot be compensated
Developer Turnover Risk	**13**	Are the following points considered as a risk on the project maintenance and customer satisfaction?
Customer anxiety	**14**	Do you agree that the following customer questions are concerns (anxiety) for him when turnover the developer?
Customer is satisfied	**15**	Do you think that the following facts positively affect customer satisfaction when there is a Developer Turnover?
Customer is dissatisfied	**16**	Do you think the following points negatively affect customer satisfaction when there is a Developer Turnover?
Customer Satisfaction	**17**	In your opinion, what is the level of customer satisfaction with the Developer Turnover in general?
	18	Do you agree that customers may abandon the project due to Developer Turnover?
Implicit turnover of the developer	**19**	When trying to update an old code that you wrote yourself from a long period of one or two years or more, do you face a problem, even a simple thing, in remembering what you wrote previously? or feel like you are editing a code written by someone else?

4.2.2 Results

4.2.2.1 Validity of the responses

1. **The General Questions**

   The results were:

   - Question 1, There are 12 persons have year of experience 1-5, and 31 have more than 5 years

   - Question 2, There are 18 developers, 13 Team Leader, 8 Managers, 4 others

Based on these results, the questionnaire is diversified in terms of experiences and the number of working years, as most of the participants have more than five years of experience (**Figure 12**). This means that the participants have worked on various projects, which gives us more confidence that the answers are according to IT Experience.

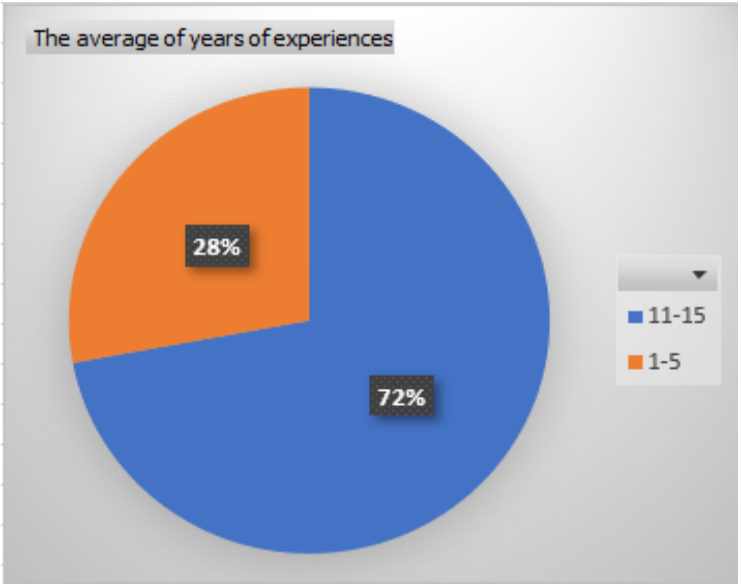


Figure 12 Average of years of experience

2. The Validation Questions

- **First validation Question**

  Question No.4 “Hard to update old code” against “NOT difficult to update an old code”.

  Five persons didn’t pass the validation (their responses were Agree for both questions or Disagree for both questions) (**Table 15**)

Table 15 Questionnaire - Validation Questions 1

4) Hard to update old code?	11) Do you think it's NOT difficult to update an old code by a new developer?
Strongly Agree	Agree
Agree	Agree
Agree	Agree
Agree	Agree
Disagree	Strongly Disagree

- **Second validation Question:**

  Question No.6 “Comments on code are sufficient to make up for the lost knowledge” Against two questions No.10 “Using comments on code and business documentation will NOT help to handle Developer Turnover effects and lost knowledge” and question No.12 “Agree that Knowledge loss cannot be compensated”. (**Table 16**)

  Two persons didn’t pass the validation against questions 10 and 12, their responses were Agree for all questions or Disagree for all questions.

  Table 16 Questionnaire - Validation Questions 2

6) Do you think that comments on code and business documentation are sufficient to make up for the lost knowledge?	10) Do you think that using comments on code and business documentation will NOT help to handle Developer Turnover effects and lost knowledge?	12) Do you agree that Knowledge loss cannot be compensated?
Disagree	Disagree	Disagree
Strongly Agree	Strongly Agree	Agree

Based on the results of these validation questions the author rejected the 7 participants who did not pass the validation questions, the remaining participants that included in the calculations are 36.

Based on these results, most of the participants succeeded in overcoming verification questions. This means that the answers are honest and accurate and the author can rely on them.

4.2.2.2 Responses

The questionnaire questions created in such a way that the answers tend to be positive, which means agreeing with the questions. Therefore, positive responses indicate the extent of agreement with the discussion done in the interviews. Negative responses indicate the extent of rejection or inconsistency with the answers to the interviews.

Table 18 shows the questionnaire results (Count per answer scales), it shows that most of the answers are positive (Strongly Agree, Agree), except the validation questions 10,11, and 12 (**Questionnaire Questions**).

In percent (**Table 19**) shows that for every question the average agreement (Strongly agree + Agree) is bigger than the average agreement for (Strongly disagree + Disagree) except the validation question in yellow and 17,18.
On the level of all questions, the percentage of "Agree" constitutes almost half, and "Strongly Agree" constitutes a quarter, meaning the average of the approval scales (Strongly Agree, Agree) represents 70% of the responses. This is robust evidence of the compatibility between the results of the interviews and the poll. (**Figure 13**) (**Table 17**)

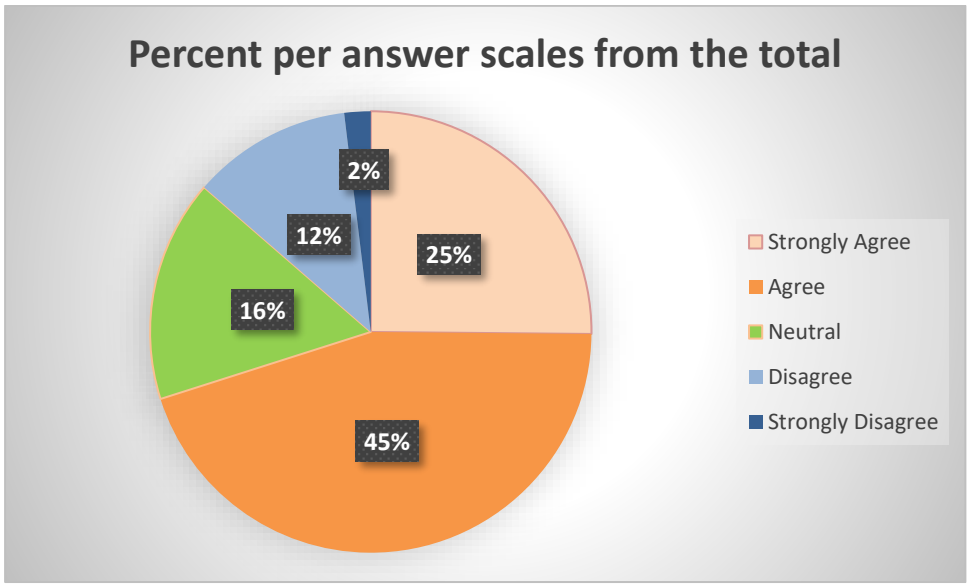


Figure 13 Percent of answers scales of Grand Totals

Table 17 Totals for Answers Scales, Percent of Grand Total

	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Grand Total
Percent of Grand Total	443	792	287	206	34	1762
	25.14%	44.95%	16.29%	11.69%	1.93%	

Table 18 Questionnaire results, Count per answer scales

Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Grand Total
1.1	7	17	8	3	1	36
1.2	26	7	2	1	0	36
1.3	16	17	3	0	0	36
2.1	15	15	3	3	0	36
2.2	8	16	11	1	0	36
2.3	7	17	8	4	0	36
3	17	16	2	1	0	36
4.1	15	18	0	1	2	36
4.2	12	11	11	2	0	36
4.3	11	16	5	4	0	36
4.4	9	14	9	3	1	36
4.5	4	16	7	9	0	36
4.6	3	22	4	6	1	36
4.7	9	16	11	0	0	36
5	15	16	4	1	0	36
6	13	15	5	2	1	36
7	10	15	7	4	0	36
8	8	21	4	3	0	36
9.1	11	21	1	2	1	36
9.2	11	18	5	2	0	36
9.3	4	20	5	5	2	36
9.4	3	14	14	3	2	36
9.5	22	9	3	2	0	36
10	1	6	1	20	8	36
11	1	4	6	23	2	36
12	2	12	7	12	3	36
13.1	11	21	0	4	0	36
13.2	11	20	4	1	0	36
13.3	3	23	8	2	0	36
13.4	8	15	4	9	0	36
14.1	10	18	6	2	0	36
14.2	9	18	7	2	0	36
14.3	10	18	6	1	1	36
14.4	10	17	8	1	0	36
14.5	12	18	4	2	0	36
15.1	7	21	5	3	0	36
15.2	0	15	9	11	1	36
15.3	12	17	3	4	0	36
15.4	5	21	8	1	1	36
15.5	1	11	17	6	1	36
16.1	17	16	3	0	0	36
16.2	9	18	5	4	0	36
16.3	11	20	4	0	1	36
16.4	11	21	2	1	0	35
16.5	10	22	2	2	0	36
16.6	8	16	7	5	0	36
17	0	6	15	12	2	35
18	1	10	9	14	2	36
19	7	21	5	2	1	36
Grand Total	443	792	287	206	34	1762

Table 19 Percent of answer scales per each question

Question	Strongly Agree	Agree	Neutral	Disagree	Strongly Disagree	Strongly Agree + Agree	Strongly Disagree + Disagree
1.1	19%	47%	22%	8%	3%	66%	11%
1.2	72%	19%	6%	3%	0%	91%	3%
1.3	44%	47%	8%	0%	0%	91%	0%
2.1	42%	42%	8%	8%	0%	84%	8%
2.2	22%	44%	31%	3%	0%	66%	3%
2.3	19%	47%	22%	11%	0%	66%	11%
3	47%	44%	6%	3%	0%	91%	3%
4.1	42%	50%	0%	3%	6%	92%	9%
4.2	33%	31%	31%	6%	0%	64%	6%
4.3	31%	44%	14%	11%	0%	75%	11%
4.4	25%	39%	25%	8%	3%	64%	11%
4.5	11%	44%	19%	25%	0%	55%	25%
4.6	8%	61%	11%	17%	3%	69%	20%
4.7	25%	44%	31%	0%	0%	69%	0%
5	42%	44%	11%	3%	0%	86%	3%
6	36%	42%	14%	6%	3%	78%	9%
7	28%	42%	19%	11%	0%	70%	11%
8	22%	58%	11%	8%	0%	80%	8%
9.1	31%	58%	3%	6%	3%	89%	9%
9.2	31%	50%	14%	6%	0%	81%	6%
9.3	11%	56%	14%	14%	6%	67%	20%
9.4	8%	39%	39%	8%	6%	47%	14%
9.5	61%	25%	8%	6%	0%	86%	6%
10	3%	17%	3%	56%	22%	20%	78%
11	3%	11%	17%	64%	6%	14%	70%
12	6%	33%	19%	33%	8%	39%	41%
13.1	31%	58%	0%	11%	0%	89%	11%
13.2	31%	56%	11%	3%	0%	87%	3%
13.3	8%	64%	22%	6%	0%	72%	6%
13.4	22%	42%	11%	25%	0%	64%	25%
14.1	28%	50%	17%	6%	0%	78%	6%
14.2	25%	50%	19%	6%	0%	75%	6%
14.3	28%	50%	17%	3%	3%	78%	6%
14.4	28%	47%	22%	3%	0%	75%	3%
14.5	33%	50%	11%	6%	0%	83%	6%
15.1	19%	58%	14%	8%	0%	77%	8%
15.2	0%	42%	25%	31%	3%	42%	34%
15.3	33%	47%	8%	11%	0%	80%	11%
15.4	14%	58%	22%	3%	3%	72%	6%
15.5	3%	31%	47%	17%	3%	34%	20%
16.1	47%	44%	8%	0%	0%	91%	0%
16.2	25%	50%	14%	11%	0%	75%	11%
16.3	31%	56%	11%	0%	3%	87%	3%
16.4	31%	60%	6%	3%	0%	91%	3%
16.5	28%	61%	6%	6%	0%	89%	6%
16.6	22%	44%	19%	14%	0%	66%	14%
17	0%	17%	43%	34%	6%	17%	40%
18	3%	28%	25%	39%	6%	31%	45%
19	19%	58%	14%	6%	3%	77%	9%
Average Percent	**25%**	**45%**	**16%**	**12%**	**2%**		

4.3 *Analysis*

As previously presented, based on the results, 21 themes were created for all interview groups. Next - in this section - is an analysis of these themes to understand the interconnections between them and come up with a conclusion that answers research questions and helps us in setting guidelines.

4.3.1 Interview Analysis

After analyze each theme, the author displays the percentage of questionnaire respondents agreeing with the same theme.

4.3.1.1 Software Companies

1. Projects with Developer Turnover

Here the author analyzed the generated themes from project with turnover

(Table 10 Themes and Sub Themes (with Developer Turnover))

The first theme **"Type of Developer Turnover"**, is the beginning of the discussion in the interviews, through which the rest of the questions addressed. This theme shows the interviewee's idea of the Developer Turnover.

The second theme **"Encourage developers"** discusses the issues that encourage the developer to stay on the team. Reviewing this theme with the theme “Developer Turnover Reasons”, the topic is mainly about salary and working conditions and how to improve them.

Questionnaire Q1(1.1,1.2 and 1.3) related to this theme. Average agreement (66%,91% and 91%) (Table **19**)

The **"Developer Turnover Reasons"** theme discusses the reason behind the developer leaving the team, where the discussion was mostly about the specificity of the Palestine region. The author was getting into the issue of salary and the impact of Outsource companies because they pay a better wage than local companies in general. Also, the working environment - in the second degree - is an issue in terms of the relationship between employees and managers, the assigned responsibilities, the nature of work, and its laws, such as the lack of flexibility in-office hours. It is also noticeable that this factor is

compared to the work environment in OutSource companies. There is another factor, not everyone was agreed upon; still, it has a presence and influence, according to what is noticed through the discussion, which is the tendency of developers to search for a job opportunity outside the country for the same reasons that mentioned above in this paragraph. Another factor that was discussed with the developers is the availability of a new opportunity for the developer elsewhere, not for the same previous reasons, there was not much agreement, as the one who touched on this topic only two developers.

Questionnaire Q2(2.1,2.2,2.3) and Q3 related to this theme. Average agreement

Q2(84%,66%,66%) and Q3=91% (Table **19**)

The **"Turnover Impact on Maintenance"** theme. The discussion centered on the Impact on maintenance, Impact on Number of Tickets, Impact on Bug Tracking.

The discussion revealed that the developers are facing a problem by modifying a previous code and dealing with new technology (for the new developer). New technology in the sense that the new developer knows to deal with it fundamentally, but upon receiving the maintenance, it has to deal with it in depth. Also, the intervention of the team leader or senior developer is required to assist the new developer. Hence the discussion on the loss of knowledge. Where there is a problem in understanding the nature of the work, the context in which the code was written, and the reason for previous modifications, as part of it, based on a discussion between the old developer and the customer. Here some developers mentioned that they had to rewrite the code from scratch, and the result was redundancy in work. All of those mentioned above ultimately leads to the need for more time than is required to solve and follow up on the problem, thus accumulating maintenance tickets and increasing their number. This was agreed between the team leaders and the developers.

Questionnaire Q4(4.1 to 4.7), Q5, Q6, Q7 and Q8 related to this theme. Average agreement Avg Q4(4.1 to 4.7)= 70%, Q5=86%, Q6=78%, Q7=70% and Q8=80% (Table **19**)

The **"Handle Turnover effects"** theme. The discussion took place with team leaders and developers on how to deal with the Developer Turnover problem, besides, to discuss with developers about the difficulties they face when receiving maintenance from a previous developer.

The factors that were raised first are circulating and non-circulating of information between team members or the so-called cross-functionality. Information circulation is achieved through delivery methods from the old developer to the newcomer, the participation of the team leader and the main developer of the newcomer, and cross-functionality between members of the existing team. Therefore, when leaving any member of the team does not affect the work of the group because it is a joint work and is done by more than one developer. This requires companies that have the ability or relatively large software companies, and this is what observed from the interview with the fourth company. Secondly, the documentation factor, there was a consensus that there is no systematic documentation of the code. Developers are required to document the code, but not everyone adheres to it, because there is no administrative decision or that the management is aware of the difficulty of documentation in terms of cost. Among the problems associated with documentation is the lack of time to read the documentation in light of the urgent maintenance issues and difficulty in understanding written documentation. There is always documentation for business because the requirements are ever written between the provider and the customer.

In the end, the discussion revolved around issues that help overcome the problem from the viewpoint of the interviewees. First, try not to influence the customer as a whole, this point is a top priority. Then, follow the standard rules to write the code and obligate the developers to do so, postpone the less important problems, give additional time to solve problems from the time of the software company and not from the time of the customer. There is a suggestion of one of the interviewees to adhere to the standard development life cycle, which reduces effects.

Questionnaire Q9 and Q10 related to this theme. Average agreement for question Q9(9.1 to 9.5) is 74%, while Q10 is a validation question so disagreement 78% is bigger than agreement 20% (Table **19**)

Here a related theme can be addressed **"New developer difficulties"** as it revolves around the challenges that the new developer encounters when the old developer is not available; at the same time, there is a problem with the handover that was made. This is common, as noticed through the interviews.

Difficulties Include the knowledge that was lost, and the developer does not find someone to compensate it, the challenge of modifying the code, especially if it reached the complexity stage (The complex code in this research has been defined as the rotation of code modification by many developers, and each one uses his method to write the code until it reaches the stage of complexity), lack of knowledge of the business and essential accurate details, maintenance problems that were not previously resolved and remained pending, inability to deal with the customer, which leads to many meetings and wasting time.

Questionnaire Q11 and Q12 related to this theme. These are validation question so disagreement 70% and 41% is bigger than agreement 14% and 39% (Table **19**)

Finally, the themes **"Customer Anxiety and Customer Satisfaction"**, most interviewees gather that the customer is worried about the new developer and compare it to the old developer "Will new developer correctly solve outstanding maintenance issues?". One of the critical issues is customer concern about the familiarity relationship that will start again with the new developer, as this relationship developed previously over long periods and was an integral part of solving problems. So, the way to communicate with the customer is not less important than the rest of the factors for solving any problem. The new developer may not be able to communicate, so it becomes a customer concern.

Among the things that make the customer dissatisfied with the new developer - according to the opinion of the interviewees - is that the customer, in general, is not satisfied with the replacement of the maintenance official. The customer opposes the abandonment of a reliable developer, the frequent change of developers, and the lack of knowledge and lack of response of the new developer, which leads the customer to refuse to deal with the latest developer and could lead to abandoning the entire project. Among the things that make

the customer satisfied with the new developer - according to the opinion of the interviewees, mainly solving the customer's problems without apparent delay, then, the new developer is better than the old, whether with experience or communication, then, developing a familiarity relation with the customer, and this is one of the things that gives the customer patience until solving problems and can be included under the concept of Social Engineering.

Questionnaire Q14, Q15, Q16, Q17 and Q18 related to this theme. Average agreement Avg Q14(14.1 to 14.5) = 78%, Avg Q15(15.1 to 15.5) =61%, Avg Q6(16.1 to 16.6) =83%.

For question Q17 disagreement 40% is bigger than agreement 17% because the question was about customer satisfaction with Developer Turnover, the results show that they think the customer is not satisfied, this is also, what the interviewee think.

Also, for question Q18 disagreement 45% is bigger than agreement 31% because the question was about if customers abandon the project due to Developer Turnover, the results show that they disagree with this point, but in the customers theme **"Not Dealing with Turnover problem"** it shows that three out of four customers said they replaced the system due to frequent Developer Turnover.

(Table **19**)

The conclusion from these themes is that Developer Turnover has its effect - not simple - on the development team extending to customer satisfaction, as have seen from analyzing the answers above in this paragraph. The precautions to avoid this problem are insufficient and almost non-existent, this has its causes that can be divided into two parts, reasons related to the question "Why does the developer leave the team?" an important reason has to do with the Palestine region, especially the impact of Outsource companies. The second is the reasons related to not dealing with the problem of Developer Turnover and trying to avoid it. Therefore, the complaints of members of the development team must be considered, study them, and form guidelines for software companies, and this is what the author did in the second part of this chapter.

2. Projects without Developer Turnover

Here the author analyze the generated themes from project without developer turnover **(Table 11 Themes and Sub Themes (without Developer Turnover))**

These interviews simpler than project interviews that contain a Developer Turnover where the discussion was about comparing the difficulties of the new developer and customer satisfaction between projects with Developer Turnover and without Developer Turnover. Through the theme **"Impact of no Developer Turnover"** It was noticeable that most of the problems related to Developer Turnover are not present. The number of maintenance tickets is less, the maintenance time is less, the developer is psychologically comfortable, the code is controlled, and in general, there is reasonable control over maintenance because the same developer takes care of it.

On the other hand, in theme **"Documentation"** the author has noticed that the lack of documentation can cause a big problem if the developer changed. Also, noticed that the developers who work on a project for a long time, two years and more, without being replaced, when modifying old code, they will face a problem of remembering what they wrote previously and feel as if is modifying a code written by someone else, this leads to the issues of the Developer Turnover, but simpler, especially in the absence of documentation. In this research, the author named this phenomenon **" Implicit turnover of the developer".** This is indicated in the **Definition** section, where the author categorized the definition in this research into two terms explicit developer turnover and implicit developer turnover, so that explicit turnover related to project with developer turnover and implicit turnover associated to projects without developer turnover.

Questionnaire questions Q19 related to this theme, which discusses **"Implicit turnover of the developer"**. Average agreement for this question is 77%, while the disagreement is just 9%, this means that this is a true phenomenon and needs to be highlighted. (Table **19**).

Regarding customer satisfaction, on the one hand, there is a concern for the customers - according to the opinion of the interviewees - they trying to solicit the developer to work with them because this developer is the only one who

understands the system. Other than that, the customers are satisfied with the maintenance and relationship in terms of developer's turnover, with some objection to the delay in support if the issue is related to an ancient code written by the developer.

The conclusion from the comparison of the two projects is that the replacement of the developer has an impact on the project and the developer, influences the customer's satisfaction negatively. Also concluded through themes **"Customer Anxiety and Customer Satisfaction"** that the customer remains concerned in both cases, concerned about the developer leaving the team at any time, even if the developer has not changed for a long time and controls the maintenance. And also, the topic of reverting to the old code written by the same developer "Implicit turnover of the developer" where some of the problems similar to the issues of Developer Turnover and need to be addressed.

In all previous interviews of the two types of projects, all participants were asked about their behavior in the team, interaction with the nature of work, and their position. Everyone answered that they love their current job; four of them answered, besides, to love their current work that they aspire and find themselves in a higher administrative position. The author did not notice that this affected the neutrality of the discussion because everyone is satisfied with his current work

4.3.1.2 Customer

The goal of customer interviews is to find out how the developer's turnover affects customer satisfaction with maintenance and compare customers' opinions with those of development teams regarding customer satisfaction.

Here the author analyze the generated themes from customer interviews (**Table 12 Themes and Sub Themes (Customer)**), Five themes were generated by analyzing customer interviews. In the first theme **"Satisfaction with maintenance in general"**, the customer was asked about his satisfaction with maintenance in general, this help to estimate the accuracy of the answers. There was satisfaction in general and dissatisfaction with specific issues such as slow maintenance, no maintenance tracking system, no quality assurance.

The second theme **"Issues lead to Satisfaction, Dissatisfaction"** is related to issues that lead to customer satisfaction or dissatisfaction, such as the presence of SLA, dealing with maintenance problems with importance, understanding the requirements, and having a maintenance tracking system. It was also noticed that there are points related to the Developer Turnover directly or indirectly, such as the presence of an alternative to the developer responsible for maintenance, better communication, and interest in developing a familiarity relationship with the developer.

The third theme **"Old-New Developer evaluation"** compares the disadvantages/advantages of the developer who left the team and the new developer who received the maintenance. Some customers find the old developer is better, and others find the new developer is better. This is due to the developer's experience and the way to communicate with the customer. For example, the new developer deals with problems more importantly and gives better results regardless of the delay. On the other hand, the old developer has a better understanding of the business and code, deals with problems without delay, but sometimes does not cooperate. In general, the customer prefers the old developer. Some customers prefer the new developers because they are trying to prove themself by satisfying the customer, and this is what the former developer did not need.

The fourth theme **"New Developer Impact"** discusses the effect of Developer Turnover from the customer's point of view. Such as the emergence of new problems, lack of knowledge, and quality of work. The customer considers delay in repairing issues cost to him. The customer feels that the new developer is in the stage of learning and is not ready for work or that the customer himself is teaching the developer. The result is that the customer confines maintenance requests to important and urgent issues.

The last theme **"The customer deals with the turnover problem"** discusses how the customer deals with this problem, noting that the customer tries to deal with the problem in the beginning for reasons. Some reasons are related

to the system itself, the stability of the system so that the problem does not have a significant impact on the customer's work, the price of the system is competitive, and its replacement is costly. The system is large and difficult to replace because of a problem of this type, and the customer's experience in finding alternative solutions. Some reasons are related to the developer himself, such as the experience of the new developer is better than the old one; the new developer deals with problems with importance as mentioned above. Also work deadlines force the customer to deal with this issue as replacing the developer will delay the deadlines. The customer may reach a dead end and have to replace the system after failing to deal with the problem, and the software is threatening workflow.

In conclusion, a consensus found between the discussion in developer team interviews and customer interviews in terms of customer satisfaction and the effect of the Developer Turnover. Such as there was a consensus between the development team and the customer of this team on the addressed issues. For example, the development team H said that they did not encounter objection from the customer to the Developer Turnover because there are always alternatives in the team, the following example from **Appendix B Codes and Sentences (Interview extract)**

Q	Interviewee	Interview extract	Code	Sub Theme	Theme
8	H	لم نواجه اعتراض او شكوى من الزبون	**14 Customer Satisfied – No complaints**	Customer is satisfied	Customer Satisfaction

On the other hand, customer C2 expressed his satisfaction with the way the software company dealt with the problem, the following example from **Appendix B Codes and Sentences (Interview extract)**

Q	Interviewee	Interview extract	Code	Sub Theme	Theme
1	C2	بشكل عام راضي, وعند حدوث المشاكل يتجاوب مباشر	**1 Satisfied Generally**	Satisfied	Satisfaction with maintenance in general
2	C2	وجود اكثر من مبرمج بحيث اذا ترك احدهم يسد محله الآخر	**6 Satisfied - developer backup**	Satisfied	Issues lead to Satisfaction, Dissatisfaction
	C2	العلاقات الشخصية	**7 Satisfied Familiarity Relationship**		

The customer prefers to deal with the old developer and worries about Developer Turnover. Some customers have stated that they have given up some of their software for this reason. However, there remain issues – maintained in the previous paragraph “The customer deals with the turnover problem” – minimize Developer Turnover influence on customer satisfaction. But it must be taken seriously and with the attention of the software company.

4.3.2 Questionnaire Analysis

Based on the analysis of the questionnaire results shown in the previous section questionnaire **Responses,** all the participant responses were positive which indicate an agreement with the generated themes and so on the discussion done in the interviews, as the author explained in the previous section **Software Companies** for every theme the related questionnaire question and the level of agreement. Percentage of Strongly Agree and Agree scales were 70% of the responses. This is robust evidence of the compatibility between the results of the interviews and the questionnaire. This makes us depend on the discussion in the previous section to answer research questions and start setting guidelines (**Recommendations**) for software companies to avoiding or decreases the problem of switching a member of the development team that has a direct relationship with the customer and maintenance.

4.3.3 Results Comparison with Related works

This section is a comparison between this study and the previous studies (discussed in **Background and Literature Review**), which leads to conclusions that did not included in other sections, in addition to the expected contribution that is unique to this research compared to previous studies.

According to the results of this research, theme "Types of Turnover" is consistent with the definitions in (**Definition**) from related works, such as Foucault et al.[1] considered it a phenomenon, this was obvious as observed from all the interviewees and questionnaire participants, aalmost everyone agrees that this problem exists.

Theme "Turnover Impact on Maintenance" is consistent with Foucault et al.[1] that the internal turnover in the same team has almost no effect, in this research most of the interviews were about the external turnover as the internal was not considered a problem because the developer remains in the same team. Also, agree with Bass et al. [3] that the effect of Developer Turnover is harmful in general or according to the opinion of the majority, as the results show.

As mentioned previously in (**External and Internal turnover**) that Foucault et al.[1] does not agree with Mockus' [4], that the new member has no effect, and through the results of this research, the author also does not agree with Mockus, as there is an effect for the new member cannot be underestimated

Theme "Developer Turnover Reasons" is consistent with Bass et al. [3], Weller et al. [16], and Hurley et al. [19]. It relates to the employment environment, and this is the main reason for the high staff turnover, especially Murrar et al. [18] that he touched on the same topic in the Palestine region, which is job satisfaction and turnover, which is proven in this research and strengthens the results of the two studies.

The theme "New developer difficulties" is consistent with Izquierdo-Cortazar et al. [7], Rigby et al.[5] and Nassif et al. [6] (**Knowledge Loss and productivity**) In terms of losing the knowledge that is difficult to compensate

On the other hand, there is no theme consistent with Hynninen et al. [12] that this phenomenon constitutes a cost to the software company. It has been discussed in the interviews that it represents a cost to the customer, but not the software company. The theme does not exist possible because the interviewees do not care about this.

The “Customer Satisfaction” theme of the results of the three interview groups is consistent with Woods [20] more employee turnover means less customer satisfaction and vice versa.

Also, the author totally agrees with Hurley et al. [19] on the one hand, as he linked the topic of employee satisfaction with customer satisfaction, but on the other hand, the author did not find a paper that places great importance on the subject of customer satisfaction as it did in this research.

The theme "New Developer Impact" in the group of customer interviews, the results are consistent with what Mockus [8] and Rigby et al.[5] as this phenomenon negatively affects productivity and the presence of the alternative developer can reflect the results.

The "Developer Satisfaction" theme is somewhat in line with what Lin et al. [9] mentioned "Developer behavior" in terms of the impact of developer behavior on his survival on the team.
The difference is that the author in this research used the topic of the "Developer behavior" to find out if the developer is satisfied with his work and whether this will affect his stay in the team and also the extent of the sincerity of his answers and discussion with the author

What distinguishes this research from the author's point of view is several points that are considered an expected contribution compared to the previous studies:
The author explained the problem of OutSource companies and their effect on the developers, that is, the problem is not only limited to the developer's satisfaction with his job due to the local companies themselves, unlike the rest of the studies, where they focused on the problem due to the software company itself. Bass et al. [3] and Weller et al. [16] Hurley et al. [19] and Murrar et al. [18] who studied the same area in which this research is being conducted
Also, the author did not find among the studies what is looking in-depth as he did in the theme "Handle Turnover effects," that is how to deal with the effects of developer turnover and try to reduce them, in addition to finding solutions specific to the region and come up with guidelines.
There is only mention of limited directives such as Donadelli [13], developers who have the knowledge take over the abandoned, the project manager can encourage developers to stay in the team. As mentioned in (**Knowledge Loss and productivity**)
In this research, the issues that could encourage the developer to stay in the team were highlighted in the theme "Encourage developers", and the opinion of those who participated in the questionnaire was taken, as 66% agreed with doing work outside the work and 91% agreed with the salary increase (Questions 1.1 and

1.2) **Table 19** (this is normal for any employee, but in the Palestine region, is related to the presence of another party that affects the satisfaction with the salary, as was shown in the theme "Encourage developers" and "Developer Turnover Reasons") and this was not touched upon by any of the previous studies.

The issue of customer satisfaction was addressed in a limited manner. In this research, the author gives great importance in addition to studying the customer's concern regardless of his satisfaction by asking the interviewers, whether the developers or customers, which not found in previous studies.

Chapter 5 Conclusion and Future work

5.1 *Threats to Validity*

1) **Conclusion Validity**

It is possible to claim that the author is looking for specific results because usually, the main effect of the developer turnover is the negative effect. Still, this research does not only relate to the positive and negative impact but rather on several topics that depend on this effect, whether positive or negative, such as the customer's opinion and what matters that lead to his satisfaction even that there is a developed turnover. Also, the reasons for this turnover in a specific area. Ultimately instructions to avoid adverse effects if there is

2) **Internal Validity**

- The interviews were recorded phonetically. Some of the interviewees refused to record the interview, so the notes were recorded in writing, and this threatens the accuracy of the recorded observations because the interviewer needs to focus on the discussion at the same time and because the thematic analysis depends mainly on what is recorded verbatim. There was no significant effect as this only happened in two interviews
- Some confounding factors affect the study and have a direct relationship with the region of Palestine, such as economic and political factors. The Palestinian economy is an unrecognized (non-free) economy that is linked to the economy of another country and suffers from a closed market, which means that the local software companies suffer from a market of weak potential. Also, they face difficulty in exporting their software outside the country and thus finding other resources other than domestic resources, which affect their ability to pay salaries that satisfied developers.

3) Construct Validity

Interviewer bias to expected results is a fact, so to reduce or avoid the unconscious bias of the interviewer when asking the question, general qualitative questions have been created so that they depend on the interviewee himself in the discussion of the answer he deems appropriate

4) External validity

- The effect of having specific team members, not all of the supposed team members that want to generalize to. For example, most of those who participated in the interviews are either a developer or a team leader and this is because the structure of the teams in companies is mostly like this, but what helps here to overcome this threat is that the member works on various tasks, such as the team leader and the main developer who manage the team, collects requirements, design, analysis and development. Also, the developer is developing and is responsible for quality assurance and testing.
- This study can be generalized to local companies and not to outsourcing companies, because the study outlines a problem that has three main components, which is the software built by a development team and a customer that uses this software. To collect data and feedback, all these items must be accessed, and this is not available from outsourcing companies. In addition, according to the analysis done, these outsourcing companies are part of the problem.
- It cannot be claimed that we can generalize this study outside Palestine, because as clarified in internal validity there are some confounding factors affect the study and have a direct relationship with the region of Palestine, such as economic and political factors. Also, as we see from the analyses, the problem is related to the outsourcing companies present in the local market and this factor may not have a strong impact outside Palestine. These two factors together constitute an obstacle to generalizing this study outside the region.

5.2 *Difficulties and Obstacles*

The author was able to overcome and find alternatives for most of the difficulties he encountered in this research. Focused on communicating with software companies and clients.

1- Many software companies do not want to cooperate by allowing the author to meet with the development teams
2- Some companies that have cooperated have expressed reservations about the individual interviews with the developers. One company requested to include the team leader when meeting one of the members.
3- Software companies rejected the request to review documents and records which show the maintenance issues done by the software company in a period.
4- Software companies were worried about giving more information than they were supposed to provide in order not to harm their interests, as the topic of the research deals with the relationship with the customer.
5- Some interview questions not answered because most of the interviewees warned against giving undesirable information not allowed by the company management.
6- Project selection: Several times, the interviewer (the author) requests to change the project because the proposed project did not fit the research.
7- The availability of the team members at the time determined for the interviews by the software company. Based on this the interviews cancelled with one of the proposed software companies
8- It is a challenge to find projects that do not include Developer Turnover
9- Some interviews were taken in writing only because the interviewee did not allow the recording.
10- One of the software companies requested the duration of the interviews per person to be around 20mins, justifying this by lack of time (but the author pushed to be within the one-hour time frame)
11- Software companies rejected the request to interview the client of the project discussed in the interview.

5.3 *Recommendations*

This section includes recommending guidelines for software companies to consider in the system building phase and maintenance phase to avoid turnover or minimize the negative impacts of turnover. These guidelines were formed from the summary of the discussion in the interviews and the themes that resulted and also based on the results of the questionnaire, which came in line with the opinions of the interviewees. “Documentation” guidelines work with both explicit and implicit turnover while the other guidelines work only on an explicit turnover, this is because in an implicit turnover, based on the analysis done, what is needed is to focus on having clear documentation in order for the developers to remember what they had written previously themselves.

5.3.1 Guidelines

A) Documentation:

Write systematic documentation that is clear and is being tested because there is difficulty in dealing with documentation by the new team member.

- Code Comments such as (Database objects and attributes, PHP code, server-side issues)
- Document any integration with other systems or any third parties
- Business processes documentation
- Plans (old and new)
- Document the not solved problems and the partially solved problems
- Document any communications were done with the business (customer)
- Document all the used technologies and its versions
- Document all the used files and folder (system files, code, versions, exe, documents, …., etc)
- Document all user credentials (Accounts, users names, passwords, domains, URLs)

B) Circulate information

- General Handover for more than one developer to discuss the whole system processes and historical issues. The team leader and main developer should be available in this handover.
- Development and Maintenance Handover:
  - Code
  - Integration with other systems or any 3rd parties
  - Bug tracking
  - Old or done Development issues
  - Deployed and the not deployed issues or models
  - Priorities in maintenance and development
  - Future development plans
  - If there are some issues still under development and not completed
  - Solved problems and the partially solved problems
- Handover on any communications were done with the business
- Handover on all the done analysis
- Handover on the Data it self
- Handover on the used technology, if there are a specific technology used and the new developer don't know about it or how to use it

C) Code standardization

Following standard rules for writing the code, and it is possible to infer global rules to suit the work of the development team—binding developers to these rules.

D) Communication

Initially, knowledge about the relationship with the customer must be transferred from the old developer or from the team leader to the new developer. It is preferable to give the new developer a course on how to deal with customers or ways to communicate with customers in the field of software or social engineering.

E) Customer

- Try to not affect the customer: Dealing with this as a main rule and giving it top priority.
- Postponing the least important problems, and focusing on the serious problem that affects the customer's business
- Give extra time to solve problems from the time of the software company, not from the time of the customer
- Maintenance tracking system (to follow up maintenance tickets)
- Periodic update to solve common problems

5.4 *Conclusion*

In this thesis, the Author discussed the phenomenon of Developer Turnover for a member of a software development team in terms of its effect on maintenance and customer satisfaction. Discussed the reasons for this phenomenon in the Palestine region in addition to setting guidelines to reduce the impact of Developer Turnover.

To achieve this approach, the author followed exploratory research based on multiple case studies. The methods of collecting data were interviews with development teams and customers for the proposed case studies using qualitative questions to give scope for extracting the opinions of participants, the second method was a questionnaire to see how developers agree with interview outcome. The thematic analysis used to analyze the qualitative data, as it is a flexible method to simplify the analysis process by extracting a valuable achievement systematically from a large body of data.

The interviews verified in several stages. The questionnaire verified before and after receiving the answers. 21 themes generated from the analysis, 10 themes for projects include the phenomenon, 6 for projects that do not include the phenomenon, and 5 themes from customer interviews.

The conclusion of discussing these themes was, On the one hand, Developer Turnover has its effect on the development team extending to customer satisfaction. The reason for the phenomenon related to the Palestine region, especially the impact of Outsource companies. The second reason is the precautions to avoid this problem and to handle it are insufficient in terms of Compensate for knowledge loss, Circulate information, and Documentation. On the other hand, the absence of the phenomenon reflects positively on the development team and customer satisfaction. Still, the customer concerned about the developer leaving the program at any time. Also, the issue of modifying old code written by the same developer " Implicit turnover of the developer", based on this the author categorized the definition of developer turnover into two terms explicit developer turnover and implicit developer turnover, so that explicit turnover related to project with developer turnover and implicit turnover associated to projects without developer turnover.

The customer prefers to deal with the old developer. Some customers have given up some of their software due to the phenomenon. However, there remain items that lead to customer satisfaction, even with frequent Developer Turnover. But it must be taken seriously and with the attention of the software company.

All the questionnaire participant responses were positive which indicate an agreement with the generated themes and the discussion done in the interviews. Percentage of Strongly Agree and Agree scales were 70% of the responses. This was a robust evidence of the compatibility between the results of the interviews and the questionnaire.

According to this, the author formulated guidelines considering items from the interview with development team members and customers to avoid or decreases the problem of switching a member of the development team that has a direct relationship with the customer and maintenance.

5.5 *Future work*

This study can be an introduction to future work, building a prediction model for those who will leave work during the coming period through the use of Machine learning techniques. This is an interesting idea, but the current study is required as a prerequisite for understanding the nature of the problem in our region.

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Appendix A Raw Collected Data

1) Software Companies - Interviews and Codes

Interviews based on the following table:

Software Company	Project with Turnover		Project Without Turnover	
	Team Leader	Developer	Team Leader	Developer
A	2	1		2
U		3		1
H	1	1	1	1
I	1			
Total Interviewees	14			

First Software Company

Team Leader& Developer

Project Type: Include Developer Turnover

About the project

➢ **Q1 Could you give an idea about the project and its development?**

يخص المؤسسات المالية وسلطة النقد

Project Versions: V1 2016, V2 2017, V3 2019

كل فترة يتم اصدار نسخة و انظمة تابعة له

Team Members: Mainly 3 developers including the team leader

Developer turnover:

ينضم مطورين و يتركوا الفريق خلال فترات معينه بناءا على ضغط الشغل

Developer Turnover

➢ **Q2 From your point of view what is developer turnover**

يوجد مطور يترك كليا ويأتي جديد محله, ويوجد مطور يدخل و يخرج لانجاز مهم فقط {1 Type of Turnover }

من الاسباب التي تؤدي الى ترك المطور للعمل كثيرة:

- مشكلة الراتب (وجود عروض اخرى خاصة من شركات الاوت سورس برواتب اعلى خصوصا في فلسطين {11 Palestine Territory}حيث ان الشركات رواتبها بالعادة متدنية){2 Salary Issue}
- مدة الدوام والالتزام بها, الموظف لا يريد الالتزام بوقت معين مثلا من 8-5, يريد وقت مفتوح مثل شركات الاوت سورس المنتشره في فلسطين{3 Attendance time}
-لاتعجبهم طبيعة الشغل و قوانينه او الادارة او مثلا يريد ان يشتغل على انروبد و هذا لا يوجد في الشركة {4 Work roles & responsibilities}
-لا يريد المتابعة مع الزبائن{4 Work roles & responsibilities}
-لا يستوعب المتابعة الدائمة و المسائلة من الممسؤول{4 Work roles & responsibilities}
- بالنهاية يفضلوا الاوت سورس{5 Outsource companies}{11 Palestine Territory}
- عدم قدرة الشركات على استيعاب اعداد المطورين {2 Salary Issue}{11 Palestine Territory}

-كثير من الشباب يأتي تم يترك ليسافر خارج البلد لفرص افضل {6 Job opportunities outside the country} {11 Palestine Territory}

-بعد فترة من العمل من سنتين واكثر يقل الاداء و يركن على الشغل{4 Work roles & responsibilities}
-لا يريد ان يتحمل مسؤولية انه اصبح عنده مشاكل وتؤدي الى صيانة {4 Work roles & responsibilities}

- A policy to encourage developers to stay in the team

يوجد حالات تم زيادة راتبها {7 Increase Salary}واصروا على ترك الشغل لانهم غير مرتاحين و مش واجدين نفسهم في هذا العمل وطريقته مع انهم ممتازين بعملهم ولا يواجهوا مشاكل, ولكن اغراءات الاوت سورس و السفرتؤثر عليهم وايضا مشكلت متابعة و البوزشن

➢ **Q3 What its effect on the project maintenance.**

-ليس بالامر السهل على المطور الجديد {1No easy}
- يتطلب منه تعلم تكنولوجيا جديدة {2Problem of learning New Technology}
-يتطلب منه تعلم الطريقة المتبعة بالتطوير و الصيانة يجب ان يلتزم بها من تقسيمات مثل كلينت و سيرفر, وايضا كتابة الكود ورسم الشاشات بطريقة معينه { 3Problem of learning to Work on Standards}
-غير ملم بالشغل ولذلك يحتاج وقت اضافي منه ومن الذي يشرح له المطلوب لانجاز الصيانة فالمطلوب انجازه بيوم يأخذ منه 3 ايام {4Extra Time}
-مشكلة مراجعه الشغل بعد ترك المطور للعمل او المشروع بسبب ان كل واحد له طريقته الخاصة بكتابة الكود او التحليل, ولذلك يكون هناك تعقيد و تتعب كثير عندما يريد مطور آخر عمل صيانه على نفس الجزئية او التعديل عليها{5Hard to Update Previous Work}

- **Q4 Is there an increase in number of complaints and the time to fix the problem due to developer turnover and from your point of view why this increase happened?**

-لا يؤثر على عدد المشاكل التي تظهر من عمل المطور السابق ولكن يؤثر على الوقت اللازم لحل المشاكل التي تظهر من عمل المطور السابق وبالتالي تراكم المشاكل المراد حلها**{1 Increase in number of complaints}**

-ايضا يظهر مشاكل جديدة بحاجة الى صيانة بسبب عدم فهم المطور الجديد لما تم بناءه سابقا وتعقيد التعديل عليه

{2New problems due to new developer}

- **Q5 Is there an impact on bug tracking after the developer has changed?**

عند حدوث مشكلة وتحتاج صيانة و الموظف المؤول عن المشكلة غير موجود او مشغول بمشروع آخر فيأخذ وقت وجهد كبير عند متابعة المشكلة و محاولت فهم ما تركه ِ فيض الامور مفهومه كيزنس ولكن ليس الكود لانه يرجع لطبيعو وكيفية كتابة الكود بحيث في بعض الملرات نضطر للتواصل مع الموطور لفهم ماذا يسبب المشكلة او نأخذ وقت طويل لمحاولة حل المشكلة خاصة انه يوجد تفاصيل كثيرة يعني بالنهاية تحليل المشكلة بوقت طويل او الاتصال بالمطور

{Problem of Bug tracking }

{1 Tracking: Extra time to analyze the problem}
{2 Tracking: Extra time to understand the code}

- **Q6 What did you do to handle the effects (how turnover was handled in the team)?** You mentioned that there is information lost because the developer left the team only the one who now it which considered a knowledge loss

- How the team was managed to circulate information among its members

-يتم عمل نقل للشغل من المطور التارك للمطور الثابت في الفريق و الاغلب يكون رئيس الفريق**{1Handover}**
- رئيس الفريق يحاول دائما ان يشغل بديل لاي مطور في الفريق قدر الاستطاعة **{2Team leader involvement}**
-دائما نطلب من المطور ان يكتب كومنت مفصله لما تم انجازه ولكن ليس الجميع يلتزم بها **{3Code Comments}**
-كتابة الكومنت ليس بشكل نظامي **{4Not Systematic Documentation}** بالنسبه للكود ولكن البزنس كله موجود و مكتوب **{5Business Documented}**

- What happened when you faced the problem of knowledge loss that cannot be solved through the previous points

-الحل النهائي يتمثل بوقت اضافي لتحليل و فهم المشكلة **{6 Extra Time to handle the maintenance}** و الشغل الاخر يتم تأجيله لحل المشكلة الحالية **{7 Postpone other tasks}**(هذا الوقت لاضافي من وقت الموظف الخاص) و هذا بالتالي يؤثر على سرعة حل مشاكل اخرى و على اداء الصيانة بشكل تراكمي وايضا رئيس الفريق يضطر للمتابعة مع المطور الذي يحل مشكلة ناتجة عن مطور تارك للعمل

- Clarify what is the effect of not circulating information among team members which leads to knowledge loss on maintenance

بالعادة نحاول ان لا يؤثر ذلك على الصيانة لدى الزبون لانا نتدارك الموضوع بعامل الوقت **{8 try to not affect the customer}**

من المشاكل التي تحدث بالصيانة:

- مثل انه كان مطلوب امور لم يقم بعملها {9 Un handled issue by old developer}
- توصيل الصوره للمطور الجديد او الذي استلم الشغل بصورة خاطئة {10 wrong handover}

اذا كان له علاقة بالزبائن وترك الذي بعده يجد مشكله بالمتابعة مع الزبائن: {11 New developer hard to communicate with customer}

-لان الذي ترك كان متابع مع الزبون فكثير من المور لا يعلمها غيره بتفاصيلها كبزنس{12 new developer-unknown details}
- الزبون طلب حل لمشكلتين وهو قام بانجاز واحده{13 old developer – not completed word}
- المطور الجديد يجب ان يحل مشكل البزنس التي كانت مع المطور الذي ترك
- فهم الكود{14 understand the code}
- فهم الزنس (لماذا حلله او كتبه بهذه الطريقة){15 understand the business}
-عمل اجتماعات كثيره مع الزبون لفهم ماذا كان يريد {16 More meetings with customer}
-لماذا هذه المشاكل تظهر الان وليس سابقا{17 Why problems appeared now}
-هل كان الموظف الذي تارك يحل المشاكل حاله حاله وقام بحل حاله واحد وتبقت حالة ثانية ام ان المشكلة جديده كليا {18 Is it new problem}
-هل هذه مشاكل سابقة وتم تركها بدون حل لانها لم تكن تؤثر

- **Q7 What is the acceptable number of problems per year or when a change of developer is considered a risk to the project in terms of maintenance and customer satisfaction?**

يعتمد على طبيعة وحجم المشكلة {1 Risk depends on size of problem}وليس عددها يعني هل المشكلة عملت كارثة وايضا من شكوى الزبون{2 Risk depends on customer complaint}

هل وجود موظف جديد يزيد في تعقيد الصيانة؟

- مجرد خروج موظف و ظهور مشكله في شغله يعتبر تعقيد لانه لا يوجد احد يحل هذه المشكلة

-مشكلة مراجعه شغله بعد خروجه بسبب ان كل واحد له طريقته الخاصة بكتابة الكود او التحليل ولذلك يكون هناك تعقيد و تشعب كثير عندما يريد مطور آخر استلام شغله و التعديل عليه بسبب صيانه او اضافة جديدة

{3 Turnover considered a complex maintenance}

Customer Satisfaction

- **Q8 How could you describe the customer satisfaction with the maintenance considering the existence of developer turnover?**

يشعر الزبون بخلل بسبب ترك الموظف ويصبح عند تسؤولات (سواءا ايجابيه او سلبيه عن الموظف الذي ترك)
-من الذي سيقوم بمتابعة الصيانة {1 Who will follow up maintenance}
-ها هذا الموظف ترك وراءه مشاكل كثيره{2 Did old developer solved all current problems}
-هل سيعطي الجديد نفس النتيجة التي كان يعطيها السابق{3 Did the new one will act like the old one}
-سرعة الاستجابة و هل الجديد سيكون متفرغ مثل القديم{4 Will the new be as full-time as the old }
-هل سيرد على الايميلات خلال ساعة و يحل المشكلة او سننتظر لتاتي يوم {5 Will he respond to emails directly and fix the problem, or will we wait}
-الزبون تعود على المبرمج و على شخصيته (وتصبح علاقة ألفه) هل سوف اتكلم مع الجديد بنفس الاريحيه كما كانة العلاقة مع القديم الذي اشتغلت معه لمدة سنتان{6 Familiarity Relationship}
فممكن ان الزبون بسبب مشكله واحدة معينه يطلب عدم التعامل مع الموظف الجديد ويطلب بصراحة انه لا يريده بالفريق او لا يريد علاقه معه) وليس لامر شخصي ولكن لانه لم يستطيع ان يفهم الشغل و اصبح عنده مشاكل {7 Not to deal with the new employee – Business problem}

مثل طلب من الموظف الجديد عمل بالك اب ولكن بعد ان يشرح له رئيس الفريق كيف يعمله ولكن الموظف الجديد لم ينتظر و بدأ بالعمل و عمل مشكله بحذف الداتا وهنا الزبون اعترض على دخول شخص جديد للفريق.

Developer Behavior

- **Q9 Where you find yourself on the team, can you explain how you interact with the nature of your work and position or roles**

work as Team Leader and developer

Team lead, Analysis and development
كل المهام التي تعطى لها تحبها و تجد نفسها في كل المواقع ومتأقلمة مع مهامها
الشغل مقسم الى جزئيات و كل عضو يشتغل على جزء و هي تشرف عليهم جميعا
تعمل تحليل وتقسم الشغل على المطورين
هي الشخص الذي له صله بالزبون لانها تعرف كل اجزاء الشغل
باقي المطورين يحضروا كل الاجتماعات و النقاشات مع الزبون

{1 Likes current job}
{2 Acclimatized to all tasks}

Developer

Project Type: Include Developer Turnover

About the project

- **Q0 Could you give an idea about the project and its development?**

يخص المؤسسات المالية وسلطة النقد
Project Versions: V1 2016, V2 2017, V3 2019
كل فترة يتم اصدار نسخة و انظمة تابعة له
Team Members: Mainly 3 developers including the team leader
Developer turnover:
ينضم مطورين و يتركوا الفريق خلال فترات معينه بناءا على ضغط الشغل

Developer Turnover

- **Q1: Can you explain your role and your work in the team and whether you have involved from scratch and/or you have involved in the change request and maintenance on the existing modules or one of the other team members modified your work?**

Developer،
QA،
Take information from the customer and the team leader

- **Q2 What difficulties did you encounter when you joined the project (in case you were not in the project from the beginning)?**
- **Q3 How would you describe the impact of joining an existing project or leaving a project on the required modifications and maintenance?**

Don't know the business, {1 Unknown Business}
don't know the basics of the required work {2 Unknow tasks}

الموديلز الجديدة لم اوجه فيها مشكلة{14 No problem in new models}
الشغل القديم واجهت مشكلة اني اريد ارجع بكل صغيرة و كبيرة للتيم ليدر {10 Team Leader & Senior Developer Involvement}
واجهة مشكلة بالتكنولوجي المستخدمة و التعلم عليها{3 Unknown Technology}

و في مشروع معين بعد شهر من الشغل لم استطيع الاكمال او عمل صيانه و طلبت اخراجي من المشروع {4 Developer Left the project}

لصعوبة فهم المشروع و معلوماته المبني عليها و ايضا لصعوبة التعديل على الكود{4 Code update} المكتوب سابقا لانه غير مفهوم ولا يوجد دوكيومنت واضحة.

يحدث نقاشات كثيرة حول المشكلة و طبيعتها هل هي مشكلة قديمة و تم البناء على بيانات خاطئة او مشكلة بالكود و يتم عمل نقاشات ليتم التوصل لكيف سيتم حلها{7 Is it a new problem }{5 More meetings with customer}

Customer Satisfaction

- **Q4: How could you describe the customer satisfaction with the maintenance in general?**

بالعادة الزبون لا يكون مرتاح للمشاكل {1 customer is dissatisfied}

- **Q5: How did the customer react in the first time you joined the project (in case the project already started before you joined it) and in the first problem you encounter?**

في حال تم حل المشكلة على اكمل وجه , يعبر الزبزن عن رضاه{2 Customer Satisfied – Problem Solved}
وفي حال لم يكن راضي, يحاول ان يحمل عدم حل المشكلة بسبب قلت معرفتي بالعمل{3 Customer Dissatisfied – less knowledge} او اني جديدة على العمل و انه لايستطيع التعامل معي و في بعض الاحيان يرفض التعامل او يكون سلبي. {4 Not to deal with the new employee – Business problem}

Developer Behavior

- **Q6 Where you find yourself on the team, can you explain how you interact with the nature of your work and position or roles.**

تجد نفسها بالQA و البرمجة
ولكن اقرب للبرمجة و هذا هو موقعها الحالي{Likes current job}

Team Leader &Developer

Project Type: Include Developer Turnover

About the project

- **Q1: Could you give an idea about the project and its development?**

Accounting Online system
يوجد منه نسخ
متوسط الحجم

Developer Turnover

- **Q2 From your point of view what is developer turnover**

-المشروع الذي يبدأ وينتهي بنفس الفريق لايوجد فيه تبديل مطور
-اذا تم تبديل المطور (سواءا بترك الشغل او الانتقال لمشروع ثاني) {1 Type of Turnover } هو يعتمد على مستواه في المشروع وكل ما زاد المستوى زادة المشكلة{8 Level of Turnover}:

1- **اذا كان غير عالي المستوى و مسيطر عليه من قبل التيم ليدر او مدير المشروع او اي شخص اعلى منه وعلى علم بالبزرنس و الكود وكل الامور التي انجزها المطور والتي لم ينجزها**
تحدث مشكلة لفترة بسيطه حتى يتم احضار بديل له ويتم تدريبة ويبدأ العمل تدريجيا مع القريق وتنتهي المشكلة وهذا لا يحدث اثر على النظام او مشكلة مع الزبون
2- **اذا ترك عضو القريق المسؤول عن البزنس او المطور الرئيسي يحدث مشكلة حقيقية**

سبب الترك:
1- سبب مادي وحصوله على عرض مغري من شركات اوت سورس {2 Salary Issue}{11 Palestine Territory}{5 Outsource companies}
2-عدم الاتفاق مع التيم او الادارة {4 Work roles & responsibilities}
3-البعض ممكن ان يتصعب من الشغل نفسه{4 Work roles & responsibilities}
4- السفر خارج البلاد لايعتبر مشكلة لترك المبرمج حاليا{11 Palestine Territory} {6 Job opportunities outside the country}

- **Q3 What its effect on the project maintenance.**

تو الاثر على الصيانة:Q3

-اذا طلع اي عضو رئيسي بزنس او مطور يحدث كثير مشاكل لانه الاثنين يكونوا معتادين على التواصل ما بين بعض {6 Main team member left}
-ضياع البزنس{7Business loss} بطلعت اي واحد منهم حتى لو كان في دوكيومنت لانه يوجد فرق بين قرآة الدوكيومنت و الجلوس مع عضو البونس او المطور وجها لوجه بحيث يكون عنده تصور لكل شيء عن المشروع وتعديلاته وصيانته {8Document is not enough}
-مشكلة طلوع المطور نفسه الجديد يحتاج الى شرح لكل شيء عن البرنامج قبل البدء بالصيانة بدأ بالتكنولوجي {2 Problem of learning New Technology }و البزنس و تداخلات البرنامج فرضا اذا طلب منه صيانة لا يعرف اين يؤثر وماذا يجب ان يعدل {9Knowledge loss} فممكن ان يصلح في منطقة و يخرب في منطقة أخرى وهذا يحدث كثيرل في البرامج الكبيره {10 New problems due to new developer }.

Team Leader & Developer

Project Type: Does not include Developer Turnover

About the project

EPOS for jawwal

Developer Turnover

Q1 How you descript a maintenance in a system that you worked in alone without developer turnover

هل الصيانة ثابته؟

اول فترة من المشروع يوجد صيانة بسبب ان النظام جديد وهنا نعطي فترة تجريبية فرضا لمدة 6-12 شهر
بعد هذه المدة ممكن ان نقيم طبيعة الصيانة

توضيح هل يوجد سيطرة على الصيانة في حال عدم وجود تبديل مطور ؟

نعم يوجد سيطرة كبيرة{9 Controlled Maintenance} , يعني ممكن خلال 3 اشهر لاتظهر اي مشكلة صيانة {1 Less Maintenance}

ولكن اذا تمت كتابة الكود بدون دوكيومنتيشن {4 No Code Document}وبعد فترة طويلة رجع نفس المطور ليعدل على الكود تكون مثل مشكلة دخول مطور جديد على الكود (حيث يكون المبرمج قد نسي كليا كيف كتب الكود) {8 Extra time to remember old code}

Customer Satisfaction

الزبون راضي بشكل عام {3 Customer Satisfied}بسبب المتابعة و العلاقة الشخصية لفترة طويلة تمتد على مدى سنوات{4 Familiarity Relationship}
بعض المشاكل تظهر ولكن لاعلاقة لها بالمبرمج

Developer Behavior

Where you find yourself on the team, can you explain how you interact with the nature of your work and position or roles.

- يحب عمله الحالي و لكنه يجد نفسه بحل مشكل البزنس و جمع المعلومات وتحليلها

{3 Finds himself in other positions}

{1 Likes current job}

Second Software Company

Developer

Project Type: Include Developer Turnover

About the project

- **Q0: Could you give an idea about the project and its development?**

Web Application
Maintenance, change requests
He Started working from maintenance phase
With Versions

For more than one customer
Team Members: Mainly 3-4 team members

Developer Turnover

- **Q1: Can you explain your role and your work in the team and whether you have involved from scratch and/or you have involved in the change request and maintenance on the existing modules or one of the other team members modified your work?**

Developer, not involved from scratch

- **Q2 What difficulties did you encounter when you joined the project (in case you were not in the project from the beginning)?**
- **Q3 How would you describe the impact of joining an existing project or leaving a project on the required modifications and maintenance?**

ما هي الصعوبات التي واجهتها عند بدء الشغل؟

-اول مشكلة فهم البزنس{1 Unknown Business}, لانه عند طلب تعديل يجب فهم البزنس لكي يعرف كيف يعدل و التأثير على اماكن اخرى بالبرنامج مثل تقارير معينه

كيف تعالج الموضوع؟

-احاول ان افهم البزنس من الاونر للنظام.. ويشرح له اين يؤثر التعديل, شفهي وليس موثق فيقوم المبرمج بالتوثيق لنفسه

-ايضا ليس كل مبرمج يكتب الكود بنفس الطريقة{4 Code update}, فيضر لتغيير طريقة كتابه للكود بما يتناسب مع ما كتبه السابق
-المبرمج السابق ترك الشركة, لذلك لو انه موجود يكون اسهل و لكن بسبب عدم وجوده يأخذ وقت طويل لمتابعت الكود من اوله لآخره لكي يعرف كيف يفكر المبرمج السابق{1 Extra Time to review code}
- وجود مبرمج جديد قد يخرب جزئية اخرى من البرنامج عند التعديل و هذا لا يستوعبه الزبون خصوصا اذا كان برنامج حساس مثل البرنامج المالي{2 New problems due to new developer}
- الوقت عامل مهم لان التعديل يأخذ وقت طويل في الفتره الاولى فيعتقد الزبون ان المبرمج لا يتجاوب معه {3 Extra Time to solve the problem}
-عدم وجود توثيق على مستوى الكود لكي اتبع الشغل السابق{5 No Code Documentation}

لماذا لايوجد توثيق؟

بشكل عام نض ملاحظات ولكن توثيق رسمي لا نعمله لانه يأخذ وقت{6 Documentation need time}

تعويض المعلومة ؟

-اوقات كثير نرجع من الصفر{7 knowledge loss – back from scratch}

-المعلومة التي ضاعة لانستطيع ارجاعها {8 knowledge loss – cannot be compensate}

تعقيد الصيانة؟

يوجد مبرمجين طبيعة كودهم معقدة ولا يعمل توثيق{9 Maintenance Complexity – Complex code}

مرات التغيير يكون ايجابي؟

-هذا يكتسبه بعد التجربة، ولكن البداية دائما عنده متكله{10 Positive to change the developer}

ما هي الاسباب التي تجعل الموظف يترك؟

- ضغط العمل{11 Work roles & responsibilities}

-فرصة احسن، حتى وان كانت فرقية الراتب ليست مبيرة ولكن المبرمج ممكن يرى فيها فرصة احسن{17 New Opportunity}

-السفر خارج البلد(رأيه ان السفر موجود بسبب الاوضاع البلد)، حيث ان البرمج السفر يلبي طموحه، وانا افضل السفر اكثر من العمل مع شركات ال out source{19 Not Outsource companies} { 12 Palestine Territory}

{12 Palestine Territory}

{13 Job opportunities outside the country}

Customer Satisfaction

- **Q4: How could you describe the customer satisfaction with the maintenance in general?**
  {1 customer is dissatisfied}
- **Q5 How did the customer react in the first time you joined the project (in case the project already started before you joined it) and in the first problem you encounter?**

ما هي ردت فعل الزبون عند معرفته ان هناك مبرمج ترك وجاء مبرمج جديد؟

-حسب علاقة الزبون بالشركة، اذا كانت قوية ممكن الزبزن يتغاضى عن التأخير {5 Relation with customer - overlooks the delay }

ما هي ردت فعله اذا الشخص المتصل معه ترك

الزبون يكون غير مرتاح وعدم الشعور بالاستقرار{6 Familiarity Relationship}

-عمليه الاستبدال ترجع مع الزبون الى نقطة الصفر وهذا لا يستوعبه، يقول انه جلس مع القديم ساعات طويله و فهمه الشغل و الان هذا كله سوف يختفي و نعيد من الصفر{3 Customer Dissatisfied – less knowledge}

-ويصبح عنده تسأل انه يعلمه مره اخرى و ترك ايضا، يكون عنده دائما خوف من عملية التبديل {7 Customer Dissatisfied – Frequent developer change}

فيعتقد الزبون ان المبرمج لا يتجاوب معه{8 Customer Dissatisfied-developer does not respond to it}

وجود مبرمج جديد قد يخرب جزئية اخرى من البرنامج عند التعديل و هذا لا يستوعبه الزبون {12 Customer Dissatisfied-New problems due to new developer}

-الزبوم ممكن ان يترك النظام{ 9 The customer abandons the project}

Developer Turnover

- **Q6 Where you find yourself on the team, can you explain how you interact with the nature of your work and position or roles.**

تشخيصك اين تجدها؟

-اذا تتيح لي الفرصة يحب استلم رئيس فريق{ 3 Finds himself in other positions}

-مرتاح بشغله الحالي و غير مؤثر عليه{ 1 Likes current job}

Developer Questions

Project Type: Include Developer Turnover + Contact person

About the project

- **Q0: Could you give an idea about the project and its development?**

Web Application
Maintenance, change requests
Started working from maintenance phase
With Versions

For one customer
Team Members: Mainly 2 team members

Developer Turnover

- **Q1: Can you explain your role and your work in the team and whether you have involved from scratch and/or you have involved in the change request and maintenance on the existing modules or one of the other team members modified your work?**

Developer, not involved from scratch

- **Q2 What difficulties did you encounter when you joined the project (in case you were not in the project from the beginning)?**

ما هي الصعوبات التي واجهتها عند الدخول على النظام واستلام الصيانةQ2-Q3

-الصعوبة بالتعديل على كود مبرمج آخر{4 Code update}
-كيف السابق كتب الكود وبماذا كان يفكر{4 Code update}
-ممكن فكرتك لحل الكود تختلف عن طريقة زميل سابق{4 Code update}
-التقنية, عندي الاساسيات ولكن عند البدء نحتاج في العمل شيء اكثر تعقيد فاواجه صعوبة في التعلم على التقنية ومتابعة تطورها {3 Unknown Technology}
-فهم البزنس في الفترة الاولى{1 Unknown Business}
-فهم البزنس من الزبون, نرجع للزبون {1 Unknown Business}
-يوجد توثيق للبزنس سواءا من الشركة او الزبون{15 Business Document}
-لا يوجد توثيق للكود{5 No Code Documentation}
-يوجد قواعد بسيطه نتبعها لكتابت الكود تساعد قليلا{16 Code standardization Helps}

- **Q3 How would you describe the impact of joining an existing project or leaving a project on the required modifications and maintenance?**

اين أثر دخولك على البرنامج كمبرمج جديد وتعديلك على الكود نتيجة انك لاتعرفي الكود؟
-ضياع الوقت وتأخير اعطاء الصيانة{3 Extra Time to solve the problem}
-نبلي ما يريده الزبون ولكن ليس بكفاءة الذي كان قبل, عدم حل المشكلة بالطريقة التي تناسب الزبون {8 Problem Solving Quality}
-ممكن ان يكون عندي افكار افضل ولكن بسبب عدم المعرفة لا استطيع حل بشل احسن{8 Problem Solving Quality}

Product manager

Project Type: Include Developer Turnover

About the project

- **Q0: Could you give an idea about the project and its development?**

Web Application (HR system)الهيئة المستقلة لحقوق الانسان
Maintenance, change requests
With Versions

For more than one customer
Team Members: Mainly 3-4 team members

Developer Turnover

- **Q1: Can you explain your role and your work in the team and whether you have involved from scratch and/or you have involved in the change request and maintenance on the existing modules or one of the other team members modified your work?**

Contact Person with Customer & Product manager, doing testing and QA also follow issues with customers

- **Q2 What difficulties did you encounter when you joined the project (in case you were not in the project from the beginning)?**

ما هي الصعوبات التي واجهتها عند بدء الشغلQ2

-اولها كان في صعوبة كتير و اسأل كتير عن البزنس{1 Unknown Business}
-لم تواجه مشكله في عدم وجود شخص تسأله عن البزنس{15 Business Document}
-عدم معرفة كيف تحل المشكلة مباشرة والنظام شغال {1 Unknown Business}live

- **Q3 How would you describe the impact of joining an existing project or leaving a project on the required modifications and maintenance?**

- سمعة الشركة:

حاولت احل المشكلة مبدئيا بعدين لجأت لشخص آخر {10 Team Leader & Senior Developer Involvement}
التصرف و حل المشكلة بسرعة حتى وان كان الزبون يعرف ان المشكلة ليست من عندنا او من نظامنا {3 Extra Time to solve the problem}

-ممكن اسيطر على المشكلة خلال الفحص ولكن بسبب اني لم اكن في النظام من الاول لم افحص جيدا وليس عندي معرفة بمشاكل النظام من الاول
-عندما اعطي المبرمج الجديد مشكلة لحلها يجد صعوبة في التعامل مع مشكلة لم يبرمج كودها{4 Code update}
-تأثير الوقت{3 Extra Time to solve the problem}

حل المشكلة:

- محاولة استيعاب الزبون وتمتص غضبه.
-احاول ان لا اعترف بوجود مشكله (ولكن ليس دائما لان بعض الزبائن يعرفوا بالنظام جيدا)
محاولت تدارك عن طرق زيادة ساعات العمل{3 Extra Time to solve the problem}

Customer Satisfaction

- **Q4: How could you describe the customer satisfaction with the maintenance in general?**

-بكل الاحوال الزبون يتأثر{1 customer is dissatisfied}

- **Q5 How did the customer react in the first time you joined the project (in case the project already started before you joined it) and in the first problem you encounter?**

الاثر على الزبون؟
-الزبون متعود على التعامل مع شخص ومرتاح للتعامل فيتأثر ولكن ايضا حسب شطارة الموظف{6 Familiarity Relationship}
-يسأل الزبون عن الشخص الذي تركك{10 Customer ask about the left developer}
-لم يفرق معه قديم او جديد
-لم يكن الاثر شديد على الزبون{11 Not a big effect on the customer}

Developer Turnover

- **Q6 Where you find yourself on the team, can you explain how you interact with the nature of your work and position or roles.**

شخصيتك اين تجدها؟

تحب ال Business & contact
تحب موقها الحالي

{1 Likes current job}

Developer Questions

Project Type: Doesn't Include Developer Turnover

About the project

Web Application
Maintenance, change requests

With Versions

Team Members: Mainly 2 team members

Developer Turnover

Q1 How you descript a maintenance in a system that you worked in alone without developer turnover

نفسيا اريح للمبرمج وخصوصا في الصيانة{11 More comfort to the developer}
فرق جوهري في الوقت{10 Less Maintenance time}

Maintenance Complexity

مشكلة الرجوع لكود قديم{2 Customer dissatisfied – delay in maintenance -old code}
السيطره على الكود من شخص واحد لا يعمل تعقيد{1 No Complexity in the Normal situation}{12 Controlled Code}

Customer Satisfaction

لايستوعب الموظف الجديد و من اول غلطه لا يستحمل ولكن في حال المشروع الآخر صار في علاقة مع الموظف {4 Familiarity Relationship}
و الزبون مرتاح{3 Customer Satisfied}

تغير المبرمج يؤثر نفسيا على الزبون ولكن بالأخير يجب ان نحل مشكلته

Developer Behavior

شخصيتك اين تجدها؟

-اذا تتيح لي الفرصة بحب استلم رئيس فريق{3 Finds himself in other positions}
-مرتاح بشغله الحالي و غير مؤثر عليه{1 Likes current job}

Third Software Company

Team Leader &Developer

Project Type: Include Developer Turnover

About the project

- **Q1: Could you give an idea about the project and its development?**

Mobile Application
Maintenance, change requests
Started working from maintenance phase
With Versions
Team Members: Mainly 5-6 team members

Developer Turnover

- **Q2 From your point of view what is developer turnover**

لو كان في فولو اب من التيم ليدر او اي شخص مسؤول عن البرودكت بطريقة سلسه ومتبع شو بصير المفروض انه ما يكون في تأثير للتيرن اوفر.. يعني اذا كانت السوفتوير لايف سايكل مطبقه صح {1 Type of Turnover}

ما هي الاسباب التي تجعل المبرمج يترك

- lack of engagement {4 Work roles & responsibilities}
-سبب مالي{2 Salary Issue}
-تجربت تكنولوجي جديدة{4 Work roles & responsibilities}
-Outsource companies {11 Palestine Territory}{5 Outsource companies}
-السفر ليس رئيسي{6 Job opportunities outside the country}{11 Palestine Territory}

A policy to encourage developers to stay in the team
-معالجت اهتمامات المبرمج مثل اعطائم مرونة بمكان العمل{9 Job Environment}
-عمل نشاطات خارجة عن العمل{10 Off work Activities}

- **Q3 What its effect on the project maintenance.**

delivery time تأخير وقت التسليم
{4Extra Time}
{2Problem of learning New Technology}التأكد من ان المبرمج الجديد يعرف التكنولوجي جيد
-يتصعب المبرمج في اول فترة في حل المشاكل{1No easy}
-يأخذ منه وقت اطول في متابعة المشكله
لم نواجه مشكلة بضياع معلومة واضررنا لكتابة الكود من الصفر{9Knowledge loss}

- **Q4) Is there an increase in number of complaints and the time to fix the problem due to developer turnover and from your point of view why this increase happened?**

{1 Increase in number of complaints} نعم يزيد عدد المشاكل, ولكن اذا كان هناك فحص جيد المفروض ان لا تزيد المشاكل

- **Q5) Is there an impact on bug tracking after the developer has changed?**

يزيد من صعوبة متابعة المشاكل خصوصا اذا لم يوجد revenging system , في حال وجوده تصبح المتابعة اسهل وتخفف
{ 4Tracking: more difficult to track problems }

Developer

Project Type: Doesn't Include Developer Turnover

About the project

Web Applications

Developer Turnover

مقارنه مع مشاريع لم يتم تبديل مبرمجين عليها

يوجد عندهم مشاريع من 10 سنوات ولم يتم تبديل مبرمج و لايوجد عليها مشاكل{1 Less Maintenance}
يوجد مشكلة الرجوع لكود قديم كتبه نفس المبرمج وعند وجود مشكلة لا يتذكر كيف كتب الكود او لماذا كتبه بهذه الطريقة {8 Extra time to remember old code}

Customer Satisfaction

لايوجد شكاوي من الزبائن الا ما ندر وليس لها علاقة بالمبرمج{3 Customer Satisfied}

Developer Behavior

Where you find yourself on the team, can you explain how you interact with the nature of your work and position or roles

Fourth Software Company

Team Leader

Project Type: Include Developer Turnover

About the project

- **(Q1): Could you give an idea about the project and its development?**

Project Versions:
كل فترة يتم اصدار نسخة و انظمة تابعة له
Team Members: Mainly 3 developers including the team leader
Developer turnover:
ينضم مطورين و يتركوا الفريق خلال فترات معينه بناءا على ضغط الشغل

Developer Turnover

- **(Q2) From your point of view what is developer turnover**

مبرمج يشتغل على مشروع وانتهى شغله ويسلم شخص آخر, التسليم هل هو ضمن خطه, هل التسليم كان كامل , هل في امور ضلت مش واضحة وسوف نصطدم بها في الصيانة {1 Type of Turnover }

لماذا يترك الفريق
-ليس مرتاح بالشغل{4 Work roles & responsibilities}
--عنده عرض افضل براتب احسن {2 Salary Issue} و طبيعة شغل افضل وميزات اكثر{4 Work roles & responsibilities}
-شركات الout source منافسه{5 Outsource companies}{11 Palestine Territory}
-الout source اقوى من السفر, السفر محدود{6 Job opportunities outside the country}

- A policy to encourage developers to stay in the team

- **(Q3) What its effect on the project maintenance.**

-المتابعة مع الزبون{14Communication with Customer}
-يأخذ وقت اكثر لمعرفو ما يريده الزبون و بيئة العمل وطريقة العمل{4Extra Time}
-خبرة بالنظام ليست كفاية او الامور التي استلمها لانه ليس كل شيء ممكن ان يتم استلامة وكتابته وكيف يم حل مشاكله لان هذه الامور فيها معرفة لايمكن تسليمها وانما تأتي مع الخبره وسرعة البديهة{9Knowledge loss}
-يأخذ وقت اطول لفهم المشكلة{4Extra Time}
- يعدل بمكان ويؤثر على مكان آخر{10New problems due to new developer}

- **(Q4) Is there an increase in number of complaints and the time to fix the problem due to developer turnover and from your point of view why this increase happened?**

- المشكلة لا تكون بزيادة عدد المشاكل ولكن ممكن ان يكون حل المشكلة بشكل جزئي , فتأتي شكوة اخرى ويتم الرجوع للمشكلة مرة اخرى -

{1 Increase in number of complaints}
{2New problems due to new developer}

- **(Q5) Is there an impact on bug tracking after the developer has changed?**

-ممكن يصير في مشكلة بالمتابعة و يشتكي الزبون للادارة
{4 Tracking: more difficult to track problems}

- **(Q6) What did you do to handle the effects (how turnover was handled in the team)?**

- نحن شركة وليس مبرمج واحد, يعني انه يوجد اكثر من شخص يستطيعوا متابعت المشكلة و حلها و مساعدة المبرمج الجديد لتدارك اي مشاكل {2Team Leader & Senior Developer Involvement }{19Circulate information among its members }
- يوجد توثيق على مستوى البزنس وليس الكود ويتم الاعتماد على التسليم من المبرمج القديم {1Handover from leaver to new comer} {5Business Documented}
- المبرمج يكون حذر اكثر عندما يعدل على كود لم يكتبه
- استخدام عامل الوقت لحل المشكلة{ 6 Extra Time to handle the maintenance }

- **Q7 What is the acceptable number of problems per year or when a change of developer is considered a risk to the project in terms of maintenance and customer satisfaction?**

حسب حجم المشكلة وليس عدد المشاكل**{1 Risk depends on size of problem}**

هل وجود موظف جديد يزيد في تعقيد الصيانة؟

- لم يحدث ان اصبح هناك تعقيد لكثره التبديل ولكن ممكن تزيد المشاكل بحيث يعدل بمكان ويؤثر على مكان آخر

{3 Turnover considered a complex maintenance}

Customer Satisfaction

- **Q8 How could you describe the customer satisfaction with the maintenance considering the existence of developer turnover?**

الزبون يحب يتعامل مع شخص واحد ودائما يسأل عنه
{6 Familiarity Relationship}

الزبون يحتاج ان يتقبل المبرمج
ممكن يشتكي الزبون للادارة لعدم رضاه عن حل المشكلة
{9 customer complains because of abandoned a reliable developer }

ممكن توصل لمرحلة ان الزبون يرفض النظام
{11 The customer abandons the project }

Developer Behavior

- **Q9: Where you find yourself on the team, can you explain how you interact with the nature of your work and position or roles**

اقرب للتعامل مع الناس من البرمجة
الشغل الذي اقوم به الان موافق لشخصيتي

{1 Likes current job}

2) Customer - Interviews and Codes

First Customer

Q1: Could you explain to me how the maintenance and modifications to the project are done and how satisfied you are?

كيف وضع الصيانة وهل انت راضي عنه؟

نحن راضين {1 Satisfied Generally}ولكن لا يتم حل مشاكلنا مباشره { 2 Dissatisfied - Delay in Maintenance}

من الاسباب عدم وجود نظام متابعة معهم الا عن طريق الايميل فتصبح مبنية على العلاقات الشخصية وبناءا عليه لانعرف متابعة المشكلة ولماذا ظهرت مرتين{3 Dissatisfied - No Tracking system}

المبرمجين غير منظمين, كل واحد مسؤول عن جزء ولا يوجد غيره يتبع او يفحص وراءه او يعرف {4 Dissatisfied - No QA or review}{5 Dissatisfied - No developer backup}

Q2: Can you give me a good idea of the points that make you satisfied or dissatisfied with the services and maintenance provided by the team members?

وجود SLA يجعلني راضي{1 Satisfied - SLA}

التعاطي مع شكاويدا بجديه اذا لم يقم المبرمج بحل المشكلة{ 2 Satisfied - Consider complaints seriously}

Q3: Do you prefer to deal with a team member involved in the project from the beginning or a newcomer and why, and how satisfied with dealing with them?

الجديد يكون افضل اذا كان مبرمج جيد {1 New developer - better}, لان القديم صحيح انه يحل المشكلة اسرع ولكن بسبب انه يعرف بالنظام جيدا وكان متواجد فيه من البداية فنشعر انه يقوم بعمل التفاف على المشاكل بدون حلها جذريا وتعود المشكلة عده مرات وبصراحة نشعر انه يستغفلنا {2 Old developer - uncooperative}

المبرمج الجديد لن يصل لهذه المرحلة و سوف يأخذ مشاكلي على محمل الجدية {3 New developer - take problems seriously }ويكون في نتائج مرضيه بغض النظر عن التأخير{4 New developer – Satisfied results regardless of the delay } والSLA تحميني من التأخير وتكاليفه

Q4: Did you notice in this project a change in the way maintenance is provided and the time provided for maintenance?

هل واجهت مشكلة متعلقة بتغير المبرمج؟

نعم واجهناها تبديل مفاجئ للمبرمج {1 A Sudden change to the developer }ولكن عندهم ticketing system وعن طريقة نتم الاتصال{2 Ticketing system help}

وعند تغير المبرمج نشعر ان هذا الشخص يتعلم {3 We feel new developer is learning}ونحن نعلمه ايضا بعض الامور {4 We teach the new developer}رغم انه وراءه فريق عمل يوجهه ويعملو له handover ولكن نحن ايضا نعاني ونعلمه

هذا يؤثر علينا و يصل الامر الى خسائر بالشغل{ 5 Losses at work} ,

الى حد انتم تستوعبوا هذا التغيير بالمبرمجين؟

نرفع شوكوى ويضطروا ان يعالجوا الموضوع بشكل اسرع ولكن نظامهم عالمي ومستقر {1 Stable System}ونحن عندنا خبره بالتعامل بالبرنامج { 2 Customer experience}فهذا يعطينا مساحة اوسع للتحمل وايضا عند رفع الشكوى يستجيبوا {3 Consider complaints seriously }

وايضا السعر الذي حصلنا به النظام مناقص وهذا يجعلنا نتحمل هذه المشاكل{4 Competitive Price}

وايضا بسبب حساسة النظام وتعقيده وحجمه, فليس من السهل اطلاقا ان نقوم باستبداله بسبب مشكلة المبرمجين وخصوصا انهم يستجيبوا للشكاوي عند رفعها{5 Huge System cannot be replaced}

بعض البرامج تترك البرنامج من اصله بسبب كثره تبديل المبرمجين وتصبح مشكلة كبيره وبالتالي كثره المشاكل التي لاتتحملها {6 Some system replaced}

Second Customer

Q1: Could you explain to me how the maintenance and modifications to the project are done and how satisfied you are?

هل راضي عن الصيانة؟

بشكل عام راضي, وعند حدوث المشاكل يتجاوب مباشر{1 Satisfied Generally}
بعض الاوقات يكون في مناقشة من اين المشكلة هل هي من المبرمج او الزبون
بعض المرات لايتجاوبوا معنا ولا يردوا علينا لاسباب عديده{2 Dissatisfied - Delay in Maintenance}
ولكن الامور بشكل عام نشعر برضى عنها

Q2: Can you give me a good idea of the points that make you satisfied or dissatisfied with the services and maintenance provided by the team members?

ما يجعل الصيانة مرضية؟

-وجود اكثر من مبرمج بحيث اذا ترك احدهم يسد محله الآخر{ 6 Satisfied - developer backup}
-العلاقات الشخصية{ 7 Familiarity Relationship}

Q3: Do you prefer to deal with a team member involved in the project from the beginning or a newcomer and why, and how satisfied with dealing with them?

حسب مستوى المبرمج اذا كان ذكي و متعاون فممكن الجديد اكثر ذكاءا من القديم{10 New developer - Better cooperation }
ولكن على نفس المستوى افضل القديم{5 Old developer - better} لانه فاهم البزنس, والكود – {11 Old Developer Understand Business}{12 Old Developer – Understand Code}

Q4: Did you notice in this project a change in the way maintenance is provided and the time provided for maintenance?

هل واجهت مشكلة متعلقة بتغير المبرمج؟

الحالة الاولى

أدى تبديل المبرمجين الكثير الى ترك النظام وبناء نظام جديد مع شركة جديده{6 Some system replaced}

الحالة الثانية
شركة البرمجة الجديده

اشتغل على النظام 4 مبرمجين, 2 استقالوا
الاثنين الذين تبقوا استلموا شغل الذين تركوا

-النتيجة تأخير بالشغل بسبب ان الشغل الذين استقالوا غير موثق
- يؤثر عدم المعرفة بشغل المبرمج السابق ان الجديد سيأخذ وقت في الصيانة, لذلك يقوموا بتأخير الصيانة لعلمهم انها ستأخذ وقت طويل منهم وفي نفس عندهم مشاريع أخرى يعملوا عليها{6 Extra Time to solve problems}

بعض المرات يصلح شغلة ويخرب غيرها{12 New problems due to new developer}
يوجد اكثر من مبرمج يعملوا صيانة{9 Positive - Developer backup}

ولكن بشكل عام التأثير قليل ولا يتعدى ال 10%, بسبب بعض المعايير, ان المبرمج الجديد ذكي و يعرف بالتكنولوجي
وايضا الزبون نفسه فاهم الشغل تقنيا بسبب تجربته مع شركة برمجة سابقة { 2 Customer experience}
ولكن تبقى مشكله التوثيق من الطرفين الزبون وشركة البرمجة غير موجود

Third Customer

Q1: Could you explain to me how the maintenance and modifications to the project are done and how satisfied you are?

No Answer!

Q2: Can you give me a good idea of the points that make you satisfied or dissatisfied with the services and maintenance provided by the team members?

-الامور التي تجعلنا راضيين

تواصل اكثر{3 Satisfied - Better Communication} ومساحة نقاش اكثر وتفهم لطلباتنا {4 Satisfied - Understand Requirements}

-الامور التي لم تكت راضيين عنها

ان الامور التي تريد يوم عمل تصبح يومين او اكثر {5 Dissatisfied - Late response}

Q3: Do you prefer to deal with a team member involved in the project from the beginning or a newcomer and why, and how satisfied with dealing with them?

افضل التعامل مع الشخص الذي بدى بالاساس {5 Old developer - better}حتى وان كان الجديد ذو خبره اكبر لان القديم عنده قدره على التعامل مع المشاكل بشكل افضل {6 Old developer – better dealing with problems} بكثير ويوفر وقت لانه عامل الوقت جدا مهم جدا ولا نحتمل التأخير{7 Old developer – save time}

تغيير الشخص صار في تواصل اكثر{8 New developer - Better Communication} ومساحة نقاش اكثر وتفهم لطلباتنا {9 New developer - Understand Requirements}

المبرمج الجديد معني لتنفيذ طلباتنا{3 New developer - take problems seriously }

Q4: Did you notice in this project a change in the way maintenance is provided and the time provided for maintenance?

هل واجهت مشكلة متعلقة بتغير المبرمج؟

-في الاول كان مستصعب لانه الكود ليس هو الذي كتبه

-قرأ الكود وفهمه واستوعبه واخذ فتره منه{6 Extra Time to solve problems}

-بعدين مشي الحال وصرنا نطلب صيانه بسهولة{7 Later on maintenance become better}

-كان يأخذ وقت أكثر من الطبيعي حتى يحلل المشكلة ويعرف السبب
توصل لمرحلة لا تريد تغيرات الا للحالات الضرورية{8 Reduce change just for urgent issues}
بعد فتره اصبح الوضع اسهل

- ان الامور التي تريد يوم عمل تصبح يومين او اكثر وهذا تكلفة عليا اكثر{9 Extra cost}

اضريدنا نشرح له البزنس من اول وجديد بأكثر من مرحله وهذا يفتح امور سابقة لم يكن متطرق لها {4 We teach the new developer}

بعض الامور واجهناها ان بعض الامور لم نتذكر لماذا معموله بالطريقة هذه, هل المفروض ان تكون بهذا الشكل ام هذا بناء خاطئ من المبرمج السابق{ 10 Less quality}

Fourth Customer

Q1: Could you explain to me how the maintenance and modifications to the project are done and how satisfied you are?

كيف وضع الصيانة وهل انت راضي عنه؟

صعب الجواب بعموميات, ولكن بشكل عام بقيمه لحد 80% راضي {1 Satisfied Generally}

Q2: Can you give me a good idea of the points that make you satisfied or dissatisfied with the services and maintenance provided by the team members?

غير راضي:

التعامل بشكل تجاري ومحاولت تحويل كل طلب الى مشروع او تغيير رئيسي ليتم الدفع عليه{ 6 Dissatisfied - cost}

بسبب الخبرة التى املكها بالتكنولجي, اضريت للطلب منهم و مساعدتم في بناء بعض الاجزاء من جديد بسبب ضعف في شغلهم{9 Dissatisfied – low quality}

راضي:

عند الصيانة و بسبب انه نظام كبير يوجد عندهم متابعة{ 8 Satisfied- Ticketing system help}

متابعة المشاكل عن طريق عمل تحديث للنظام { 10 Satisfied - Periodic Upgrade}

وجود علاقة مع المطور { 7 Familiarity Relationship}

Q3: Do you prefer to deal with a team member involved in the project from the beginning or a newcomer and why, and how satisfied with dealing with them?

حسب المطور: يوجد مطور قديم موجود من اول المشروع , كان شغله سيء جدا و وتحملنا وجوده حتى نهاية المشروع و طلبنا عدم التعامل معه نهائيا.**{2 Old developer - uncooperative}**

و يوجد شخص آخر كان ممتاز جدا و كنا نخاف من تبديله لانه سيؤثر كثيرا على سير العمل **{5 Old developer - better}**

وحاله أخرى كان يوجد مطور معطل العمل بطريقة سيئة جدا و استبدلوه بمطور حل جميع المشاكل **{1 New developer - better}**

Q4: Did you notice in this project a change in the way maintenance is provided and the time provided for maintenance?

هل واجهت مشكلة متعلقة بتغير المبرمج؟

تيكنكلي يكون فاشل لا يعرف يشتغل و يؤخر الشغل {6 Extra Time to solve problems}

ينتجح عنه مشاكل جديدة{12 New problems due to new developer}

غير مرتب

نستمر في تذكيره بالمطلوب واهمية تذاكر الصيانة{4 We teach the new developer}

تأخير كبير, المشكلة التي تحتاج يوم تتأخر اسبوع{6 Extra Time to solve problems}

الى حد انتم تستوعبوا هذا التغيير بالمبرمجين؟

لا نفكر بالتغيير حتى اذا كان المطور ضعيف ولكن يسلك الشغل بأقل القليل و نحاول استيعاب الامر{7 Trying to overcome it }

موضوع الdeadline و الالتزامات تجعلنا لا نستطيع اتخاذ قرار برفض المطور, لانه الجديد يحتاج وقت للتسليم و الانخراط بالعمل و ممكن ايضا ان يكون غير جيد {10 Deadlines}

بناءا عليه نصبح نضغط على المطور والشركة حتى تصل الى حد نريد معه اتخاذ قرار وتحمل الRisk اذا لم تحل المشكلة نلجأ الى الشكاوي الكثيرة و العالية و حل المشكلة مع ادارة الشركة {11 Escalations}

لا نستطيع تبديل النظام بسبب اهمية و حجم النظام وصعوبة تبديله {5 Huge System cannot be replaced}

Appendix B Sentences, Codes and Themes

1) Codes and Sentences (Interview extract)

With Developer Turnover				
Position	**Q**	**Interview**	**Interview extract**	**Code**
TL	2	A1	يوجد مطور يترك كليا ويأتي جديد محله ويوجد مطور يدخل و يخرج لانجاز مهم فقط	1 Type of Turnover
	2	A1	مشكلة الراتب خصوصا في فلسطين حيث ان الشركات رواتبها بالعادة متدنية	2 Salary Issue 11 Palestine Territory
	2	A1	مدة الدوام والالتزام بها الموظف لا يريد الالتزام بوقت معين مثلا من 8-5	3 Attendance time
	2	A1	لاتعجبهم طبيعة الشغل و قوانينه او الادارة	4 Work roles and responsibilities
	2	A1	لا يريد المتابعة مع الزبائن	4 Work roles and responsibilities
	2	A1	لا يستوعب المتابعة الدائمة و المسائلة من المسؤول	4 Work roles and responsibilities
	2	A1	يفضلوا الاوت سورس	11 Palestine Territory 5 Outsource companies
	2	A1	كثير من الشباب يأتي ثم يترك ليسافر خارج البلد لفرص افضل	11 Palestine Territory 6 Job opportunities outside the country
	2	A1	بعد فترة من العمل من سنتين واكثر يقل الاداء	4 Work roles and responsibilities
	2	A1	لا يريد ان يتحمل مسؤولية	4 Work roles and responsibilities
	2	A1	زيادة راتبها	7 Increase Salary
	2	A2	اذا تم تبديل المطور (سواءا بترك الشغل او الانتقال لمشروع ثاني)	1 Type of Turnover
	2	A2	يعتمد على مستواه في المشروع وكل ما زاد المستوى زادة المشكلة	8 Level of Turnover
	2	A2	سبب مادي وحصوله على عرض مغري من شركات اوت سورس	2 Salary Issue 11 Palestine Territory 5 Outsource companies
	2	A2	عدم الاتفاق مع التيم او الادارة	4 Work roles and responsibilities
	2	A2	البعض ممكن ان يتصعب من الشغل نفسه	4 Work roles and responsibilities
	2	A2	السفر خارج البلاد لايعتبر مشكلة لترك المبرمج حاليا	11 Palestine Territory 6 Job opportunities outside the country
	2	I	مبرمج يشتغل على مشروع وانتهى شغله ويسلم شخص آخر التسليم هل هو ضمن خطه هل التسليم كان كامل هل في امور ضلت مش واضحة وسوف نصطدم بها في الصيانة	1 Type of Turnover
	2	I	ليس مرتاح بالشغل	4 Work roles and responsibilities
	2	I	عرض افضل براتب احسن	2 Salary Issue
	2	I	طبيعة شغل افضل وميزات اكثر	4 Work roles and responsibilities
	2	I	شركات الout source منافسه	11 Palestine Territory 5 Outsource companies
	2	I	الout source اقوى من السفر السفر محدود	11 Palestine Territory 6 Job opportunities outside the country

	2	H	لو كان في فولو اب من التيم ليدر او اي شخص مسؤول عن البرودكت بطريقة سلسه ومتبع شو بصير المفروض انه ما يكون في تأثير للتيرن اوفر	1 Type of Turnover
	2	H	lack of engagement	4 Work roles and responsibilities
	2	H	سبب مالي	2 Salary Issue
	2	H	تجربت تكنولوجي جديدة	4 Work roles and responsibilities
	2	H	Outsource companies	11 Palestine Territory 5 Outsource companies
	2	H	السفر ليس رئيسي	11 Palestine Territory 6 Job opportunities outside the country
	2	H	معالجت اهتمامات المبرمج مثل اعطائم مرونة بمكان العمل	9 Job Environment
	2	H	عمل نشاطات خارجة عن العمل	10 Off work Activities
	3	A1	ليس بالامر السهل على المطور الجديد	1No easy
	3	A1	يتطلب منه تعلم تكنولوجيا جديدة	2Problem of learning New Technology
	3	A1	يتطلب منه تعلم الطريقة المتبعة بالتطوير و الصيانة يجب ان يلتزم بها	3Problem of learning to Work on Standards
	3	A1	غير ملم بالشغل ولذلك يحتاج وقت اضافي منه ومن الذي يشرح له المطلوب لانجاز الصيانة	4Extra Time
	3	A1	مشكلة مراجعه الشغل بعد ترك المطور للعمل او المشروع بسبب ان كل واحد له طريقته الخاصة بكتابة الكود او التحليل ولذلك يكون هناك تعقيد و تشعب كثير عندما يريد مطور آخر عمل صيانه على نفس الجزئية او التعديل عليها	5Hard to Update Previous Work
	4	A1	يؤثر على الوقت اللازم لحل المشاكل التي تظهر من عمل المطور السابق وبالتالي تراكم المشاكل المراد حلها	1 Increase in number of complaints
	4	A1	يظهر مشاكل جديدة بحاجة الى صيانة بسبب عدم فهم المطور الجديد لما تم بناءه	2New problems due to new developer
	5	A1	فيأخذ وقت وجهد كبير عند متابعة المشكلة و محاولت فهم ما تركه فبض الامور مفهومه كبزنس ولكن ليس الكود لانه يرجع لطبيعو وكيفية كتابة الكود	1 Tracking: Extra time to analyze the problem
	5	A1	عند متابعة المشكلة يوجد تفاصيل كثيرة يعني بالنهاية تحليل المشكلة بوقت طويل او الاتصال بالمطور	2 Tracking: Extra time to understand the code
	6	A1	يتم عمل نقل للشغل من المطور التارك للمطور الثابت	1Handover
	6	A1	رئيس الفريق يحاول دائما ان يشغل بديل لاي مطور في الفريق قدر الاستطاعة	2 Team Leader and Senior Developer Involvement
	6	A1	دائما نطلب من المطور ان يكتب كومنت مفصله لما تم انجازه ولكن ليس الجميع يلتزم بها	3Code Comments
	6	A1	كتابة الكومنت ليس بشكل نظامي	4Not Systematic Documentation
	6	A1	البزنس كله موجود و مكتوب	5Business Documented
	6	A1	الحل النهائي يتمثل بوقت اضافي لتحليل و فهم المشكلة	6 Extra Time to handle the maintenance
	6	A1	الشغل الاخر يتم تأجيله لحل المشكلة الحالية	7 Postpone other tasks
	6	A1	نحاول ان لا يؤثر ذلك على الصيانة لدى الزبون لانا نتدارك الموضوع بعامل الوقت	8 try to not affect the customer
	6	A1	كان مطلوب امور لم يقم بعملها	9 Un handled issue by old developer

	6	A1	توصيل الصوره للمطور الجديد او الذي استلم الشغل بصورة خاطئة	**10 wrong handover**
	6	A1	الذي بعده يجد مشكله بالمتابعة مع الزبائن	**11 New developer hard to communicate with customer**
	6	A1	الذي ترك كان متابع مع الزبون فكثير من المور لا يعلمها غيره بتفاصيلها كبزنس	**12 new developer-unknown details**
	6	A1	الزبون طلب حل لمشكلتين وهو قام بانجاز واحده	**13 old developer – not completed work**
	6	A1	فهم الكود	**14 understand the code**
	6	A1	فهم الزنس	**15 understand the business**
	6	A1	عمل اجتماعات كثيره مع الزبون لفهم ماذا كان يريد	**16 More meetings with customer**
	6	A1	لماذا هذه المشاكل تظهر الان وليس سابقا	**17 Why problems appeared now**
	6	A1	هل كان الموظف الذي ترك قام بحل حاله واحد وتبقت حالة ثانية ام ان المشكلة جديده كليا	**18 Is it new problem**
	7	A1	يعتمد على طبيعة وحجم المشكلة	**1 Risk depends on size of problem**
	7	A1	يعني هل المشكلة عملت كارثة وايضا من شكوى الزبون	**2 Risk depends on customer complaint**
	7	A1	مجرد خروج موظف و ظهور مشكله في شغله يعتبر تعقيد لانه لا يوجد احد يحل هذه المشكلة	**3 Turnover considered a complex maintenance**
	3	A2	اذا طلع اي عضو رئيسي بزنس او مطور يحدث كثير مشاكل لانه الاثنين يكونوا معتادين على التواصل ما بين بعض	**6 Main team member left**
	3	A2	ضياع البزنس بطلعت اي واحد منهم حتى لو كان في دوكيومنت لانه يوجد فرق بين قرآة الدوكيومنت و الجلوس مع عضو البونس او المطور وجها لوجه	**7Business loss**
	3	A2	حتى لو كان في دوكيومنت لانه يوجد فرق بين قرآة الدوكيومنت و الجلوس مع عضو البونس او المطور وجها لوجه بحيث يكون عنده تصور لكل شيء عن المشروع وتعديلاته وصيانته	**8Document is not enough**
	3	A2	مشكلة طلوع المطور نفسه الجديد يحتاج الى شرح لكل شيء عن البرنامج قبل البدء بالصيانة بدأ بالتكنولوجي	**2 Problem of learning New Technology**
	3	A2	فرضا اذا طلب منه صيانة لا يعرف اين يؤثر وماذا يجب ان يعدل	**9Knowledge loss**
	3	A2	فممكن ان يصلح في منطقة و يخرب في منطقة أخرى وهذا يحدث كثيرل في البرامج الكبيره	**10 New problems due to new developer**
	3	A2	لا يستطيع ان يأخذ قرارات كثيرة في الصيانة لانه لا يعرف ويريد ان يسأل	**11Cannot make a decision in Maintenance**
	3	A2	فالذي يأتي من بعده وبحال لم يكن التيم ليدر ملم بعمل المطور الذي ترك	**9Knowledge loss**
	3	A2	مشكله في فهم ما كتبه المطور التارك مثل تعديل على شاشة تتعامل مع كود من مكان غير هذه الشاشة	**5Hard to update previous work**
	3	A2	بناءا عليه يصبح في ريدندانسي بالشغل لان المطور الجديد فهم الشغل من زاوية واحده صغيره	**12redundancy in work**

	3	A2	هذا يؤدي الى ضياع وقت كبير جدا ممكن الساعة تصبح ثلاثث ساعات وممكن ان المطور نفسه يعيد الشغل اكثر من مرة وفي حالات يقوم رئيس الفريق بإعادة الشغل لانه لم يتم حسب المطلوب	4Extra Time
	3	A2	وهذا يؤثر على سير العمل في الفريق ككل لانه ممكن ان يكون عملة متداخل مع اعضاء آخرين فيؤخرهم او اذا لم يقم بالصيانة بالشكل المطلوب فيؤثر سلبا على اجزاء البرنامج الاخرى التي يعمل عليها مطورين آخرين وايضا يؤثر على انجاز الخطط الموضوعة مسبقا للعمل فرضا انجاز عدد معين من المشكل في فترة محددة للانتقال بعدها الى مرحلة اخرى	13Affect other team members maintenance and plans
	4	A2	يزداد عدد الشكاوي مع ازياد مستوى المبرمج بالشغل ممكن يزداد من 3 الى 5 اضعاف ممكن يصبح في شكاوي اسبوعيه بالمقابل الجزء الذي لا يوجد عليه تبديل مطور شكاويه كل فترة طويلة شكوى او اثنتين بالشهر	1increase in number of complaints
	5	A2	عمل اولويات لحل المشاكل حسب اين تظهر المشكلة في مكان حساس بالنظام و تؤثر على حسابات الزبون تعطى اولوية	3Rearrange the priorities
	6	A2	يتم عمل نقل للشغل من المطور التارك للمطور الثابت في الفريق و الاغلب يكون رئيس الفريق	2Team leader and Senior Developers involvement
	6	A2	يتم تدوير المعلومة بين اعضاء الفريقهذا يساعد بحل المشكلة ولكن يعتمد على مستوى العضو التارك	19 circulate information among its members
	6	A2	يوجد كتابة دوكيومنت للبزنس و الكود ولكن قرآة الدوكيومنت نفسها يعتبر مشكلة سواءا بالوقت المطلوب لقرآتها او بفهمها	5Business Documented
	6	A2	يوجد كتابة دوكيومنت للبزنس و الكود ولكن قرآة الدوكيومنت نفسها يعتبر مشكلة سواءا بالوقت المطلوب لقرآتها او بفهمها	3Code Comments
	6	A2	كتابة الكومنت ليس بشكل نظامي	4Not Systematic Documentation
	6	A2	(ما السبب انكم لا تقوموا بعمل نظامي للتوثيق)؟ لايوجد قرار اداري	20No management decision for Systematic Documentation
	7	A2	يعتمد على طبيعة وحجم المشكلة وليس عددها	1risk depends on size of problem
	7	A2	فالذي يأتي من بعده وبحال لم يكن التيم ليدر ملم بعمل المطور الذي ترك فهذا يعتبر تعقيد في الصيانة حتى وان كانت طبيعة المشكلة غير معقده	3Turnover considered a complex maintenance
	7	A2	تناوب اكثر من مطور على نفس الكود يزيد من التعقيد	4Multi Developers update same code
	3	I	المتابعة مع الزبون	14Communication with Customer
	3	I	يأخذ وقت اكثر لمعرفو ما يريده الزبون و بيئة العمل وطريقة العمل	4Extra Time
	3	I	خبرة بالنظام ليست كفاية او الامور التي استلمها لانه ليس كل شيء ممكن ان يتم استلامة وكتابته وكيف يم حل مشاكله لان هذه الامور فيها معرفة لايمكن تسليمها وانما تأتي مع الخبره وسرعة البديهة	9Knowledge loss
	3	I	يأخذ وقت اطول لفهم المشكلة	4Extra Time
	3	I	يعدل بمكان ويؤثر على مكان آخر	10New problems due to new developer

	4	I	ممكن ان يكون حل المشكلة بشكل جزئي فتأتي شكوة اخرى ويتم الرجوع للمشكلة مرة اخرى	1 Increase in number of complaints
	4	I	ممكن ان يكون حل المشكلة بشكل جزئي فتأتي شكوة اخرى ويتم الرجوع للمشكلة مرة اخرى	2New problems due to new developer
	5	I	ممكن يصير في مشكلة بالمتابعة و يشتكي الزبون للادارة	4 Tracking: more difficult to track problems
	6	I	يوجد اكثر من شخص يستطيعوا متابعت المشكلة و حلها و مساعدة المبرمج الجديد لتدارك اي مشاكل	2Team Leader and Senior Developer Involvement
	6	I	يعني انه يوجد اكثر من شخص يستطيعوا متابعت المشكلة و حلها و مساعدة المبرمج الجديد لتدارك اي مشاكل	19Circulate information among its members
	6	I	يوجد توثيق على مستوى البزنس وليس الكود	5Business Documented
	6	I	ويتم الاعتماد على التسليم من المبرمج القديم	1Handover from leaver to new comer
	6	I	استخدام عامل الوقت لحل المشكلة	6 Extra Time to handle the maintenance
	7	I	حسب حجم المشكلة وليس عدد المشاكل	1 Risk depends on size of problem
	7	I	لم يحدث ان اصبح هناك تعقيد لكثرة التبديل	3 Turnover considered a complex maintenance
	3	H	تأخير وقت التسليم delivery time	4Extra Time
	3	H	التأكد من ان المبرمج الجديد يعرف التكنولوجي جيد	2Problem of learning New Technology
	3	H	يتصعب المبرمج في اول فترة في حل المشاكل	1No easy
	3	H	لم نواجه مشكلة بضياع معلومة واضررنا لكتابة الكود من الصفر	9Knowledge loss
	4	H	نعم يزيد عدد المشاكل ولكن اذا كان هناك فحص جيد المفروض ان لا تزيد المشاكل	1 Increase in number of complaints
	5	H	يزيد من صعوبة متابعة المشاكل خصوصا اذا لم يوجد system revenging في حال وجوده تيصبح المتابعة اسهل وتخفف	4Tracking: more difficult to track problems
	6	H	المشي بطريقة صحيحة بال (requirements QA development life cycle بحيث ان ترك مبرمج و اتيان واحد جديد لا يئثر على -الشغل	21Use development life cycle
	6	H	توثيق الكود التي تمت كتابته ووضع ملاحظات (على مستوى الكود)	3Code Comments
	6	H	عمل هانداوفر	1Handover from leaver to new comer
	7	H	بسبب (ما السبب انكم لا تقوموا بعمل نظامي للتوثيق) انه يريد قرار اداري وبسبب ان الانظمة صغيره ولا تحتناج الي توثيق والكود بسيط ومتشابه اداري	20 No management decision for Systematic Documentation
	8	A1	من الذي سيقوم بمتابعة الصيانة	1 Who will follow up maintenance
	8	A1	ها هذا الموظف ترك وراءه مشاكل كثيره	2 Did old developer solved all current problems
	8	A1	هل سيعطي الجديد نفس النتيجة التي كان يعطيها السابق	3 Did the new one will act like the old one
	8	A1	سرعة الاستجابة و هل الجديد سيكون متفرغ مثل القديم	4 Will the new be as full-time as the old
	8	A1	هل سيرد على الايميلات خلال ساعة و يحل المشكلة او سننتظر لثاني يوم	5 Will he respond to emails directly and fix the problem, or will we wait

	8	A1	الزبون تعود على المبرمج و على شخصيته (وتصبح علاقة ألفه), هل سوف اتكلم مع الجديد بنفس الاريحيه كما كانة العلاقة مع القديم الذي اشتغلت معه لمدة سنتان	6 Familiarity Relationship
	8	A1	فممكن ان الزبون بسبب مشكله واحدة معينه يطلب عدم التعامل مع الموظف الجديد ويطلب بصراحة انه لا يريده بالفريق او لا يريد علاقه معه) وليس لامر شخصي ولكن لانه لم يستطيع ان يفهم الشغل و اصبح عنده مشاكل	7 Not to deal with the new employee – Business problem
	9	A1	كل المهام التي تعطى لها تحبها و تجد نفسها في كل المواقع	1 Likes current job
	9	A1	متأقلمة مع مهامها	2 Acclimatized to all tasks
	8	A2	الزبون يستآء جدا	8 customer is dissatisfied
	8	A2	يشتكي الزبون من الشركة انها تخلت عن مطور يعتمد عليه	9 customer complains because of abandoned a reliable developer
	8	A2	و مصدر ثقة بالشغل	10 Old Developer source of trust
	8	A2	وجاء مطور بديل لا يفهم الشغل او يعمل مشكل بالصيانة	7 Not to deal with the new employee – Business problem
	8	A2	ممكن ان يؤدي الى ان تخسر الشركة المشروع لان المطور الجديد لم يستطيع ان يكمل المهمة	11 The customer abandons the project
	8	A2	ممكن ان يكون المطور الجديد احسن من القديم فهذا يؤثر ايجابيا على رضى الزبون	12 Customer Satisfied – New better then Old
	8	A2	عامل الوقت ممكن ان يشكل طوق انقاذ لتبديل المطور, في حال ان الزبون صبر على الجديد مع مساعدة بقية اعضاء الفريق	13 Customer Satisfied – Extra time
	9	A2	لكنه يجد نفسه بحل مشكل البزنس و جمع المعلومات وتحليلها	3 Finds himself in other positions
	9	A2	يحب عمله الحالي	1 Likes current job
	8	I	الزبون بحب يتعامل مع شخص واحد ودائما يسأل عنه	6 Familiarity Relationship
	8	I	ممكن يشتكي الزبون للادارة لعدم رضاه عن حل المشكلة	9 customer complains because of abandoned a reliable developer
	8	I	ممكن توصل لمرحلة ان الزبون يرفض النظام	11 The customer abandons the project
	9	I	الشغل الذي اقوم به الان موافق لشخصيتي	1 Likes current job
	8	H	الزبون بكون متعود على المبرمج القديم ويحتاج فترة للتعود على الجديد	6 Familiarity Relationship
	8	H	لم نواجه اعتراض او شكوى من الزبون	14 Customer Satisfied – No complaints
Dev	2	A	Don't know the business,	1 Unknown Business
	2	A	don't know the basics of the required work	2 Unknow tasks
	2	A	الموديلز الجديدة لم اوجه فيها مشكلة	14 No problem in new models
	2	A	واجهة مشكلة بالتكنولوجي المستخدمة و التعلم عليها	3 Unknown Technology
	2	A	لصعوبة فهم المشروع و معلوماته المبني عليها و ايضا لصعوبة التعديل على الكود المكتوب سابقا لانه غير مفهوم ولا يوجد دوكيومنت واضحة.	4 Code update

	2	UBS1	اول مشكلة فهم البزنس, لانه عند طلب تعديل يجب فهم البزنس لكي يعرف كيف يعدل و التأثير على اماكن اخرى بالبرنامج مثل تقارير معينه	1 Unknown Business
	2	UBS1	ايضا ليس كل مبرمج يكتب الكود بنفس الطريقة, فيضر لتغيير طريقة كتابه للكود بما يتناسب مع ما كتبه السابق	4 Code update
	2	UBS1	عدم وجود توثيق على مستوى الكود لكي اتبع الشغل السابق	5 No Code Documentation
	2	UBS1	بشكل عام نض ملاحظات ولكن توثيق رسمي لا نعمله لانه يأخذ وقت	6 Documentation need time
	2	UBS1	اوقات كثير نرجع من الصفر	7 knowledge loss – back from scratch
	2	UBS1	المعلومة التى ضاعة لانسطيع ارجاعها	8 knowledge loss – cannot be compensate
	2	UBS1	يوجد مبرمجين طبيعة كودهم معقدة ولا يعمل توثيق	9 Maintenance Complexity – Complex code
	2	UBS1	التغيير ايجابي - هذا يكتسفه بعد التجربة, ولكن البداية دائما عنده مشكله	10 Positive to change the developer
	2	UBS2	الصعوبة بالتعديل على كود مبرمج آخر, كيف السابق كتب الكود وبماذا كان يفكر, ممكن فكرتك لحل الكود تختلف عن طريقة زميل سابق	4 Code update
	2	UBS2	التقنية, عندي الاساسيات ولكن عند البدء نحتاج في العمل شيء اكثر تعقيد فاواجه صعوبة في التعلم على التقنية ومتابعة تطورها	3 Unknown Technology
	2	UBS2	فهم البزنس في الفترة الاولى, فهم البزنس من الزبون, نرجع للزبون	1 Unknown Business
	2	UBS2	يوجد توثيق للبزنس سواءا من الشركة او الزبون	15 Business Document
	2	UBS2	لا يوجد توثيق للكود	5 No Code Documentation
	2	UBS2	يوجد قواعد بسيطه نتبعها لكتابت الكود تساعد قليلا	16 Code standardization Helps
	2	UBS2	ممكن مش مرتاح بالتعامل	11 Work roles and responsibilities
	2	UBS2	ممكن يغير المجال و يجد نفسه فيه	17 New Opportunity
	2	UBS2	بسبب الراتب	18 Salary Issue
	2	UBS2	بسبب السفر	12 Palestine Territory 13 Job opportunities outside the country
	2	UBS2	ترى ان الترك بسبب السفر اكثر من الout source	12 Palestine Territory 19 Not Outsource companies
	2	UBS1	ضغط العمل	11 Work roles and responsibilities
	2	UBS1	فرصة احسن, حتى وان كانت فرقية الراتب ليست مبيرة ولكن المبرمج ممكن يرى فيها فرصة احسن	17 New Opportunity
	2	UBS1	السفر خارج البلد(رأيه ان السفر موجود بسبب الاوضاع البلد), حيث ان البرمج السفر يلبي طموحه	12 Palestine Territory 13 Job opportunities outside the country
	2	UBS1	وانا افضل السفر اكثر من العمل مع شركات ال out source	12 Palestine Territory 19 Not Outsource companies
	2	UBS3	اولها كان في صعوبة كثير و اسأل كثير عن البزنس	1 Unknown Business
	2	UBS3	لم تواجه مشكله في عدم وجود شخص تسأله عن البزنس	15 Business Document
	2	UBS3	عدم معرفة كيف تحل المشكلة مباشرة والنظام شغال live	1 Unknown Business

	2	UBS3	عندما اعطي المبرمج الجديد مشكلة لحلها يجد صعوبة في التعامل مع مشكلة لم يبرمج كودها	4 Code update
	3	A	الشغل القديم واجهت مشكلة اني اريد ارجع بكل صغيرة و كبيرة للتيم ليدر	10 Team Leader and Senior Developer Involvement
	3	A	و في مشروع معين بعد شهر من الشغل لم استطيع الاكمال او عمل صيانه و طلبت اخراجي من المشروع	4 Developer Left the project
	3	A	يحدث نقاشات كثيرة حول المشكلة و طبيعتها هل هي مشكلة قديمة و تم البناء على بيانات خاطئة او مشكلة بالكود و يتم عمل نقاشات ليتم التوصل لكيف سيتم حلها	5 More meetings with customer
	3	A	هل هي مشكلة قديمة و تم البناء على بيانات خاطئة او مشكلة بالكود	7 Is it a new problem
	3	UBS1	المبرمج السابق ترك الشركة, لذلك لو انه موجود بكون اسهل و لكن بسبب عدم وجوده يأخذ وقت طويل لمتابعت الكود من اوله لآخره لكي يعرف كيف يفكر المبرمج السابق	1 Extra Time to review code
	3	UBS1	وجود مبرمج جديد قد يخرب جزئية اخرى من البرنامج عند التعديل و هذا لا يستوعبه الزبون خصوصا اذا كان برنامج حساس مثل البرنامج المالي	2 New problems due to new developer
	3	UBS1	الوقت عامل مهم لان التعديل يأخذ وقت طويل في الفتره الاولى فيعتقد الزبون ان المبرمج لا يتجاوب معه	3 Extra Time to solve the problem
	3	UBS2	ضياع الوقت وتأخير اعطاء الصيانة	3 Extra Time to solve the problem
	3	UBS2	نبلي ما يريده الزبون ولكن ليس بكفاءة الذي كان قبل, عدم حل المشكلة بالطريقة التي تناسب الزبون	8 Problem Solving Quality
	3	UBS2	ممكن ان يكون عندي افكار افضل ولكن بسبب عدم المعرفة لا استطيع حل بشل احسن	8 Problem Solving Quality
	3	UBS2	يوجد شخص آخر يراجع الكود	10 Team Leader and Senior Developer Involvement
	3	UBS2	ممكن ان نكتب الكود مرتين لهذا السبب	9 Redundancy in work
	3	UBS3	حاولت احل المشكلة مبدئيا بعدين لجأت لشخص آخر	10 Team Leader and Senior Developer Involvement
	3	UBS3	التصرف و حل المشكلة بسرعة حتى وان كان الزبون يعرف ان المشكلة ليست من عندنا او من نظامنا	3 Extra Time to solve the problem
	3	UBS3	تأثير الوقت, محاولت تدارك عن طرق زيادة ساعات العمل	3 Extra Time to solve the problem
	4	A	بالعادة الزبون لا يكون مرتاح للمشاكل	1 customer is dissatisfied
	4	UBS1		1 customer is dissatisfied
	4	UBS3	بكل الاحوال الزبون يتأثر	1 customer is dissatisfied
	5	A	في حال تم حل المشكلة على اكمل وجه , يعبر الزبزن عن رضاه	2 Customer Satisfied – Problem Solved
	5	A	وفي حال لم يكن راضي, يحاول ان يحمل عدم حل المشكلة بسبب قلت معرفتي بالعمل او اني جديدة على العمل و انه لايستطيع التعامل معي و	3 Customer Dissatisfied – less knowledge
	5	A	في بعض الاحيان يرفض التعامل او يكون سلبي.	4 Not to deal with the new employee – Business problem

	5	UBS1	حسب علاقة الزبون بالشركة, اذا كانت قوية ممكن الزبزن يتغاضى عن التأخير	5 Relation with a customer - overcome the delay
	5	UBS1	الزبون يكون غير مرتاح وعدم الشعور بالاستقرار	6 Familiarity Relationship
	5	UBS1	عمليه الاستبدال ترجع مع الزبون الى نقطة الصفر وهذا لا يستوعبه, يقول انه جلس مع القديم ساعات طويله و فهمه الشغل و الان هذا كله سوف يختفي و نعيد من الصفر	3 Customer Dissatisfied – less knowledge
	5	UBS1	ويصبح عنده تسأل انه يعلمه مره اخرى و ترك ايضا, يكون عنده دائما خوف من عملية التبديل	7 Customer Dissatisfied – Frequent developer change
	5	UBS1	فيعتقد الزبون ان المبرمج لا يتجاوب معه	8 Customer Dissatisfieddeveloper does not respond to it
	5	UBS1	وجود مبرمج جديد قد يخرب جزئية اخرى من البرنامج عند التعديل و هذا لا يستوعبه الزبون	12 Customer Dissatisfied-New problems due to new developer
	5	UBS1	الزبوم ممكن ان يترك النظام	9 The customer abandons the project
	5	UBS2	ممكن الزبون يرفض النظام, يوجد زبون ترك النظام بسبب كثرة التعديل عليه بعد ان تبدل المبرمجان الذين بنوا النظام	9 The customer abandons the project
	5	USB3	الزبون متعود على التعامل مع شخص ومرتاح للتعامل فيتأثر ولكن ايضا حسب شطارة الموظف	6 Familiarity Relationship
	5	USB3	يسأل الزبون عن الشخص الذي ترك	10 Customer ask about the left developer
	5	USB3	لم يكن الاثر شديد على الزبون , لم يفرق معه قديم او جديد	11 Not a big effect on the customer
	6	A	تجد نفسها بالQA و البرمجة, ولكن اقرب للبرمجة و هذا هو موقعها الحالي	Likes current job
	6	UBS1	اذا تتيح لي الفرصة بحب استلم رئيس فريق	3 Finds himself in other positions
	6	UBS1	مرتاح بشغله الحالي و غير مؤثر عليه	1 Likes current job
	6	UBS2	احب كتابت الكود و فحص الاخطاء, مرتاحة في شغلها الحالي و ايضا اشتغلت بالفحص و حبته	1 Likes current job
	6	USB3	تحب ال contact and Business, تحب موقها الحالي	1 Likes current job

With Developer Turnover

Position	Q	Interview	Interview extract	Code
Mix	1	A1	اشتغلت على نظام مع بالتل كمطور لحالي فقط, الصيانة المطلوبة قليلة, لاني انا التي كتبت الكود, حتى ان النظام فيه حالات معقدة و خاصة جدا ولكني لا اواجه مشكلة لانه كودي و البزنس انا اناقشه معهم	1 Less Maintenance
	1	A1	لاني انا اقوم بها بشكل ممتاز	2 Efficient Maintenance
	1	A1	ولكن اذا تركت المشروع لن يستطيع احد المتابعة بعدي لتعقيد البزنس و الكود وحتى صعوبة كتابة دوكيومنت	4 No Code Document
	1	A1	استخدم الايميلات بيني وبين الزبون كدوكيومنت	5 Email as Document
	1	A1	انا اكتب الكود و اعمل عليه صيانة	6 Same Developer write, update the code

	1	A1	وان ملمة بكل شيء حتى عندما يرجعوالي بمشكلة حسابية ويعتقدوا انها مشكلة فأنا استطيع بسهولة معرفت انها ليست مشكلة واخبارهم بذلك ويكونوا راضيين	7 Strong knowledge
	1	A1	ويتطلب مني وقت للرجوع للكود القديم الذي كتبته و تذكره فيصبح الموضوع كأني اقرأ كود كتبه شخص آخر	8 Extra time to remember old code
	1	A2	نعم يوجد سيطرة كبيرة	9 Controlled Maintenance
	1	A2	يعني ممكن خلال 3 اشهر لاتظهر اي مشكلة صيانة	1 Less Maintenance
	1	A2	ولكن اذا تمت كتابة الكود بدون دوكيومنتيشن	4 No Code Document
	1	A2	وبعد فترة طويلة رجع نفس المطور ليعدل على الكود تكون مثل مشكلة دخول مطور جديد على الكود (حيث يكون المبرمج قد نسي كليا كيف كتب الكود)	8 Extra time to remember old code
	1	H	يوجد عندهم مشاريع من 10 سنوات ولم يتم تبديل مبرمج و لايوجد عليها مشاكل	1 Less Maintenance
	1	H	يوجد مشكلة الرجوع لكود قديم كتبه نفس المبرمج وعند وجود مشكلة لا يتذكر كيف كتب الكود او لمااذا كتبه بهذه الطريقة	8 Extra time to remember old code
	1	UBS	نفسيا اريح للمبرمج وخصوصا في الصيانة	11 More comfort to the developer
	1	UBS	فرق جوهري في الوقت	10 Less Maintenance time
	1	UBS	السيطره على الكود من شخص واحد لا يعمل تعقيد	12 Controlled Code
	2	A1	الصيانة هنا سهلة و لا تعقيد لانيانا اكتب الكود و اعمل عليه صيانة	1 No Complexity in the Normal situation
	2	A1	كثرة الطلبات و التعقيدات فيصبح الصيانة معقدة	2 Complexity - Frequent updates
	2	UBS	السيطره على الكود من شخص واحد لا يعمل تعقيد	1 No Complexity in the Normal situation
	3	A1	بالاول الزبون لايملك دوكيومنت للشغل, حاول يستقطب المطور ليشتغل عنده	1 Try to attract the developer
	3	A1	هنا عدم رضا الزبون بسبب من جهة الزبون نفسه و كثرة الطلبات و التعقيدات فيصبح الصيانة معقدة ويتطلب مني وقت للرجوع للكود القديم الذي كتبته و تذكره فيصبح الموضوع كأني اقرأ كود كتبه شخص آخر	2 Customer dissatisfied – delay in maintenance - old code
	3	A2	الزبون راضي بشكل عام	3 Customer Satisfied
	3	A2	بسبب المتابعة و العلاقة الشخصية لفترة طويلة تمتد على مدى سنوات	4 Familiarity Relationship
	3	H	لايوجد شكاوي من الزبائن الا ما ندر وليس لها علاقة بالمبرمج	3 Customer Satisfied
	3	UBS	صار في علاقة مع الموظف	4 Familiarity Relationship
	3	UBS	الزبون مرتاح	3 Customer Satisfied
	4	A1	تجد نفسها بالQA و البرمجة ولكن اقرب للبرمجة و هذا هو موقعها الحالي	1 Likes current job
	4	A2	يحب عمله الحالي	1 Likes current job
	4	A2	و لكنه يجد نفسه بحل مشكل البزنس و جمع المعلومات وتحليلها	3 Finds himself in other positions
	4	UBS	اذا تتيح لي الفرصة بحب استلم رئيس فريق	3 Finds himself in other positions
	4	UBS	مرتاح بشغله الحالي و غير مؤثر عليه	1 Likes current job

Customer				
	Q	Interview	Interview extract	Code
	1	C1	نحن راضين	1 Satisfied Generally
	1	C1	لكن لا يتم حل مشاكلنا مباشرة	2 Dissatisfied - Delay in Maintenance
	1	C1	من الاسباب عدم وجود نظام متابعة معهم الا عن طريق الايميل فتصبح مبنية على العلاقات الشخصية وبناءا عليه لانعرف متابعة المشكلة ولماذا ظهرت مرتين	3 Dissatisfied - No Tracking system
	1	C1	المبرمجين غير منظمين, كل واحد مسؤول عن جزء ولا يوجد غيره يتبع او يفحص وراءه او يعرف	4 Dissatisfied - No QA or review
	1	C1	المبرمجين غير منظمين, كل واحد مسؤول عن جزء ولا يوجد غيره يتبع او يفحص وراءه او يعرف	5 Dissatisfied - No developer backup
	1	C2	بشكل عام راضي, وعند حدوث المشاكل يتجاوب مباشر	1 Satisfied Generally
	1	C2	بعض المرات لايتجاوبوا معنا ولا يردوا علينا لاسباب عديدة	2 Dissatisfied - Delay in Maintenance
			صعب الجواب بعموميات, ولكن بشكل عام بقيمه لحد 80% راضي	1 Satisfied Generally
	2	C1	وجود SLA يجعلني راضي	1 Satisfied - SLA
	2	C1	التعاطي مع شكاوينا بجديه اذا لم يقم المبرمج بحل المشكلة	2 Satisfied - Consider complaints seriously
	2	C2	وجود اكثر من مبرمج بحيث اذا ترك احدهم يسد محله الآخر	6 Satisfied - developer backup
	2	C2	العلاقات الشخصية	7 Familiarity Relationship
	2	C3	تواصل اكثر	3 Satisfied - Better Communication
	2	C3	ومساحة نقاش اكثر وتفهم	Satisfied - Understand Requirements 4 لطلباتنا
	2	C3	ان الامور التي تريد يوم عمل تصبح يومين او اكثر	5 Dissatisfied - Late response
			التعامل بشكل تجاري ومحاولت تحويل كل طلب الى مشروع او تغيير رئيسي ليتم الدفع	6 Dissatisfied - cost
			اضريت للطلب منهم و مساعدتم في بناء بعض الاجزاء من جديد بسبب ضعف في شغلهم	9 Dissatisfied – low quality
			عند الصيانة و بسبب انه نظام كبير يوجد عندهم متابعة	8 Satisfied- Ticketing system help
			متابعة المشاكل عن طريق عمل تحديث للنظام	10 Satisfied - Periodic Upgrade
			وجود علاقة مع المطور	7Familiarity Relationship
	3	C1	الجديد يكون افضل اذا كان مبرمج جيد	1 New developer - better
	3	C1	فنشعر انه يقوم بعمل التفاف على المشاكل بدون حلها جذريا وتعود المشكلة عدة مرات وبصراحة نشعر انه يستغفلنا	2 Old developer - uncooperative
	3	C1	يأخذ مشاكلي على محمل الجدية	3 New developer - take problems seriously
	3	C1	ويكون في نتائج مرضيه بغض النظر عن التأخير والSLA تحميني من التأخير وتكاليفه	4 New developer – Satisfied results regardless of the delay
	3	C2	افضل القديم	5 Old developer - better
	3	C2	فاهم البزنس, والكود	12 Old Developer – Understand Code
	3	C2	فاهم البزنس, والكود	11 Old Developer – Understand Business
	3	C3	افضل التعامل مع الشخص الذي بنى بالاساس	5 Old developer - better
	3	C3	حتى وان كان الجديد ذو خبرة اكبر لان القديم عنده قدرة على التعامل مع المشاكل بشكل افضل بكثير	6 Old developer – better dealing with problems
	3	C3	ويوفر وقت لانه عامل الوقت عنا مهم جدا ولا نحتمل التأخير	7 Old developer – save time

	3	C3	تغيير الشخص صار في تواصل اكثر	8 New developer - Better Communication
	3	C3	ومساحة نقاش اكثر وتفهم لطلباتنا	9 New developer - Understand Requirements
	3	C3	المبرمج الجديد معني لتنفيذ طلباتنا	3 New developer - take problems seriously
			يوجد مطور قديم موجود من اول المشروع , كان شغله سيء جدا و وتحملنا وجوده حتى نهاية المشروع و طلبنا عدم التعامل معه نهائيا	2 Old developer - uncooperative
			يوجد شخص آخر كان ممتاز جدا و كنا نخاف من تبديله لانه سيؤثر كثيرا على سير العمل	5 Old developer - better
			وحاله أخرى كان يوجد مطور معطل العمل بطريقة سيئة جدا و استبدلوه بمطور حل جميع المشاكل	1 New developer - better
	4.1	C1	نعم واجهناها تبديل مفاجئ للمبرمج	1 A Sudden change to the developer
	4.1	C1	ولكن عندهم ticketing system وعن طريقة تتم الاتصال	2 Ticketing system help
	4.1	C1	وعند تغير المبرمج نشعر ان هذا الشخص يتعلم	3 We feel new developer is learning
	4.1	C1	ونحن نعلمه ايضا بعض الامورغم انه وراءه فريق عمل يوججه ويعملو له handover ولكن نحن ايضا نعاني ونعلمه	4 We teach the new developer
	4.1	C1	هذا يؤثر علينا و يصل الامر الى خسائر بالشغل	5 Losses at work
	4.1	C2	يؤثر عدم المعرفة بشغل المبرمج السابق ان الجديد سيأخذ وقت في الصيانة, لذلك يقوموا بتأخير الصيانة لعلمهم انها ستأخذ وقت طويل منهم	6 Extra Time to solve problems
	4.1	C2	بعض المرات يصلح شغلة ويخرب غيرها	12 New problems due to new developer
	4.1	C3	قرأ الكود وفهمه واستوعبه واخذ فترة منه	6 Extra Time to solve problems
	4.1	C3	بعدين مشي الحال وصرنا نطلب صيانه بسهولة	7 Later on maintenance become better
	4.1	C3	كان يأخذ وقت أكثر من الطبيعي حتى يحلل المشكلة ويعرف السبب نوصل لمرحلة لا نريد تغيرات الا للحالات الضرورية	8 Reduce change just for urgent issues
	4.1	C3	ان الامور التي تريد يوم عمل تصبح يومين او اكثر وهذا تكلفة علينا اكثر	9 Extra cost
	4.1	C3	اضرينا نشرح له البزنس من اول وجديد بأكثر من مرحله وهذا يفتح امور سابقة لم يكن متطرق لها	4 We teach the new developer
	4.1	C3	بعض الامور واجهناها ان بعض الامور لم نتذكر لماذا معموله بالطريقة هذه, هل المفروض ان تكون بهذا الشكل ام هذا بناء خاطئ من المبرمج السابق	10 Less quality
	4.1	C3	ولكن بعض الحالات كانت ان المبرمج الجديد معرفته اقل	11 Less knowledge
	4.1	C3	وبناءا عليه تسليم شغل بفترة اكبر من المفروض	6 Extra Time to solve problems
	4.1	C4	تيكنكلي يكون فاشل لا يعرف يشتغل و يؤخر الشغل , تأخير كبير, المشكلة التي تحتاج يوم تتأخر اسبوع	6 Extra Time to solve problems
	4.1	C4	ينتج عنه مشاكل جديدة	12 New problems due to new developer
		C4	نستمر في تذكيره بالمطلوب واهمية تذاكر الصيانة	4 We teach the new developer
	4.2	C1	نرفع شوكوى ويضطروا ان يعالجوا الموضوع بشكل اسرع ولكن نظامهم عالمي ومستقر	1 Stable System
	4.2	C1	ونحن عندنا خبره بالتعامل بالبرنامج فهذا يعطينا مساحة اوسع للتحمل	2 Customer experience
	4.2	C1	وايضا عند رفع الشكوى يستجيبوا	3 Consider complaints seriously
	4.2	C1	وايضا السعر الذي حصلنا به النظام منافس وهذا يجعلنا نتحمل هذه المشاكل	4 Competitive Price
	4.2	C1	وايضا بسبب حساسة النظام وتعقيده وحجمه, فليس من السهل اطلاقا ان نقوم باستبداله بسبب مشكلة المبرمجين	5 Huge System cannot be replaced

	4.2	C1	بعض البرامج نترك البرنامج من اصله بسبب كثرة تبديل المبرمجين وتصبح مشكلة كبيرة وبالتالي كثرة المشاكل التي لانتحملها	6 Some system replaced
	4.2	C2	أدى تبديل المبرمجين الكثير الى ترك النظام وبناء نظام جديد مع شركة جديدة	6 Some system replaced
	4.2	C2	يوجد اكثر من مبرمج بعملوا صيانة	9 Positive - Developer backup
	4.2	C2	وايضا الزبون نفسه فاهم الشغل تقنيا بسبب تجربته مع شركة برمجة سابقة	2 Customer experience
	4.2	C3	كنا نحاول استيعاب الامر لانه جديد ونحن مصلحتنا الى مرحلة معينه نتعدي هذا الموضوع	7 Trying to overcome it
	4.2	C3	اذا بدلوا جونيور بسينور فهذا يكون ايجابي	8 Positive- Junior replaced with Senor
	4.2	C3	وكنا نرفض هذا الوضع ونصل لمرحلة ترك البرنامج كاملا لانتحملها	6 Some systems replaced
	4.2	C4	لا نفكر بالتغيير حتى اذا كان المطور ضعيف ولكن يسلك الشغل بأقل القليل و نحاول استيعاب الامر	7 Trying to overcome it
	4.2	C4	موضوع الdeadline و الالتزامات تجعلنا لا نستطيع اتخاذ قرار برفض المطور, لانه الجديد يحتاج وقت للتسليم و الانخراط بالعمل و ممكن ايضا ان يكون غير جيد	10 Deadlines
	4.2	C4	اذا لم تحل المشكلة نلجأ الى الشكاوي الكثيرة و العالية و حل المشكلة مع ادارة الشركة	11 Escalations
	4.2	C4	لا نستطيع تبديل النظام بسبب اهمية و حجم النظام وصعوبة تبديله	5 Huge System cannot be replaced

2) Grouping Codes

With Developer Turnover			
Position	**Q. No.**	**Code**	
TL	2	1	Type of turnover
		2	Salary Issue
	merge	3	Attendance time
		4	Work roles and responsibilities
		5	Out source companies
		6	Job opportunities outside the country
		7	Increase Salary
		8	Level of Turnover
		9	Job Environment
		10	Off work Activities
		11	Palestine Tero
TL	3	1	Not easy for new developer
		2	Problem of learning New Technology
		3	Problem of learning to Follow Standards
		4	Extra Time
		5	Hard to update previous work
		6	Main team member left
		7	Business loss
		8	Document is not enough
		9	Knowledge loss
		10	New problems due to new developer
		11	Cannot make a decision in Maintenance
		12	redundancy in work
		13	Affect other team members maintenance and plans
		14	Communication with Customer
TL	4	1	Increase in number of complaints
		2	New problems due to new developer
TL	5	1	Tracking:Extra time to analyze the problem
		2	Tracking:Extra time to understand the code
		3	Tracking:Rearrange the priorities
		4	Tracking: more difficult to track problems
TL	6	1	Handover from leaver to new commer
		2	Team Leader and Senior Developer Involvement
		3	Code Comments
		4	Not a systematic Documentation
		5	Business Documented

		6	Extra Time to handle the maintenance
		7	Postpone other tasks
		8	Try not to affect the customer
		9	Un handled issue by old developer
		10	Wrong handover
		11	New developer hard to communicate with customer
		12	New developer-unknown business details
		13	Old developer – not completed work
		14	understand the code
		15	understand the business
		16	More meetings with customer
		17	Why problems appeared now
		18	Is it a new problem
		19	circulate information among its members
		20	No management decision for Systematic Documentation
		21	Use development life cycle
TL	7	1	Risk depends on size of problem
		2	Risk depends on customer complaint
		3	Turnover considered a complex maintenance
		4	Multi Developers update same code
TL	8	1	Who will follow up maintenance
		2	Did old developer solved all current problems
		3	Did the new one will act like the old one
		4	Will the new be as full-time as the old
		5	Will he respond to emails directly and fix the problem, or will we wait
		6	Familiarity Relationship
		7	Not to deal with the new employee – Business problem
		8	Customer is dissatisfied
		9	Customer complains because of abandoned a reliable developer
		10	Old Developer - source of trust
		11	The customer abandons the project
		12	Customer Satisfied – New better then Old
		13	Customer Satisfied – Extra time
		14	Customer Satisfied – No complaints
TL	9	1	Likes current job
		2	Acclimatized to all tasks
		3	finds himself in other positions
Dev	2	1	Unknown Business
		2	Unknow tasks

		3	Unknown Technology
		4	Code update
		5	No Code Documentation
		6	Documentation need time
		7	knowledge loss – back from scratch
		8	knowledge loss – cannot be compensate
		9	Maintenance Complexity – Complex code
		10	Positive to change the developer
		11	Work roles and responsibilities
		12	Palestine Territory
		13	Job opportunities outside the country
		14	No problem in new models
		15	Business Document
		16	Code standardization Helps
		17	New Opportunity
		18	Salary Issue
		19	Not Outsource companies
Dev	3	1	Extra Time to review code
		2	New problems due to new developer
		3	Extra Time to solve the problem
		4	Developer Left the project
		5	More meetings with customer
		6	Why problems appeared now
		7	Is it a new problem
		8	Problem Solving Quality
		9	Redundancy in work
		10	Team Leader and Senior Developer Involvement
Dev	4+5	1	Customer is dissatisfied
		2	Customer Satisfied – Problem Solved
		3	Customer Dissatisfied – less knowledge
		4	Not to deal with the new employee – Business problem
		5	Relation with a customer - overcome the delay
		6	Familiarity Relationship
		7	Customer Dissatisfied – Frequent developer change
		8	Customer Dissatisfied-developer does not respond to it
		9	The customer abandons the project
		10	Customer ask about the left developer
		11	Not a big effect on the customer
		12	Customer Dissatisfied-New problems due to new developer
Dev	6	1	Likes current job

		3	Finds himself in other positions
Without Developer Turnover			
Position	**Q. No.**	**Code**	
Mix	1	1	Less Maintenance
		2	Efficient Maintenance
		4	No Code Document
		5	Email as Document
		6	Same Developer write, update the code
		7	Strong knowledge
		8	Extra time to remember old code
		9	Controlled Maintenance
		10	Less Maintenance Time
		11	More comfort to the developer
		12	Controlled Code
	2		No Complexity in the Normal situation
			Complexity - Frequent updates
	3	1	Try to attract the developer
		2	Customer dissatisfied – delay in maintenance -old code
		3	Customer Satisfied
		4	Familiarity Relationship
	4	1	Likes current job
		3	Finds himself in other positions
Customer Satisfaction			
	Q. No.	**Code**	
	1	1	Satisfied Generally
		2	Dissatisfied - Delay in Maintenance
		3	Dissatisfied - No Tracking system
		4	Dissatisfied - No QA or review
		5	Dissatisfied - No developer backup
	2	1	Satisfied - SLA
		2	Satisfied - Consider complaints seriously
		3	Satisfied - Better Communication
		4	Satisfied - Understand Requirements

		5	Dissatisfied - Late response
		6	Satisfied - developer backup
		7	Familiarity Relationship
		8	Satisfied- Ticketing system help
		9	Dissatisfied – low quality
		10	Satisfied - Periodic Upgrade
	3	1	New developer - better
		2	Old developer - uncooperative
		3	New developer - take problems seriously
		4	New developer – Satisfied results regardless of the delay
		5	Old developer - better
		6	Old developer – better dealing with problems
		7	Old developer – save time
		8	New developer - Better Communication
		9	New developer - Understand Requirements
		10	New developer - Better cooperation
		11	Old Developer – Understand Business
		12	Old Developer – Understand Code
	4.1	1	A Sudden change to the developer
		2	Ticketing system help
		3	We feel new developer is learning
		4	We teach the new developer
		5	losses at work
		6	Extra Time to solve problems
		7	Later on, maintenance becomes better
		8	Reduce change just for urgent issues
		9	Extra cost
		10	Less quality
		11	Less knowledge
		12	New problems due to new developer
	4.2	1	Stable System
		2	Customer experience
		3	Consider complaints seriously
		4	Competitive Price
		5	Huge System cannot be replaced
		6	Some systems replaced
		7	Trying to overcome it
		8	Positive- Junior replaced with Senor
		9	Positive - Developer backup
		10	Deadlines
		11	Escalations

3) Generating Themes

1- Question 2 / Team Leader / With Developer Turnover

Group code and extract themes				
Interviewee	**Interview extract**	**Code**	**Sub Theme**	**Theme**
A1	يوجد مطور يترك كليا ويأتي جديد محله, ويوجد مطور يدخل و يخرج لانجاز مهم فقط	1 Type of Turnover	Type of Turnover	Type of Turnover
A2	اذا تم تبديل المطور (سواءا بترك الشغل او الانتقال لمشروع ثاني)	1 Type of Turnover		
I	مبرمج يشتغل على مشروع وانتهى شغله ويسلم شخص آخر, التسليم هل هو ضمن خطه, هل التسليم كان كامل , هل في امور ضلت مش واضحة وسوف نصطدم بها في الصيانة	1 Type of Turnover		
H	لو كان في فولو اب من التيم ليدر او اي شخص مسؤول عن البرودكت بطريقة سلسه ومتبع شو بصير المفروض انه ما يكون في تأثير للتيرن اوفر	1 Type of Turnover		
A2	يعتمد على مستواه في المشروع وكل ما زاد المستوى زادة المشكلة	8 Level of Turnover		
H	عمل نشاطات خارجة عن العمل	10 Off work Activities	Encourage developers	Encourage developers
H	معالجت اهتمامات المبرمج مثل اعطائم مرونة بمكان العمل	9 Job Environment		
A1	زيادة راتبها	7 Increase Salary		
A2	السفر خارج البلاد لايعتبر مشكلة لترك المبرمج حاليا	11 Palestine Territory 6 Job opportunities outside the country	Palestine Territory	Developer Turnover Reasons
I	الout source اقوى من السفر , السفر محدود	11 Palestine Territory 6 Job opportunities outside the country		
H	السفر ليس رئيسي	11 Palestine Territory 6 Job opportunities outside the country		
A1	كثير من الشباب يأتي ثم يترك ليسافر خارج البلد لفرص افضل	11 Palestine Territory 6 Job opportunities outside the country		
I	شركات الout source منافسه	11 Palestine Territory 5 Outsource companies		
H	Outsource companies	11 Palestine Territory 5 Outsource companies		
A1	يفضلوا الاوت سورس	11 Palestine Territory 5 Outsource companies		
A2	وحصوله على عرض مغري من شركات اوت سورس	11 Palestine Territory 5 Outsource companies		
A1	مشكلة الراتب خصوصا في فلسطين حيث ان الشركات روابتها بالعادة متدنية	2 Salary Issue 11 Palestine Territory		
I	عرض افضل براتب احسن	2 Salary Issue		
H	سبب مالي	2 Salary Issue		
A1	سبب مادي	2 Salary Issue		
A1	مدة الدوام والالتزام بها, الموظف لا يريد الالتزام بوقت معين مثلا من 8-5,	3 Attendance time	Work roles and responsibilities	
A1	لاتعجبهم طبيعة الشغل و قوانينه او الادارة	4 Work roles and responsibilities		
A1	لا يريد المتابعة مع الزبائن	4 Work roles and responsibilities		
A1	لا يستوعب المتابعة الدائمة و المسائلة من المسؤول	4 Work roles and responsibilities		
A1	بعد فترة من العمل من سنتين واكثر يقل الاداء	4 Work roles and responsibilities		
A1	لا يريد ان يتحمل مسؤولية	4 Work roles and responsibilities		
A2	عدم الاتفاق مع التيم او الادارة	4 Work roles and responsibilities		
A2	البعض ممكن ان يتصعب من الشغل نفسه	4 Work roles and responsibilities		
I	ليس مرتاح بالشغل	4 Work roles and responsibilities		
I	طبيعة شغل افضل وميزات اكثر	4 Work roles and responsibilities		
H	lack of engagement	4 Work roles and responsibilities		
H	تجربت تكنولوجي جديدة	4 Work roles and responsibilities		

2- Questions 3-7 / Team Leader / With Developer Turnover

Group code and extract themes					
Q	**Interviewee**	**Interview extract**	**Code**	**Sub Theme**	**Theme**
3	A1	ليس بالامر السهل على المطور الجديد	1 Not easy	Impact on maintenance	Turnover Impact On Maintenance
3	H	يتصعب المبرمج في اول فترة في حل المشاكل	1 Not easy		
3	I	يعدل بمكان ويؤثر على مكان آخر	10 New problems due to new developer		
3	A2	فممكن ان يصلح في منطقة و يخرب في منطقة أخرى وهذا يحدث كثيرل في البرامج الكبيره	10 New problems due to new developer		
3	A2	لا يستطيع ان يأخذ قرارات كثيرة في الصيانة لانه لا يعرف ويريد ان يسأل	11 Cannot make a decision in Maintenance		
3	A2	بناءا عليه يصبح في ريدندانسي بالشغل لان المطور الجديد فهم الشغل من زاوية واحده صغيره	12 Redundancy in work		
3	A2	وهذا يؤثر على سير العمل في الفريق ككل لانه ممكن ان يكون عملة متداخل مع اعضاء آخرين فيؤخرهم او اذا لم يقم بالصيانة بالشكل المطلوب فيؤثر سلبا على اجزاء البرنامج الاخرى التي يعمل عليها مطورين آخرين وايضا يؤثر على انجاز الخطط الموضوعة مسبقا للعمل فرضا انجاز عدد معين من المشكل في فترة محددة للانتقال بعدها الى مرحلة اخرى	13 Affect other team members maintenance and plans		
3	I	المتابعة مع الزبون	14 Communication with Customer		
3	A1	يتطلب منه تعلم تكنولوجيا جديدة	2 Problem of learning New Technology		
3	H	التأكد من ان المبرمج الجديد يعرف التكنولوجي جيد	2 Problem of learning New Technology		
3	A2	مشكلة طلوع المطور نفسه الجديد يحتاج الى شرح لكل شيء عن البرنامج قبل البدء بالصيانة بدأ بالتكنولوجي	2 Problem of learning New Technology		
3	A1	يتطلب منه تعلم الطريقة المتبعة بالتطوير و الصيانة يجب ان يلتزم بها	3 Problem of learning to Work on Standards		
3	A1	غير ملم بالشغل ولذلك يحتاج وقت اضافي منه ومن الذي يشرح له المطلوب لانجاز الصيانة	4 Extra Time		
3	A2	هذا يؤدي الى ضياع وقت كبير جدا ممكن الساعة تصبح ثلاث ساعات وممكن ان المطور نفسه يعيد الشغل اكثر من مرة وفي حالات يقوم رئيس الفريق بإعادة الشغل لانه لم يتم حسب المطلوب	4 Extra Time		
3	I	يأخذ وقت اكثر لمعرفو ما يريده الزبون و بيئة العمل وطريقة العمل	4 Extra Time		
3	I	يأخذ وقت اطول لفهم المشكلة	4 Extra Time		
3	H	تأخير وقت التسليم delivery time	4 Extra Time		
3	A1	مشكلة مراجعه الشغل بعد ترك المطور للعمل او المشروع بسبب ان كل واحد له طريقته الخاصة بكتابة الكود او التحليل ولذلك يكون هناك تعقيد و تشعب كثير عندما يريد مطور آخر عمل صيانه على نفس الجزئية او التعديل عليها	5 Hard to Update Previous Work		
3	A2	مشكله في فهم ما كتبه المطور التارك مثل تعديل على شاشة تتعامل مع كود من مكان غير هذه الشاشة	5 Hard to Update Previous Work		
3	A2	اذا طلع اي عضو رئيسي بزنس او مطور يحدث كثير مشاكل لانه الاثنين يكونوا معتادين على التواصل ما بين بعض	6 Main team member left		
3	A2	ضياع البزنس بطلعت اي واحد منهم حتى لو كان في دوكيومنت لانه يوجد فرق بين قرآة الدوكيومنت و الجلوس مع عضو البونس او المطور وجها لوجه	7 Business loss		
3	A2	حتى لو كان في دوكيومنت لانه يوجد فرق بين قرآة الدوكيومنت و الجلوس مع عضو البونس او المطور وجها لوجه بحيث يكون عنده تصور لكل شيء عن المشروع وتعديلاته وصيانته	8 Document is not enough		
3	A2	فالذي يأتي من بعده وبحال لم يكن التيم ليدر ملم بعمل المطور الذي ترك	9 Knowledge loss		
3	I	خبرة بالنظام ليست كفاية او الامور التي استلمها لانه ليس كل شيء ممكن ان يتم استلامة وكتابته وكيف يم حل مشاكله لان هذه الامور فيها معرفة لايمكن تسليمها وانما تأتي مع الخبره وسرعة البديهة	9 Knowledge loss		
3	H	لم نواجه مشكلة بضياع معلومة واضررنا لكتابة الكود من الصفر	9 Knowledge loss		
3	A2	فرضا اذا طلب منه صيانة لا يعرف اين يؤثر وماذا يجب ان يعدل	9 Knowledge loss		

4	A1	يؤثر على الوقت اللازم لحل المشاكل التي تظهر من عمل المطور السابق وبالتالي تراكم المشاكل المراد حلها	1 Increase in number of complaints	Impact on Number of Tickets	
4	I	ممكن ان يكون حل المشكلة بشكل جزئي فتأتي شكوة اخرى ويتم الرجوع للمشكلة مرة اخرى	1 Increase in number of complaints		
4	H	نعم يزيد عدد المشاكل ولكن اذا كان هناك فحص جيد المفروض ان لا تزيد المشاكل	1 Increase in number of complaints		
4	A2	يزداد عدد الشكاوي مع ازياد مستوى المبرمج بالشغل ممكن يزداد من 3 الى 5 اضعاف ممكن يصبح في شكاوي اسبوعيه بالمقابل الجزء الذي لا يوجد عليه تبديل مطور شكاويه كل فترة طويلة شكوى او اثنتين بالشهر	1 Increase in number of complaints		
4	A1	يظهر مشاكل جديدة بحاجة الى صيانة بسبب عدم فهم المطور الجديد لما تم بناءه	2 New problems due to new developer		
4	I	ممكن ان يكون حل المشكلة بشكل جزئي فتأتي شكوة اخرى ويتم الرجوع للمشكلة مرة اخرى	2 New problems due to new developer		
5	A1	فيأخذ وقت وجهد كبير عند متابعة المشكلة و محاولت فهم ما تركه فبض الامور مفهومه كبزنس ولكن ليس الكود لانه يرجع لطبيعو وكيفية كتابة الكود	1 Tracking: Extra time to analyze the problem	Impact on Bug Tracking	
5	A1	عند متابعة المشكلة يوجد تفاصيل كثيرة يعني بالنهاية تحليل المشكلة بوقت طويل او الاتصال بالمطور	2 Tracking: Extra time to understand the code		
5	A2	عمل اولويات لحل المشاكل حسب اين تظهر المشكلة في مكان حساس بالنظام و تؤثر على حسابات الزبون تعطى اولوية	3 Rearrange the priorities		
5	I	ممكن يصير في مشكلة بالمتابعة و يشتكي الزبون للادارة	4 Tracking: more difficult to track problems		
5	H	يزيد من صعوبة متابعة المشاكل خصوصا اذا لم يوجد system revenging في حال وجوده تيصبح المتابعة اسهل وتخفف	4 Tracking: more difficult to track problems		
6	A1	يتم عمل نقل للشغل من المطور التارك للمطور الثابت	1 Handover from leaver to new comer	Circulate information	Handle Turnover effects
6	I	ويتم الاعتماد على التسليم من المبرمج القديم	1 Handover from leaver to new comer		
6	H	عمل هانداوفر	1 Handover from leaver to new comer		
6	A2	يتم تدوير المعلومة بين اعضاء الفريقهذا يساعد بحل المشكلة ولكن يعتمد على مستوى العضو التارك	19 Circulate information among its members		
6	I	يعني انه يوجد اكثر من شخص يستطيعوا متابعت المشكلة و حلها و مساعدة المبرمج الجديد لتدارك اي مشاكل	19 Circulate information among its members		
6	A1	رئيس الفريق يحاول دائما ان يشغل بديل لاي مطور في الفريق قدر الاستطاعة	2 Team Leader and Senior Developer Involvement		
6	I	يوجد اكثر من شخص يستطيعوا متابعت المشكلة و حلها و مساعدة المبرمج الجديد لتدارك اي مشاكل	2 Team Leader and Senior Developer Involvement		
6	A2	يتم عمل نقل للشغل من المطور التارك للمطور الثابت في الفريق و الاغلب يكون رئيس الفريق	2 Team leader and Senior Developers involvement		
6	H	المشي بطريقة صحيحة بال (requirements development life cycle (QA بحيث ان ترك مبرمج و اتيان واحد جديد لا يثثر على -الشغل	21 Use development life cycle	Handle Turnover	
6	A1	الحل النهائي يتمثل بوقت اضافي لتحليل و فهم المشكلة	6 Extra Time to handle the maintenance		
6	I	استخدام عامل الوقت لحل المشكلة	6 Extra Time to handle the maintenance		
6	A1	الشغل الاخر يتم تأجيله لحل المشكلة الحالية	7 Postpone other tasks		
6	A1	نحاول ان لا يؤثر ذلك على الصيانة لدى الزبون لانا نتدارك الموضوع بعامل الوقت	8 Try to not affect the customer		
6	A1	دائما نطلب من المطور ان يكتب كومنت مفصله لما تم انجازه ولكن ليس الجميع يلتزم بها	3 Code Comments	Documentation	
6	A2	يوجد كتابة دوكيومنت للبزنس و الكود ولكن قرأة الدوكيومنت نفسها يعتبر مشكلة سواءا بالوقت المطلوب لقرأتها او بفهمها	3 Code Comments		
6	H	توثيق الكود التي تمت كتابته ووضع ملاحظات (على مستوى الكود)	3 Code Comments		
6	A2	(ما السبب انكم لا تقوموا بعمل نظامي للتوثيق)؟ لايوجد قرار اداري	20 No management decision for Systematic Documentation		
7	H	(ما السبب انكم لا تقوموا بعمل نظامي للتوثيق) بسبب انه يريد قرار اداري وبسبب ان الانظمة	20 No management decision for Systematic Documentation		

		صغيره ولا تحتناج الي توثيق والكود بسيط ومتشابه اداري			
6	A1	كتابة الكومنت ليس بشكل نظامي	4 Not Systematic Documentation		
6	A2	كتابة الكومنت ليس بشكل نظامي	4 Not Systematic Documentation		
6	A1	البزنس كله موجود و مكتوب	5 Business Documented		
6	A2	يوجد كتابة دوكيومنت للبزنس و الكود ولكن قرأة الدوكيومنت نفسها يعتبر مشكلة سواءا بالوقت المطلوب لقرأتها او بفهمها	5 Business Documented		
6	I	يوجد توثيق على مستوى البزنس وليس الكود	5Business Documented		
6	A1	توصيل الصوره للمطور الجديد او الذي استلم الشغل بصورة خاطئة	10 Wrong handover	Problems in Circulate information	New developer difficulties
6	A1	فهم الزنس	15 Understand the business		
6	A1	الذي ترك كان متابع مع الزبون فكثير من المور لا يعلمها غيره بتفاصيلها كبزنس	12 New developer-unknown details		
6	A1	الزبون طلب حل لمشكلتين وهو قام بانجاز واحده	13 Old developer – not completed work		
6	A1	كان مطلوب امور لم يقم بعملها	9 Un handled issue by old developer		
6	A1	فهم الكود	14 Understand the code		
6	A1	الذي بعده يجد مشكله بالمتابعة مع الزبائن	11 New developer hard to communicate with customer	Other difficulties	
6	A1	عمل اجتماعات كثيره مع الزبون لفهم ماذا كان يريد	16 More meetings with customer		
6	A1	لماذا هذه المشاكل تظهر الان وليس سابقا	17 Why problems appeared now		
6	A1	هل كان الموظف الذي ترك قام بحل حاله واحد وتبقت حالة ثانية ام ان المشكلة جديده كليا	18 Is it new problem		
7	A1	يعتمد على طبيعة وحجم المشكلة	1 Risk depends on size of problem	Turnover Risk and Complexity	Turnover Risk and Complexity
7	I	حسب حجم المشكلة وليس عدد المشاكل	1 Risk depends on size of problem		
7	A2	يعتمد على طبيعة وحجم المشكلة وليس عددها	1 Risk depends on size of problem		
7	A1	يعني هل المشكلة عملت كارثة وايضا من شكوى الزبون	2 Risk depends on customer complaint		
7	A1	مجرد خروج موظف و ظهور مشكله في شغله يعتبر تعقيد لانه لا يوجد احد يحل هذه المشكلة	3 Turnover considered a complex maintenance		
7	I	لم يحدث ان اصبح هناك تعقيد لكثرة التبديل	3 Turnover considered a complex maintenance		
7	A2	فالذي يأتي من بعده وبحال لم يكن التيم ليدر ملم بعمل المطور الذي ترك فهذا يعتبر تعقيد في الصيانة حتى وان كانت طبيعة المشكلة غير معقده	3 Turnover considered a complex maintenance		
7	A2	تناوب اكثر من مطور على نفس الكود يزيد من التعقيد	4 Multi Developers update same code		

3- Questions 8-9 / Team Leader / With Developer Turnover

Group code and extract themes					
Q	**Interviewee**	**Interview extract**	**Code**	**Sub Theme**	**Theme**
8	A1	من الذي سيقوم بمتابعة الصيانة	1 Who will follow up maintenance	Customer anxiety	Customer anxiety
8	A2	و مصدر ثقة بالشغل	10 Old Developer source of trust		
8	A1	ها هذا الموظف ترك وراءه مشاكل كثيره	2 Did old developer solved all current problems		
8	A1	هل سيعطي الجديد نفس النتيجة التي كان يعطيها السابق	3 Did the new one will act like the old one		
8	A1	سرعة الاستجابة و هل الجديد سيكون متفرغ مثل القديم	4 Will the new be as full-time as the old		
8	A1	هل سيرد على الايميلات خلال ساعة و يحل المشكلة او سننتظر لثاني يوم	5 Will he respond to emails directly and fix the problem, or will we wait		
8	A1	الزبون تعود على المبرمج و على شخصيته (وتصبح علاقة ألفه), هل سوف اتكلم مع الجديد بنفس الاريحيه كما كانة العلاقة مع القديم الذي اشتغلت معه لمدة سنتان	6 Familiarity Relationship		
8	I	الزبون بحب يتعامل مع شخص واحد ودائما يسأل عنه	6 Familiarity Relationship		
8	H	الزبون بكون متعود على المبرمج القديم ويحتاج فترة للتعود على الجديد	6 Familiarity Relationship		
8	A2	ممكن ان يكون المطور الجديد احسن من القديم فهذا يؤثر ايجابيا على رضى الزبون	12 Customer Satisfied – New better then Old	Customer is satisfied	Customer Satisfaction
8	A2	عامل الوقت ممكن ان يشكل طوق انقاذ لتبديل المطور, في حال ان الزبون صبر على الجديد مع مساعدة بقية اعضاء الفريق	13 Customer Satisfied – Extra time		
8	H	لم نواجه اعتراض او شكوى من الزبون	14 Customer Satisfied – No complaints		
8	A2	الزبون يستاء جدا	8 customers is dissatisfied	Customer is dissatisfied	
8	A1	فممكن ان الزبون بسبب مشكله واحدة معينه يطلب عدم التعامل مع الموظف الجديد ويطلب بصراحة انه لا يريده بالفريق او لا يريد علاقه معه) وليس لامر شخصي ولكن لانه لم يستطيع ان يفهم الشغل و اصبح عنده مشاكل	7 Not to deal with the new employee – Business problem		
8	A2	وجاء مطور بديل لا يفهم الشغل او يعمل مشكل بالصيانة	7 Not to deal with the new employee – Business problem		
8	I	ممكن يشتكي الزبون للادارة لعدم رضاه عن حل المشكلة	9 customer complains because of abandoned a reliable developer		
8	A2	يشتكي الزبون من الشركة انها تخلت عن مطور يعتمد عليه	9 customer complains because of abandoned a reliable developer		
8	A2	ممكن ان يؤدي الى ان تخسر الشركة المشروع لان المطور الجديد لم يستطيع ان يكمل المهمة	11 The customer abandons the project		
8	I	ممكن توصل لمرحلة ان الزبون يرفض النظام	11 The customer abandons the project		
9	A1	كل المهام التي تعطى لها تحبها و تجد نفسها في كل المواقع	1 Likes current job	Developer Behaviour	Developer Satisfaction
9	A2	يحب عمله الحالي	1 Likes current job		
9	I	الشغل الذي اقوم به الان موافق لشخصيتي	1 Likes current job		
9	A1	متأقلمة مع مهامها	2 Acclimatized to all tasks		
9	A2	لكنه يجد نفسه بحل مشكل البزنس و جمع المعلومات وتحليلها	3 Finds himself in other positions		

4- Questions 2-3 / Developer / With Developer Turnover

Group code and extract themes					
Q	**Interview**	**Interview extract**	**Code**	**Sub Theme**	**Theme**
2	UBS1	المعلومة التى ضاعة لانستطيع ارجاعها	8 knowledge loss – cannot be compensate	knowledge loss	New developer difficulties
2	A	Don't know the business,	1 Unknown Business		
2	UBS1	اول مشكلة فهم البزنس, لانه عند طلب تعديل يجب فهم البزنس لكي يعرف كيف يعدل و التأثير على اماكن اخرى بالبرنامج مثل تقارير معينه	1 Unknown Business		
2	UBS2	فهم البزنس في الفترة الاولى, فهم البزنس من الزبون, نرجع للزبون	1 Unknown Business		
2	UBS3	اولها كان في صعوبة كثير و اسأل كثير عن البزنس	1 Unknown Business		
2	UBS3	عدم معرفة كيف تحل المشكلة مباشرة والنظام شغال live	1 Unknown Business		
2	A	don't know the basics of the required work	2 Unknow tasks		
2	A	واجهة مشكلة بالتكنولوجي المستخدمة و التعلم عليها	3 Unknown Technology		
2	UBS2	التقنية, عندي الاساسيات ولكن عند البدء نحتاج في العمل شيء اكثر تعقيد فاواجه صعوبة في التعلم على التقنية ومتابعة تطورها	3 Unknown Technology		
2	UBS1	اوقات كثير نرجع من الصفر	7 knowledge loss – back from scratch		
2	A	لصعوبة فهم المشروع و معلوماته المبني عليها و ايضا لصعوبة التعديل على الكود المكتوب سابقا لانه غير مفهوم ولا يوجد دوكيومنت واضحة.	4 Code update	Code Issues	
2	UBS1	ايضا ليس كل مبرمج يكتب الكود بنفس الطريقة, فيضر لتغيير طريقة كتابه للكود بما يتناسب مع ما كتبه السابق	4 Code update		
2	UBS2	الصعوبة بالتعديل على كود مبرمج آخر, كيف السابق كتب الكود وبماذا كان يفكر, ممكن فكرتك لحل الكود تختلف عن طريقة زميل سابق	4 Code update		
2	UBS1	يوجد مبرمجين طبيعة كودهم معقدة ولا يعمل توثيق	9 Maintenance Complexity – Complex code		
2	UBS1	التغيير ايجابي - هذا يكتشفه بعد التجربة, ولكن البداية دائما عنده مشكله	10 Positive to change the developer	Positive Issues to handle problems	Decrease Difficulties (Handle Turnover effects)
2	A	الموديلز الجديدة لم اوجه فيها مشكلة	14 No problem in new models		
2	UBS2	يوجد قواعد بسيطه نتبعها لكتابت الكود تساعد قليلا	16 Code standardization Helps		
2	UBS1	عدم وجود توثيق على مستوى الكود لكي اتبع الشغل السابق	5 No Code Documentation	Documentation	
2	UBS2	لا يوجد توثيق للكود	5 No Code Documentation		
2	UBS2	يوجد توثيق للبزنس سواءا من الشركة او الزبون	15 Business Document		
2	UBS3	لم تواجه مشكله في عدم وجود شخص تسأله عن البزنس	15 Business Document		
2	UBS1	بشكل عام نض ملاحظات ولكن توثيق رسمي لا نعمله لانه يأخذ وقت	6 Documentation need time		
2	UBS1	ضغط العمل	11 Work roles and responsibilities	Work roles and responsibilities	Developer Turnover Reasons
2	UBS2	ممكن مش مرتاح بالتعامل	11 Work roles and responsibilities		
2	UBS2	ممكن يغير المجال و يجد نفسه فيه	17 New Opportunity	New Opportunity	
2	UBS1	فرصة احسن, حتى وان كانت فرقية الراتب ليست مبيرة ولكن المبرمج ممكن يرى فيها فرصة احسن	17 New Opportunity		
2	UBS2	بسبب الراتب	18 Salary Issue	Palestine Territory	
2	UBS1	وانا افضل السفر اكثر من العمل مع شركات ال out source	12 Palestine Territory 19 Not Outsource companies		
2	UBS2	ترى ان الترك بسبب السفر اكثر من الout source	12 Palestine Territory 19 Not Outsource companies		
2	UBS1	السفر خارج البلد(رأيه ان السفر موجود بسبب الاوضاع البلد), حيث ان البرمج السفر يلبي طموحه	12 Palestine Territory 13 Job opportunities outside the country		
2	UBS2	بسبب السفر	12 Palestine Territory 13 Job opportunities outside the country		
3	UBS1	المبرمج السابق ترك الشركة, لذلك لو انه موجود بكون اسهل و لكن بسبب عدم وجوده يأخذ وقت طويل لمتابعت الكود من اوله لأخره لكي يعرف كيف يفكر المبرمج السابق	1 Extra Time to review code	Turnover Impact on Maintenance	Turnover Impact on Maintenance
3	A	الشغل القديم واجهت مشكلة اني اريد ارجع بكل صغيرة و كبيرة للتيم ليدر	10 Team Leader and Senior Developer Involvement		
3	UBS2	يوجد شخص آخر يراجع الكود	10 Team Leader and Senior Developer Involvement		
3	UBS3	حاولت احل المشكلة مبدئيا بعدين لجأت لشخص آخر	10 Team Leader and Senior Developer Involvement		
3	UBS1	وجود مبرمج جديد قد يخرب جزئية اخرى من البرنامج عند التعديل و هذا لا يستوعبه الزبون خصوصا اذا كان برنامج حساس مثل البرنامج المالي	2 New problems due to new developer		

3	UBS1	الوقت عامل مهم لان التعديل يأخذ وقت طويل في الفتره الاولى فيعتقد الزبون ان المبرمج لا يتجاوب معه	3 Extra Time to solve the problem		
3	UBS2	ضياع الوقت وتأخير اعطاء الصيانة	3 Extra Time to solve the problem		
3	UBS3	التصرف و حل المشكلة بسرعة حتى وان كان الزبون يعرف ان المشكلة ليست من عندنا او من نظامنا	3 Extra Time to solve the problem		
3	UBS3	تأثير الوقت, محاولت تدارك عن طرق زيادة ساعات العمل	3 Extra Time to solve the problem		
3	A	و في مشروع معين بعد شهر من الشغل لم استطيع الاكمال او عمل صيانه و طلبت اخراجي من المشروع	4 Developer Left the project		
3	A	يحدث نقاشات كثيرة حول المشكلة و طبيعتها هل هي مشكلة قديمة و تم البناء على بيانات خاطئة او مشكلة بالكود و يتم عمل نقاشات ليتم التوصل لكيف سيتم حلها	5 More meetings with customer		
3	A	هل هي مشكلة قديمة و تم البناء على بيانات خاطئة او مشكلة بالكود	7 Is it a new problem		
3	UBS2	نبلي ما يريده الزبون ولكن ليس بكفاءة الذي كان قبل, عدم حل المشكلة بالطريقة التي تناسب الزبون	8 Problem Solving Quality		
3	UBS2	ممكن ان يكون عندي افكار افضل ولكن بسبب عدم المعرفة لا استطيع حل بشل احسن	8 Problem Solving Quality		
3	UBS2	ممكن ان نكتب الكود مرتين لهذا السبب	9 Redundancy in work		

5- Questions 4-5 / Developer / With Developer Turnover

Group code and extract themes					
Q	**Interview**	**Interview extract**	**Code**	**Sub Theme**	**Theme**
4	A	بالعادة الزبون لا يكون مرتاح للمشاكل	1 customer is dissatisfied	Customer is dissatisfied	Customer Satisfaction
4	UBS1		1 customer is dissatisfied		
4	UBS3	بكل الاحوال الزبون يتأثر	1 customer is dissatisfied		
5	A	وفي حال لم يكن راضي, يحاول ان يحمل عدم حل المشكلة بسبب قلت معرفتي بالعمل او اني جديدة على العمل و انه لايستطيع التعامل معي و	3 Customer Dissatisfied – less knowledge		
5	UBS1	عمليه الاستبدال ترجع مع الزبون الى نقطة الصفر وهذا لا يستوعبه, يقول انه جلس مع القديم ساعات طويله و فهمه الشغل و الان هذا كله سوف يختفي و نعيد من الصفر	3 Customer Dissatisfied – less knowledge		
5	UBS1	ويصبح عنده تسأل انه يعلمه مره اخرى و ترك ايضا, يكون عنده دائما خوف من عملية التبديل	7 Customer Dissatisfied – Frequent developer change		
5	UBS1	فيعتقد الزبون ان المبرمج لا يتجاوب معه	8 Customer Dissatisfied developer does not respond to it		
5	UBS1	الزبوم ممكن ان يترك النظام	9 The customer abandons the project		
5	UBS2	ممكن الزبون يرفض النظام, يوجد زبون ترك النظام بسبب كثرة التعديل عليه بعد ان تبدل المبرمجان الذين بنوا النظام	9 The customer abandons the project		
5	UBS1	وجود مبرمج جديد قد يخرب جزئية اخرى من البرنامج عند التعديل و هذا لا يستوعبه الزبون	12 Customer Dissatisfied-New problems due to new developer		
5	A	في بعض الاحيان يرفض التعامل او يكون سلبي.	4 Not to deal with the new employee – Business problem		
5	A	في حال تم حل المشكلة على اكمل وجه , يعبر الزبزن عن رضاه	2 Customer Satisfied – Problem Solved	Customer is satisfied	
5	UBS1	حسب علاقة الزبون بالشركة, اذا كانت قوية ممكن الزبزن يتغاضى عن التأخير	5 Relation with a customer - overcome the delay		
5	USB3	لم يكن الاثر شديد على الزبون , لم يفرق معه قديم او جديد	11 Not a big effect on the customer		
5	USB3	يسأل الزبون عن الشخص الذي ترك	10 Customer ask about the left developer	Customer anxiety	Customer anxiety
5	UBS1	الزبون يكون غير مرتاح وعدم الشعور بالاستقرار	6 Familiarity Relationship		
5	USB3	الزبون متعود على التعامل مع شخص ومرتاح للتعامل فيتأثر ولكن ايضا حسب شطارة الموظف	6 Familiarity Relationship		
6	UBS1	مرتاح بشغله الحالي و غير مؤثر عليه	1 Likes current job	Developer Behavior	Developer Satisfaction
6	UBS2	احب كتابت الكود و فحص الاخطاء, مرتاحة في شغلها الحالي و ايضا اشتغلت بالفحص و حبته	1 Likes current job		
6	USB3	تحب ال contact and Business, تحب موقها الحالي	1 Likes current job		
6	A	تجد نفسها بالQA و البرمجة, ولكن اقرب للبرمجة و هذا هو موقعها الحالي	1 Likes current job		
6	UBS1	اذا تتيح لي الفرصة بحب استلم رئيس فريق	3 Finds himself in other positions		

6- Questions 1-2 / Without Developer Turnover

Group code and extract themes					
Q	**Interviewee**	**Interview extract**	**Code**	**Sub Theme**	**Theme**
1	A1	اشتغلت على نظام مع بالتل كمطور لحالي فقط, الصيانة المطلوبة قليلة, لاني انا التي كتبت الكود, حتى ان النظام فيه حالات معقدة و خاصة جدا ولكني لا اواجه مشكلة لانه كودي و البزنس انا اناقشه معهم	1 Less Maintenance	The advantages of No Developer Turnover	No Developer Turnover
1	A2	يعني ممكن خلال 3 اشهر لاتظهر اي مشكلة صيانة	1 Less Maintenance		
1	H	يوجد عندهم مشاريع من 10 سنوات ولم يتم تبديل مبرمج و لايوجد عليها مشاكل	1 Less Maintenance		
1	UBS	فرق جوهري في الوقت	10 Less Maintenance time		
1	UBS	نفسيا اريح للمبرمج وخصوصا في الصيانة	11 More comfort to the developer		
1	UBS	السيطره على الكود من شخص واحد لا يعمل تعقيد	12 Controlled Code		
1	A2	نعم يوجد سيطرة كبيرة	9 Controlled Maintenance		
1	A1	لاني انا اقوم بها بشكل ممتاز	2 Efficient Maintenance		
1	A1	انا اكتب الكود و اعمل عليه صيانة	6 Same Developer write, update the code		
1	A1	وان ملمة بكل شيء حتى عندما يرجعوالي بمشكلة حسابية ويعتقدوا انها مشكلة فأنا استطيع بسهولة معرفت انها ليست مشكلة واخبارهم بذلك ويكونوا راضيين	7 Strong knowledge		
1	A1	ويتطلب مني وقت للرجوع للكود القديم الذي كتبته و تذكره فيصبح الموضوع كأني اقرأ كود كتبه شخص آخر	8 Extra time to remember old code	Implicit turnover of the developer	
1	H	يوجد مشكلة الرجوع لكود قديم كتبه نفس المبرمج وعند وجود مشكلة لا يتذكر كيف كتب الكود او لماذا كتبه بهذه الطريقة	8 Extra time to remember old code		
1	A2	وبعد فترة طويلة رجع نفس المطور ليعدل على الكود تكون مثل مشكلة دخول مطور جديد على الكود (حيث يكون المبرمج قد نسي كليا كيف كتب الكود)	8 Extra time to remember old code		
1	A1	ولكن اذا تركت المشروع لن يستطيع احد المتابعة بعدي لتعقيد البزنس و الكود وحتى صعوبة كتابة دوكيومنت	4 No Code Document	Documentation	Documentation
1	A2	ولكن اذا تمت كتابة الكود بدون دوكيومنتيشن	4 No Code Document		
1	A1	استخدم الايميلات بيني وبين الزبون كدوكيومنت	5 Email as Document		
2	A1	الصيانة هنا سهلة و لا تعقيد لانيانا اكتب الكود و اعمل عليه صيانة	1 No Complexity in the Normal situation	Less Complexity	Complexity
2	UBS	السيطره على الكود من شخص واحد لا يعمل تعقيد	1 No Complexity in the Normal situation		
2	A1	كثرة الطلبات و التعقيدات فيصبح الصيانة معقدة	2 Complexity - Frequent updates	Complexity	

7- Questions 3-4 / Without Developer Turnover

Group code and extract themes					
Q	**Interviewee**	**Interview extract**	**Code**	**Sub Theme**	**Theme**
3	A1	بالاول الزبون لايملك دوكيومنت للشغل, حاول يستقطب المطور ليشتغل عنده	1 Try to attract the developer	Customer anxiety	Customer anxiety
3	A1	هنا عدم رضا الزبون بسبب من جهة الزبون نفسه و كثرة الطلبات و التعقيدات فيصبح الصيانة معقدة ويتطلب مني وقت للرجوع للكود القديم الذي كتبته و تذكره فيصبح الموضوع كأني اقرأ كود كتبه شخص آخر	2 Customer dissatisfied – delay in maintenance -old code	Customer is dissatisfied (Implicit turnover of the developer)	Customer Satisfaction
3	A2	الزبون راضي بشكل عام	3 Customer Satisfied	Customer is satisfied	
3	H	لايوجد شكاوي من الزبائن الا ما ندر وليس لها علاقة بالمبرمج	3 Customer Satisfied		
3	UBS	الزبون مرتاح	3 Customer Satisfied		
3	A2	بسبب المتابعة و العلاقة الشخصية لفترة طويلة تمتد على مدى سنوات	4 Familiarity Relationship		
3	UBS	صار في علاقة مع الموظف	4 Familiarity Relationship		
4	A1	تجد نفسها بالQA و البرمجة ولكن اقرب للبرمجة و هذا هو موقعها الحالي	1 Likes current job	Developer Behaviour	Developer Satisfaction
4	A2	يحب عمله الحالي	1 Likes current job		
4	UBS	مرتاح بشغله الحالي و غير مؤثر عليه	1 Likes current job		
4	A2	و لكنه يجد نفسه بحل مشكل البزنس و جمع المعلومات وتحليلها	3 Finds himself in other positions		
4	UBS	اذا تتيح لي الفرصة بحب استلم رئيس فريق	3 Finds himself in other positions		

8- Question 1-4 / Customer

Group code and extract themes					
Q	**Interview**	**Interview extract**	**Code**	**Sub Theme**	**Theme**
1	C1	نحن راضين	1 Satisfied Generally	Satisfied	Satisfaction with maintenance in general
1	C2	بشكل عام راضي, وعند حدوث المشاكل يتجاوب مباشر	1 Satisfied Generally		
1	C4	صعب الجواب بعموميات, ولكن بشكل عام بقيمه لحد 80% راضي	1 Satisfied Generally		
1	C2	بعض المرات لايتجاوبوا معنا ولا يردوا علينا لاسباب عديدة	2 Dissatisfied - Delay in Maintenance	Dissatisfied	
1	C1	لكن لا يتم حل مشاكلنا مباشرة	2 Dissatisfied - Delay in Maintenance		
1	C1	من الاسباب عدم وجود نظام متابعة معهم الا عن طريق الايميل فتصبح مبنية على العلاقات الشخصية وبناءا عليه لانعرف متابعة المشكلة ولماذا ظهرت مرتين	3 Dissatisfied - No Tracking system		
1	C1	المبرمجين غير منظمين, كل واحد مسؤول عن جزء ولا يوجد غيره يتبع او يفحص وراءه او يعرف	4 Dissatisfied - No QA or review		
1	C1	المبرمجين غير منظمين, كل واحد مسؤول عن جزء ولا يوجد غيره يتبع او يفحص وراءه او يعرف	5 Dissatisfied - No developer backup		
2	C1	وجود SLA يجعلني راضي	1 Satisfied - SLA	Satisfied	Issues lead to Satisfaction, Dissatisfaction
2	C1	التعاطي مع شكاوينا بجديه اذا لم يقم المبرمج بحل المشكلة	2 Satisfied - Consider complaints seriously		
2	C3	تواصل اكثر	3 Satisfied - Better Communication		
2	C3	ومساحة نقاش اكثر وتفهم لطلباتنا	4 Satisfied - Understand Requirements		
2	C2	وجود اكثر من مبرمج بحيث اذا ترك احدهم يسد محله الآخر	6 Satisfied - developer backup		
2	C2	العلاقات الشخصية	7 Satisfied - Familiarity Relationship		
4.1	C1	ولكن عندهم ticketing system وعن طريقة تتم الاتصال	8 Satisfied- Ticketing system help		
2	C4	عند الصيانة و بسبب انه نظام كبير يوجد عندهم متابعة	8 Satisfied- Ticketing system help		
2	C4	متابعة المشاكل عن طريق عمل تحديث للنظام	10 Satisfied - Periodic Upgrade		
2	C4	وجود علاقة مع المطور	7Familiarity Relationship		
2	C3	ان الامور التي تريد يوم عمل تصبح يومين او اكثر	5 Dissatisfied - Late response	Dissatisfied	
2	C4	ان الامور التي تريد يوم عمل تصبح يومين او اكثر	5 Dissatisfied - Late response		
2	C4	التعامل بشكل تجاري ومحاولت تحويل كل طلب الى مشروع او تغيير رئيسي ليتم الدفع	6 Dissatisfied - cost		
3	C1	الجديد يكون افضل اذا كان مبرمج جيد	1 New developer - better	New developer - evaluation	Old - New Developer evaluation
3	C1	يأخذ مشاكلي على محمل الجدية	3 New developer - take problems seriously		
3	C3	المبرمج الجديد معني لتنفيذ طلباتنا	3 New developer - take problems seriously		
3	C1	ويكون في نتائج مرضيه بغض النظر عن التأخير والSLA تحميني من التأخير وتكاليفه	4 New developer - Satisfied results regardless of the delay		
3	C3	تغيير الشخص صار في تواصل اكثر	8 New developer - Better Communication		
3	C4	وحاله أخرى كان يوجد مطور معطل العمل بطريقة سيئة جدا و استبدلوه بمطور حل جميع المشاكل	1 New developer - better		
3	C3	ومساحة نقاش اكثر وتفهم لطلباتنا	9 New developer - Understand Requirements		
3	C2	فاهم البزنس, والكود	11 Old Developer - Understand Business	Old developer - evaluation	
3	C2	فاهم البزنس, والكود	12 Old Developer - Understand Code		
3	C3	افضل التعامل مع الشخص الذي بني بالاساس	5 Old developer - better		
3	C2	افضل القديم	5 Old developer - better		
3	C3	حتى وان كان الجديد ذو خبرة اكبر لان القديم عنده قدرة على التعامل مع المشاكل بشكل افضل بكثير	6 Old developer - better dealing with problems		
3	C3	ويوفر وقت لانه عامل الوقت عنا مهم جدا ولا نحتمل التأخير	7 Old developer - save time		
3	C1	فنشعر انه يقوم بعمل التفاف على المشاكل بدون حلها جذريا وتعود المشكلة عدة مرات وبصراحة نشعر انه يستغفلنا	2 Old developer - uncooperative		
3	C4	يوجد مطور قديم موجود من اول المشروع , كان شغله سيء جدا و وتحملنا وجوده حتى نهاية المشروع و طلبنا عدم التعامل معه نهائيا	2 Old developer - uncooperative		
3	C4	يوجد شخص آخر كان ممتاز جدا و كنا نخاف من تبديله لانه سيؤثر كثيرا على سير العمل	5 Old developer - better		
4.1	C2	بعض المرات يصلح شغلة ويخرب غيرها	12 New problems due to new developer	New Developer - Negative Impact	New Developer
4.1	C1	ونحن نعلمه ايضا بعض الامور{رغم انه وراءه فريق عمل يوجهه ويعملو له handover ولكن نحن ايضا نعاني ونعلمه	4 We teach the new developer		

4.1	C1	نعم واجهناها تبديل مفاجئ للمبرمج	1 A Sudden change to the developer		Impact on Maintenance
4.1	C3	بعض الامور واجهناها ان بعض الامور لم نتذكر لماذا معموله بالطريقة هذه, هل المفروض ان تكون بهذا الشكل ام هذا بناء خاطئ من المبرمج السابق	10 Less quality		
4.1	C3	ولكن بعض الحالات كانت ان المبرمج الجديد معرفته اقل	11 Less knowledge		
4.1	C1	وعند تغير المبرمج نشعر ان هذا الشخص يتعلم	3 We feel new developer is learning		
4.1	C3	اضرينا نشرح له البزنس من اول وجديد بأكثر من مرحله وهذا يفتح امور سابقة لم يكن متطرق لها	4 We teach the new developer		
4.1	C1	هذا يؤثر علينا و يصل الامر الى خسائر بالشغل	5 Losses at work		
4.1	C2	يؤثر عدم المعرفة بشغل المبرمج السابق ان الجديد سيأخذ وقت في الصيانة, لذلك يقوموا بتأخير الصيانة لعلمهم انها ستأخذ وقت طويل منهم	6 Extra Time to solve problems		
4.1	C3	قرأ الكود وفهمه واستوعبه واخذ فترة منه	6 Extra Time to solve problems		
4.1	C3	وبناءا عليه تسليم شغل بفترة اكبر من المفروض	6 Extra Time to solve problems		
4.1	C3	كان يأخذ وقت أكثر من الطبيعي حتى يحلل المشكلة ويعرف السبب نوصل لمرحلة لا نريد تغيرات الا للحالات الضرورية	8 Reduce change just for urgent issues		
4.1	C3	ان الامور التي تريد يوم عمل تصبح يومين او اكثر وهذا تكلفة علينا اكثر	9 Extra cost		
4.1	C4	وبناءا عليه تسليم شغل بفترة اكبر من المفروض	6 Extra Time to solve problems		
4.1	C4	تيكنكلي يكون فاشل لا يعرف يشتغل و يؤخر الشغل , تأخير كبير, المشكلة التي تحتاج يوم تتأخر اسبوع	6 Extra Time to solve problems		
4.1	C4	ينتج عنه مشاكل جديدة	12 New problems due to new developer		
4.1	C4	نستمر في تذكيره بالمطلوب واهمية تذاكر الصيانة	4 We teach the new developer		
4.1	C3	بعدين مشي الحال وصرنا نطلب صيانه بسهولة	7 Later on, maintenance becomes better	New Developer - Positive Impact	
4.2	C1	نرفع شوكوى ويضطروا ان يعالجوا الموضوع بشكل اسرع ولكن نظامهم عالمي ومستقر	1 Stable System		The customer deals with the turnover problem
4.2	C1	ونحن عندنا خبره بالتعامل بالبرنامج فهذا يعطينا مساحة اوسع للتحمل	2 Customer experience		
4.2	C2	وايضا الزبون نفسه فاهم الشغل تقنيا بسبب تجربته مع شركة برمجة سابقة	2 Customer experience		
4.2	C1	وايضا عند رفع الشكوى يستجيبوا	3 Consider complaints seriously		
4.2	C1	وايضا السعر الذي حصلنا به النظام منافس وهذا يجعلنا نتحمل هذه المشاكل	4 Competitive Price		
4.2	C1	وايضا بسبب حساسة النظام وتعقيده وحجمه, فليس من السهل اطلاقا ان نقوم باستبداله بسبب مشكلة المبرمجين	5 Huge System cannot be replaced	Dealing with Turnover problem	
4.2	C3	اذا بدلوا جونيور بسينور فهذا يكون ايجابي	8 Positive- Junior replaced with Senor		
4.2	C2	يوجد اكثر من مبرمج بعملوا صيانة	9 Positive - Developer backup		
4.2	C4	موضوع الdeadline و الالتزامات تجعلنا لا نستطيع اتخاذ قرار برفض المطور, لانه الجديد يحتاج وقت للتسليم و الانخراط بالعمل و ممكن ايضا ان يكون غير جيد	10 Deadlines		
4.2	C4	لا نستطيع تبديل النظام بسبب اهمية و حجم النظام وصعوبة تبديله	5 Huge System cannot be replaced		
4.2	C3	كنا نحاول استيعاب الامر لانه جديد ونحن مصلحتنا الى مرحلة معينه نتعدي هذا الموضوع	7 Trying to overcome it	Not Dealing with Turnover problem	
4.2	C1	بعض البرامج نترك البرنامج من اصله بسبب كثرة تبديل المبرمجين وتصبح مشكلة كبيرة وبالتالي كثرة المشاكل التي لانتحملها	6 Some system replaced		
4.2	C2	أدى تبديل المبرمجين الكثير الى ترك النظام وبناء نظام جديد مع شركة جديدة	6 Some system replaced		
4.2	C3	وكنا نرفض هذا الوضع ونصل لمرحلة ترك البرنامج كاملا لانتحملها	6 Some systems replaced		
4.2	C4	لا نفكر بالتغيير حتى اذا كان المطور ضعيف ولكن يسلك الشغل بأقل القليل و نحاول استيعاب الامر	7 Trying to overcome it		
4.2	C4	اذا لم تحل المشكلة نلجأ الى الشكاوي الكثيرة و العالية و حل المشكلة مع ادارة الشركة	11 Escalations		

4) Final Themes

With Developer Turnover							
Position	Q. No	No. Of agreements per theme	No. Of agreements per sub theme	No. of codes	Related Codes	Sub Themes	Themes
TL	2	4	4	2	1,8	Types of Turnover	Types of Turnover
	2	2	2	3	10,9,7	Encourage developers	Encourage developers
	2		4	4	2,5,6,11	Palestine Territory	Developer Turnover Reasons
	2	8	4	2	3,4	Work roles & responsibilities	
	3		4	12	1-12	Impact on maintenance	Turnover Impact on Maintenance
	4		4	2	1,2	Impact on Number of Tickets	
	5	12	4	4	1,2,3,4	Impact on Bug Tracking	
	6		4	3	1,2,19	Circulate information	Handle Turnover effects
	6		3	4	6,7,8,21	Handle Turnover	
	6	11	4	4	3,4,5,20	Documentation	
	6		1	10	9-18	Problems in Circulate information	New developer difficulties
	6	2	1	4	11,16,17,18	Other difficulties	
	7	3	3	4	1,2,3,4	Turnover Risk	Turnover Risk
	8	4	4	7	1,2,3,4,5,6,10	Customer anxiety	Customer anxiety
	8		2	3	12,13,14	Customer is satisfied	Customer Satisfaction
	8	5	3	4	7,8,9,11	Customer is dissatisfied	
	9	3	3	3	1,2,3	Developer Behaviour	Developer Satisfaction
Dev	2		4	5	1,2,3,7,8	knowledge loss	New developer difficulties
	2	7	3	2	4,9	Code Issues	
	2		3	3	10,14,16	Positive Issues	Decrease Difficulties (Handle Turnover effects)
	2	6	3	3	5,6,15	Documentation	
	2		2	1	11	Work roles & responsibilities	Developer Turnover Reasons
	2		2	1	17	New Opportunity	
	2	6	2	4	12,13,18,19	Palestine Territory	
	3	4	4	9	1,2,3,4,5,7,8,9,10	Turnover Impact on Maintenance	Turnover Impact on Maintenance
	4,5	2	2	2	6,10	Customer anxiety	Customer anxiety
	4,5		3	3	2,5,11	Customer is satisfied	Customer Satisfaction
	4,5	7	4	7	1,3,4,7,8,9,12	Customer is dissatisfied	
	6	4	4	2	1,3	Developer Behaviour	Developer Satisfaction
With Out developer Turnover							
Position	Q. No	No. Of agreements per theme	No. Of agreements per sub theme	No. of codes	Related Codes	Sub Themes	Themes
Mix	1	7	4	8	1,2,6,7,9,10,11,12	The advantages of no developer turnover	Impact of no developer turnover
	1		3	1	8	Implicit turnover of the developer	
	1	2	2	2	4,5	Documentation	Documentation
	2	3	1	1	2	Complexity	Complexity
	2		2	1	1	Less Complexity	
	3	1	1	1	1	Customer anxiety	Customer anxiety
	3	4	1	1	2	Customer is dissatisfied	Customer Satisfaction
	3		3	2	3,4	Customer is satisfied	
	4	3	3	2	1,3	Developer Behaviour	Developer Satisfaction
Customer Satisfaction							
Position	Q. No	No. Of agreements per theme	No. Of agreements per sub theme	No. of codes	Related Codes	Sub Themes	Themes
	1		3	1	1	Satisfied	Satisfaction with maintenance in general
	1	5	2	4	2,3,4,5	Dissatisfied	
	2		4	7	1,2,3,4,6,7,10	Satisfied	Issues lead to Satisfaction, Dissatisfaction
	2	6	2	2	5,9	Dissatisfied	
	3		3	5	1,3,4,8,9	New developer - evaluation	Old - New Developer evaluation
	3	7	4	6	2,5,6,7,11,12	Old developer - evaluation	
	4.1		4	10	1,3-6,8-12	New Developer - Negative Impact	New Developer Impact
	4.1	5	1	2	2,7	New Developer - Positive Impact	
	4.2		4	8	1-5,8,9,10	Dealing with Turnover problem	The customer deals with the turnover problem
	4.2	8	4	3	6,7,11	Not Dealing with Turnover problem	

5) Rearranged Themes based on No of agreements

With Developer Turnover							
Position	Q. No.	No. Of agreements per theme	No. Of agreements per sub theme	No. of codes	Related Codes	Sub Themes	Themes
TL	3		4	12	1-12	Impact on maintenance	Turnover Impact on Maintenance
TL	5		4	4	1,2,3,4	Impact on Bug Tracking	
TL	4	12	4	2	1,2	Impact on Number of Tickets	
TL	6		4	4	3,4,5,20	Documentation	Handle Turnover effects
TL	6		4	3	1,2,19	Circulate information	
TL	6	11	3	4	6,7,8,21	Handle Turnover	
TL	2		4	4	2,5,6,11	Palestine Territory	Developer Turnover Reasons
TL	2	8	4	2	3,4	Work roles & responsibilities	
TL	8		3	4	7,8,9,11	Customer is dissatisfied	Customer Satisfaction
TL	8	5	2	3	12,13,14	Customer is satisfied	
TL	8	4	4	7	1,2,3,4,5,6,10	Customer anxiety	Customer anxiety
TL	2	4	4	2	1,8	Types of Turnover	Types of Turnover
TL	7	3	3	4	1,2,3,4	Turnover Risk	Turnover Risk
TL	9	3	3	3	1,2,3	Developer Behaviour	Developer Satisfaction
TL	2	2	2	3	10,9,7	Encourage developers	Encourage developers
TL	6		1	10	9-18	Problems in Circulate information	New developer difficulties
TL	6	2	1	4	11,16,17,18	Other difficulties	
Dev	4,5		4	7	1,3,4,7,8,9,12	Customer is dissatisfied	Customer Satisfaction
Dev	4,5	7	3	3	2,5,11	Customer is satisfied	
Dev	2		4	5	1,2,3,7,8	knowledge loss	New developer difficulties
Dev	2	7	3	2	4,9	code Issues	
Dev	2		3	3	10,14,16	Positive Issues	Decrease Difficulties (Handle Turnover effects)
Dev	2	6	3	3	5,6,15	Documentation	
Dev	2		2	4	12,13,18,19	Palestine Territory	Developer Turnover Reasons
Dev	2		2	1	11	Work roles & responsibilities	
Dev	2	6	2	1	17	New Opportunity	
Dev	3	4	4	9	1,2,3,4,5,7,8,9,10	Turnover Impact on Maintenance	Turnover Impact on Maintenance
Dev	6	4	4	2	1,3	Developer Behaviour	Developer Satisfaction
Dev	4,5	2	2	2	6,10	Customer anxiety	Customer anxiety
Without developer Turnover							
Position	Q. No.	No. Of agreements per theme	No. Of agreements per sub theme	No. of codes	Related Codes	Sub Themes	Themes
Mix	1	7	4	8	1,2,6,7,9,10,11,12	The advantages of no developer turnover	Impact of no developer turnover
	1		3	1	8	Implicit turnover of the developer	
	3	4	3	2	3,4	Customer is satisfied	Customer Satisfaction
	3		1	1	2	Customer is dissatisfied	
	4	3	3	2	1,3	Developer Behaviour	Developer Satisfaction
	2	3	2	1	1	Less Complexity	Complexity
	2		1	1	2	Complexity	
	1	2	2	2	4,5	Documentation	Documentation
	3	1	1	1	1	Customer anxiety	Customer anxiety
Customer Satisfaction							
Position	Q. No.	No. Of agreements per theme	No. Of agreements per sub theme	No. of codes	Related Codes	Sub Themes	Themes
	4.2		4	8	1-5,8,9,10	Dealing with Turnover problem	The customer deals with the turnover problem
	4.2	8	4	3	6,7,11	Not Dealing with Turnover problem	
	3		4	6	2,5,6,7,11,12	Old developer - evaluation	Old - New Developer evaluation
	3	7	3	5	1,3,4,8,9	New developer - evaluation	
	2		4	7	1,2,3,4,6,7,10	Satisfied	Issues lead to Satisfaction, Dissatisfaction
	2	6	2	2	5,9	Dissatisfied	
	4.1		4	10	1,3-6,8-12	New Developer - Negative Impact	New Developer Impact
	4.1	5	1	2	2,7	New Developer - Positive Impact	
	1		3	1	1	Satisfied	Satisfaction with maintenance in general
	1	5	2	4	2,3,4,5	Dissatisfied	