

# Proposition of Recommendations for Choosing a Project Manager Software for Virtual Agile Small-Scale Start-ups

by

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# **Proposition de recommandations pour le choix d'une le logiciel de chef de projet pour les PME virtuelles agiles**

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## **RÉSUMÉ**

Les chefs de projet sont confrontés à divers défis concernant la gestion des ressources et des tâches. L'un des plus grands défis est de choisir le logiciel qu'ils utilisent pendant le projet pour configurer leurs tâches planifiées et suivre leur progression au sein de leur équipe. Chaque progiciel possède différentes fonctionnalités qui peuvent être utiles dans le processus de gestion de projet.

Cependant, les start-up peuvent avoir du mal à choisir le logiciel le plus adapté en raison de contraintes budgétaires et de temps. Les start-up manquent généralement de l'expérience requise et d'une vision claire de l'avenir, elles ne peuvent donc pas déterminer leurs besoins et reconnaître quel logiciel serait le plus adapté à leurs besoins.

Les recommandations proposées dans cette étude visent à aider les chefs de projet à prendre une décision plus éclairée dans le choix de leur logiciel de gestion de projet en fonction des besoins et des priorités de chaque équipe. Pour ce faire, cette étude a mené des enquêtes auprès de 37 personnes parmi 11 chefs de projet et 26 membres d'équipe au sein de huit start-up utilisant la gestion de projet agile et composées de 5 à 12 membres. Ils ont été interrogés sur leurs besoins et leur satisfaction vis-à-vis de logiciels tels que Teamwork, Zoho, Asana, Trello et Monday.

Selon les résultats de l'enquête dans la section Chi-Square et le tableau de fréquence, Asana était le meilleur choix pour la majorité. Les résultats du test du chi carré indiquent également qu'il n'y avait pas de corrélation entre le rôle des participants et le logiciel le mieux choisi (selon la quantité de p-value). Enfin, cinq équations ont été construites à l'aide d'une régression linéaire multiple pour recommander le logiciel optimal en fonction des préférences et des exigences de chaque nouvelle start-up.

**Mots-clés :** Gestion de projet, start-up, projets agiles, logiciel de gestion de projet





# **Proposition of Recommendations for Choosing a Project Manager Software for Virtual Agile Small-Scale Start-ups**

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## **ABSTRACT**

Project managers face various challenges regarding managing resources and tasks. One of the greatest challenges is choosing the software they use during the project to set up their scheduled tasks and track their progress within their team. Each software package has different features that can be useful in the project management process.

However, start-ups can find it difficult to choose the most suitable software due to budgetary and time constraints. Start-up's generally lack the required experience and a clear vision of the future, so they cannot determine their needs and recognize which software would be the most suitable considering their needs.

The recommendations proposed in this study aim to help project managers to make a more informed decision in the selection of their project management software according to the needs and priorities of each team. To do so, this study conducted surveys with 37 individuals from 11 project managers and 26 team members within eight start-ups using agile project management and composed of 5-12 members. They were asked about their needs and satisfaction with software such as Teamwork, Zoho, Asana, Trello and Monday.

According to the survey results in the Chi-Square section and frequency chart, Asana was the best choice for the majority. The results of the chi-square test also indicate that there was no correlation between the role of participants and the best- chosen software (according to the amount of p-value). Finally, five equations were constructed using multiple linear regression to recommend the optimal software based on each new start-up's preferences and requirements.

**Keywords:** Project management, start-ups, agile projects, project management 's software



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**LIST OF ABBREVIATIONS**

AI	Artificial intelligence
F	Features
FC	Features category
ML	Machine learning
MCA	Multiple correspondence analysis
PM	Project manager
PMBOK	Project management body of knowledge
QFD	Quality function development
HOQ	House of quality
TM	Team member
VOC	Voice of customer
Weight FC	Weights of features category
XP	Extreme programming



## INTRODUCTION

During the early stages of a business, many start-ups face challenges due to uncertainty, unpredictability as well as financial, time, and resource constraints. Start-ups are sensitive to changes in technologies and markets. (G. Carmine, N. Paternoster, 2016).

Moreover, because of covid-19, many organizations switched to remote working starting in March 2020. As a result, the value of teleworking increased. Communication has been identified as the most important aspect of a successful virtual team by Poole and Zhang (2005), defining it as "the glue that keeps teams together" (Poole and Zhang, 2005)

Therefore, this study attempts to recommend project managers to choose a proper project management software.

In order to propose the recommendations, this study has benefited from survey research. Information has been obtained from 37<sup>1</sup> participants answering survey questions. The research further has used six methods to analyze the data. These descriptive methods which are specifically used for analyzing data obtained from samples are:

(1) QFD (2) Average Matrix (3) Multiple Correspondence analysis (MCA) (4) Chi-Square (5) Multiple Linear Regression (MLR), and (6) Classification tree.

The results obtained from the first three methods were failed experiments bearing no additional information, given their different types of the data. The Chi-square test determines whether there is correlation between the best software chosen by project managers or team members. According to the p-value from the Fisher exact test, it can be said that the null hypothesis (i.e., no correlation between the role and the best-chosen software) should be accepted or rejected. In this case because the p-value was greater than 0.05, so the null hypothesis was accepted. Thus, there is no correlation between the role and the best-chosen software. In the future works, the data from team members and project managers of start-ups can be analyzed together.

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<sup>1</sup> This study tried to have 100 surveys of managers and employees, but because of Covid-19 and teleworking situations, and a long list of questions in the survey, at the end just 37 applicants completed the survey.

Furthermore, the multiple linear regression was performed five times separately for each software to obtain an equation for each. The five equations can recommend appropriate software for a new project manager with other preferences in any business setting. Finally, the classification tree obtained new categories for the participants, that a new project manager with the same preferences can be fixed in the same group and choose the same software.

## **CHAPTER 1**

### **OVERVIEW AND DEFINITION**

#### **1.1 The Problem and its Background**

Start-up teams face more challenges than large enterprises in choosing the best appropriate software for their project management needs due to budget and time constraints. Project management is an essential for start-ups to track their progress and timelines. They usually lack the required experience and a clear vision of the future, so they cannot determine their needs and recognize what would be the best software to meet those needs. They require the cheapest and fastest choice for their management needs. Therefore, this study aims to provide them with recommendations that they can benefit from, instead of trying different software and finding out that they have sometimes chosen the wrong one and then switching to a new software, so as to avoid wasting time, money, and resources.

This study becomes more relevant today, where given the unprecedented time of COVID-19, most companies either have moved completely remote or into a hybrid model and must use the most affordable and useful management tools. Instead of wasting time considering the different features of each software in a market, they can use the suggested results of this research to find the most suitable solution. In particular, due to the current virtual relationships between company team members, communication is critical for virtual agile teams since they rely on Enterprise Social Networking technologies such as Monday.com and Trello to manage project activities. Using such technologies provides several benefits, including increased transparency, day-to-day interactions, and team awareness.

#### **1.2 Project Communication Managements**

Project communication management is primarily concerned with the procedures that must be followed to ensure that project information is collected, created, and processed on time, as well as the monitoring, control, and disposal of project information. It deals with questions such as “who needs what information the most?”, “when are they in need of that information the

most?" A similar question: project managers spend a lot of time communicating with team members. An effective communication strategy connects various stakeholders, who may come from different cultural and organizational backgrounds and have varying interests, all of which influence the delivery of the project.

Therefore, appropriate resources such as time and budget are allocated for communication activities.

The fifth edition of Project Management Body of Knowledge (PMBOK) guidebook states that:

" Effective communication means that the information is provided in the right format, at the right time, to the right audience, and with the right impact. Efficient communication means providing only the information that is needed. " (Project Management Institute, 2013)

### **1.3 Tools of Groupware**

Groupware tools can be classified into three levels (Dahiru, Usman & Mohammed, Abubakar,2015).

1. Communication Tools: This type of software is used to send different types of messages, emails, files, web publishing, file sharing, and more.
2. Conferencing Tools: This group of software is to establish real-time interactions, for instance, chat, video and audio conferencing, forums, etc.

#### **3. Collaborative Management Tools:**

These tools facilitate group activities such as project management, information management and workflow.

Based on to the different meetings with start-ups, project managers, and experts, this research focuses on the top five software. The five chosen software are Zoho project, Monday.com, Trello, Teamwork and Asana. The majority of start-ups volunteered to participate in this study and surveys were aware of this five software.

#### **1.4 Statement of the Problem**

There is no significant guideline that helps managers and employees identify a proper project management software that matches their specific requirements, especially in start-ups with low experience and low budget. Start-ups with small-scale teams (five to twelve people) have the challenge of finding the proper software according to their needs. They often choose software and then might get forced to switch to another one due to insufficient features they need from the software.

There is a lack of knowledge about collaborative software for project managers and their usages, and there is no remarkable advice that points to a project management software that fits the needs and priorities of start-ups.

#### **1.5 Purpose of the study/ Research Gap**

There is no proper recommendation for project managers of start-ups to choose their software. This study aims to create a recommendation that suggests the most appropriate project management software and its associated features according to each Startup's needs.

The target group of this study is start-ups with 5 to 12 team members who are using the agile method to manage their tasks. This study aims to prevent start-ups from wasting time, energy, resources, and money choosing the wrong software that might not satisfy all their current and future needs.

#### **1.6 Research Questions**

1. How to choose a project management platform for Start-up teams?

What are the expectations and needs of Start-up teams' project managers and team members?

For example, task management, communication features and document management.

(Characteristics of a platform)

According to the ranking of customer satisfaction, what are the most affordable and valuable software among the followings: 1-Trello, 2-Asana, 3-Zoho project, 4-Monday, and 5-Teamwork for the start-ups with an agile project management methodology and a team of 5-12 members? According to the participants' (project managers and their team members) experience, five software were chosen for this research's surveys. (More details have explained in section 3.4 of this thesis)

### **1.7 Significance of the Study**

During this unprecedented time of COVID-19, most projects are done in dispersed teams regardless of their geographical locations. Communication is vital for virtual teams, and project management software is essential in managing their daily tasks.

So, having a recommendation for choosing the proper project management software and knowing best practices can benefit both employees and employers, especially start-ups. Even if people overcome covid-19, some companies still prefer to continue remote working, and software is an essential tool for proceeding with the tasks.

This study performs a comparative analysis of different software and recommends the start-ups the software that fits their needs. This way, the start-up will reduce cost, wasted resources, and energy, focusing more on what matters to them: bringing the best product to market.

### **1.8 Hypothesis**

In this study, the following assumptions are considered:

1- There is no full-featured (calls, messaging, and tasks management) project management software that does not require any subscription or payment. Therefore, companies, especially start-ups who have limited budgets and experience, need to find a software that can fulfill their needs and be affordable at the same time.



2- Startup's and team managers with different backgrounds need and use different features from software and need recommendations to choose the proper project management software to prevent wasting time and reduce risks.

3- Different project management software can offer various services and features despite the many similarities they may have.

4- There is a correlation between the best-chosen software and the role of survey participants. For instance, team members and project managers have a similar taste in choosing project management's software.

### **1.9 Scope (Assumptions, challenges, Limitations, and Delimitations)**

A survey was prepared and given to 37 anonymous individuals who were chosen based on their experience working with project managers software. They worked in start-ups with different business categories, such as finance, IT and marketing, etc. This survey included five software and their features. (More details are explained in section 3.4 of this study)

The followings are the assumptions and limitations of this study:

1. The individuals were asked to rank these features based on their satisfaction with using the software.

Generally, when the sample size is larger, the biases would be less in the results. Because this study was carried out during the time of Covid-19, it was not difficult to communicate with many people and convince them to participate in the survey. Initially, this study attempted to invite 100 surveys of managers and employees to complete the survey. Still, because of teleworking, it only received 41 results, 4 of which were eliminated for significant error and bias and remained only 37.

No power analysis was performed for the sample size to have a minimum number of participants. It was not a planned experience with an adopted experimental design. This research is primarily descriptive, and all the statistical methods used are descriptive. Despite this, the sample size can be considered sufficient because there was no inference or use of p-values. This study only used the p-value for the chi-square test, but because of the Fisher exact test, it is reasonable, and this test is generally used for analyzing small samples.

Generally, the sample size is considered when the goal is to use P-value and confidence intervals to infer to the whole population based on the sample results. Moreover, the statistical tools that were used are intended for descriptive analysis, the purpose of which is to report and describe the behavior of the participants. In this study there is no need to extrapolate the result to the entire population.

2. The main point is that the teams are non-co-located.
3. Time was a limitation for us in this study.
4. Size groups of teams are important in this research, and teams of 5-12 people are considered.
5. To achieve more precise results, this study only considers agile projects and virtual teams.
6. Zoho has different software on its website: Zoho project, Zoho sprint, etc. However, wherever the name Zoho is mentioned throughout this study, it refers to the Zoho project.
7. This thesis has not considered the different types of security in start-ups, their data, the location and country of each software, and limitations regards to policies about the cloud and uploading data.

There are three main challenges in this research:

1. Software has different versions; like free/silver/gold or premium:

This software has three or four different versions: a free version (basic one) – A premium version (advanced one- around ten to fourteen dollars) – Enterprise (VIP one more than twenty dollars). Start-ups may not have enough money to spend on full-featured software that might be very expensive. In addition, their needs might not be satisfied only with a basic plan. Therefore, this study will focus on the second version (premium one – or the version around ten to fourteen dollars) that is considered affordable and useful simultaneously (Except for the Zoho project, the third version was chosen for this research.)

It is worth mentioning that all the survey applicants have experience with these versions.

2. Some of these software can automatically integrate with other software like Slack, Zoom, or Google Calendar. It can be effective in each software's value and preferences.

3. Software may get updated in the future, so this research's list of software features may change in the next versions.

### **1.10 Outline of thesis**

This thesis is organized as follows: in chapter 1, background, objectives, research questions, Significance of the study, hypotheses, scope and limitations, and outlines have been discussed. In chapter 2 presents literature review. It is followed by the presentation of the methodology and the framework in chapter 3. The findings and results are further discussed in chapter 4 and in the last section, conclusion, future work, and research directions have been summarized.

## CHAPTER 2

### LITERATURE AND REVIEW

#### 2.1 Start-ups

Start-ups are " human institutions designed to deliver new products or services under conditions of extreme uncertainty," according to E. Ries' definition from 2011. (E.Ries, 2011; N. Assyne, 2017) Additionally, start-ups have been defined as recently established human institutions with no past and prepared to produce cutting-edge innovations (N. Paternoster, C. Giardino, M. Unterkalmsteiner, T. Gorschek, and P. Abrahamsson. 2014; N. Assyne, 2017). S. M. Sutton views them as new and innovative institutions prepared to adapt their practices. Sutton said that start-ups have the following characteristics: they are young and immature, have limited resources, are subject to many influences, and use cutting-edge technologies. (Sutton, M. M. 2000; Assyne, N. 2017) These definitions imply that to be successful, start-ups must avoid bureaucratic processes and implement lean and agile techniques to develop and give customers what they want to use. (E.Ries, 2011; N. Assyne, 2017) As can be seen in Table 2.1, other definitions of start-ups have been discussed.

Table 2. 1 “Startup”. Definitions

Taken from Shvets, G. (2018.p28)

Author	Definitions of “start-up”
S. Blank, B. Dorf	Startup-is a temporary structure, carrying out a search for renewable, profitable, and scaled business models.
E. Reece	Startup company-any newly created organization, set up for creation of a new product in conditions of extreme uncertainty.
D. Ponomaryov	Startup-is a form of innovative activity. It’s a company having short history of operational activities, that remains in the stage of development or investigation of perspective markets
L. Reiner	Startup- is a company that normally is engaged in designing and implementing innovative development processes, validation, and investigation of key markets.

Author	Definitions of “start-up”
Administration of small business of the USA	Start-up is a business, which usually is technologically oriented and possesses high development potential.
P. Graham	Start-up is a company, designed for quick expansion.
A. Evseychev	Start-up is a process of realization of an idea within a short period and, as a rule, at limited resources of an uncommon project, having innovative character.

In Table 2.2, there is a comparison of start-ups and small business enterprises (G.Shvets. 2018; N.I. Sytnyk. 2016) that can be useful for separating them from each other and, according to these items, can be recognized if a team is a start-up or small business enterprise. There are some other factors, such as the size of teams, amount of the budget, bureaucracy, and market, to find out if the team is still a start-up or not anymore. (Sean Peak, 2022)

Table 2. 2 Comparison of star-ups and small business enterprises

Taken from Shvets, G. (2018.p29); Sytnyk N.I. (2016. pp. 64-68)

Characteristic	Start-up	Small business enterprise
Innovative character	Established for realization of new ideas	Established both for realization of new ideas and on copying already existing ideas
Sphere of activity	IT-products, high tech products	Services, distribution, manufacturing
Trajectory of successful development	Oriented on short term existence, success is attributed to transition into a big company, sale or merging, or public tock floatation	Oriented on long term existence in nearly unchanged form, success is not attributed to sale or merging
Growth rate	High	Not high
Capability of scaled business model	High	Not high
Influence on the market	Essential	Insignificant

Characteristic	Start-up	Small business enterprise
Infrastructure	Business incubators, business accelerators, start-up schools, techno-parks	Business centres, business incubators, techno-parks, leasing centres, business supporting funds, investment funds, innovations funds, information, and consulting agencies et a.
Source of investment	Own means, business angels, venture funds, seed funds, crowd funding	Own financial means, bank credits, business angels
Activity scale	International	Mostly Local or regional

In Table 2.3, the different stages of start-up development have been illustrated: the pre-start-up stage, start-up stage and post-start-ups stage. This information was one of the helpful points that the author of this study used in the surveys with start-ups.

Table 2. 3 Stages of start-up development

Taken from Kornukh O.V. (2014. - pp. 26-30); Shvets, G. (2018.p29)

Start-up stage	Description
Pre - STARTUP stage	
Pre-seed stage	There exists an idea and it has been clearly determined what buyers need, though there is not a clear understanding of how the idea should technically be implemented and promoted, so that it should earn money, or there is but a general idea.
Seed stage	The market is investigated, start-up plan is compiled, requirements specification is compiled and executed, a prototype is created and tested, search for first investors and preparatory work goes on for the project's start up.
Prototype	Compilation of requirement specifications and interfaces design
Operational prototype	Creation of the product or the project with the main functions
Alpha version of the project (product)	Although the project (product) is ready, testing has not yet taken place. Throughout testing, certain small modifications that were missed during the requirement-specification and design phases are added to the interface. First potential consumers are approached for negotiations.

Closed beta – stage of the project (product)	Innovative projects look close to those designed by start-uppers; a small number of users, invited by the founders, appear with the objective of testing service and reveal possible errors, drawbacks, or modifications.
<b>Start-up stage</b>	<b>Description</b>
Public beta-version of the project (product)	Relatively active invitation of customers, who need the services, offered by the project goes on. Very often the public beta-version is done by distributing a limited number of invitations. Agreements with first customers are also concluded.
Start-up of the project (product's manufacturing)	
Startup stage	This is a crucial stage for any projects –early and late start up stage and initial operating stage.
Post -STARTUP stage	
Growth stage	The start-up occupies a regular place in the market, moving steadily towards finding a niche, specified at the stage of business plan compilation.
Expansion stage	The start-up has approached execution of the business plan in the original specified market and begins to extend its boundaries, by means of occupying other markets. The company may expand its business both unilaterally and by purchasing other enterprises.
Exit stage	Exit from business activity (partial or complete) by business-angels and venture investors, who previously participated in financing of the start-up. Such exit can be carried out by selling the company to strategic investors, by stock floatation at the stock market, (an outlet to IPO) and by private stock floatation (sales of the enterprise's shares. Venture funds finance promising start-ups, that at the initial growth stage exhibit quick growth and slow down prior to the exit stage, as compared to the previous stages, although the business itself becomes more stable. Also, one of the variants of start-uppers' or investors' exit can be business cessation or enterprise's bankruptcy.

Start-up firms rely on outside investment to help them succeed. In the United States and Europe alone, start-up firms got 429 billion dollars in 2015 (PitchBook Data, Inc. 2015). A 75 percent optimistic start-up failure rate equates to \$322 billion in cash, possibly squandered on failed projects.

Product engineering difficulties and deficiencies in applied engineering methods have been connected to start-up failures in previous research (C. Giardino, S.S. Bajwa, and X. Wang, E. Klotins, 2018). It's difficult to say how much software engineering methods are accountable for or connected to the success rate. On the other hand, improved software engineering techniques might raise the chance of success by just a few percent, resulting in a considerable increase in capital return.

Some authors, such as Sutton (S.M. Sutton, E.C. Cubed, and M. Andretti, 2000) and Giardino (C. Giardino, M. Unterkalmsteiner, 2014) emphasize the difficulties that start-ups confront, like high risk, unpredictability, an insufficient resources, rapid development, inexperienced teams, and time limitations, among others. Start-ups, on the other hand, are flexible to new engineering techniques and sensitive to changing technology and markets (G. Carmine, N. Paternoster, 2016).

According to an earlier study (E. Klotins, 2018) that focused on the amount of empirical evidence to support their uniqueness, most start-up characteristics are based on anecdotal evidence.

Consequently, software engineering across start-ups and other companies putting new software-intensive products on the market may be identical. (Klotins and colleagues, 2021)

## **2.2 Reasons Affecting Start-up Failure**

Start-ups have developed as a natural reaction to the present economic circumstances, focusing on quality, innovation, and customer involvement. But there is no generally agreed definition of a start-up, Eric Rise's is the most often accepted: "start-ups are human organisations that are designed to create new products and services in the face of significant uncertainty." (Rise, 2011).

The danger and uncertainty in which start-ups operate is frequently mentioned (Blank & Dorf, 2012; Morales-Trujillo & Garca-Mireles, 2019), and one of the reasons why many businesses fail within the first five years is because of this. (Nobel, 2011; Crowne, 2002).



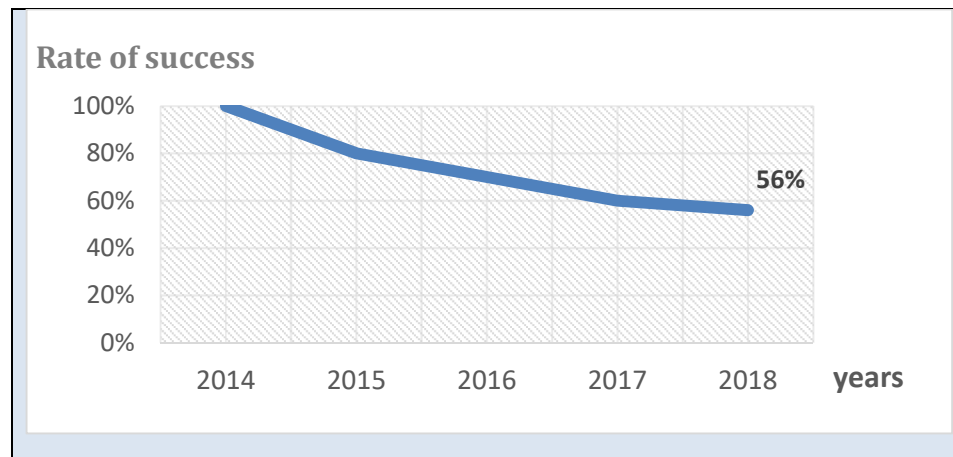


Figure 2. 1 Rate of Start-up success over the previous five years

Taken from M. Mansfield (2019), Raluca Ionica (2020, p. 3)

Figure 2.1 depicts the state of businesses created in 2014 over a five-year period. As can be seen, the overall trend of start-up survival is declining, with just 56% of newly launched businesses surviving in their fifth year. (R. Dovleac, A. Ionica & M. Leba. 2020).

Lack of financial resources, a lack of technical innovation, and a lack of experience have all been identified as significant causes of start-up failure. (R. Dovleac, A. Ionica & M. Leba. 2020).

Throughout history, many academics have emphasized the significance of start-ups and small companies to the economy. Due to its unique features, such as rapid changes to meet customer needs, many software firms have embraced agile methods for their development process. Accepting change, ensuring flexibility in reacting to business strategy, delivering products and features in incremental, iterative stages, self-organizing teams, and emphasizing working code rather than extensive documentation are all hallmarks of agile methods. (R. Dovleac, A. Ionica & M. Leba. 2020).

The monitoring of three essential factors, also known as the project triple imperative, which are generally connected with project success, is the basic, but at the same time relatively simple, basis for project management. (Turner, R.; Ledwith, A.; Kelly, J ,2009). The project triple imperative expresses three essential elements that determine the project's success: time,

project budget, and output quality. (Nagyová A, Pačaiová H, Markulík Š, Turisová R, Kozel R, Džugan J, 2021).

Project management frequently results in a variety of issues, and this is true even for the best-planned projects. When striving to achieve these two constraints, the timetable is frequently delayed (time), expenses are frequently surpassed (project budget), and the quality of the result occasionally deteriorates. Each of these scenarios is detrimental to the client. Even if the project product is of acceptable quality and is produced on time, it might cause the same issues as poor-quality output that is supplied on time. (Nagyová A, Pačaiová H, Markulík Š, Turisová R, Kozel R, Džugan J, 2021; Turner, R.; Ledwith, A.; Kelly, J, 2009).

So, choosing a proper project management platform, can help the start-ups to monitor cost, time, resources and in the next steps quality to reduce the risks. (Nagyová A, Pačaiová H, Markulík Š, Turisová R, Kozel R, Džugan J, 2021).

### **2.3 Agile Methodology**

The Agile manifesto suggests a change from massive, plan-driven engineering to lighter, more flexible, and customer-focused procedures (K. Beck, M. Beedle, 2021). This manifesto serves as the foundation for agile software engineering approaches. For instance, the Scrum and XP methodologies outline certain Agile behaviours (L. Rising and N.S. Janoff, 2000; V.E. Jyothi and K.N. Rao, 2012).

### **2.3.1 Agile for start-ups**

However, off-the-shelf methods are often supplemented with extra practices to address particular issues (P. Diebold and M. Dahlem, 2014; S. Jalali and C. Wohlin, 2012). The 49 Agile Techniques in Start-up Companies activities that start-ups utilise, rather than any specific agile model, are the subject of inquiry. Small organisations have successfully used agile techniques for projects with uncertain and shifting needs. (T. Chow and D.B. Cao, 2008; S. Misra, V. Kumar, 2012).

Agile methods, in principle, may be ideal for start-ups (G. Carmine, N. Paternoster, 2016). On the other hand, successful adoption of Agile methods requires highly trained teams and widespread support (T. Clow and D.B. Cao, 2008; S. Misra, V. Kamur, 2012). According to prior research on software engineering practices at start-ups, when the need for more systematic practice arises, start-ups initially employ an ad hoc approach to engineering and progressively adopt agile concepts. The causes for the move include excessive technological debt, poor quality, and a lack of control over the engineering process. (G. Carmine, 2016).

Adopting agile methodologies in start-ups is motivated by accelerated product delivery, the adaptability to manage fluctuating priorities, and increased team efficiency. The most popular team collaboration techniques are open workspaces, task boards, and a prioritised backlog. (R. Souza, L. Rocha. 2019; E. Mkpojoigu, 2019). According to Souza et al. (R. Souza, L. Rocha. 2019), start-ups are more likely to embrace methods that offer immediate advantages and reduce time-to-market.

### **2.3.2 The Characteristics of Agile Methodologies**

Agile methodologies are flexible, quick, and dynamic. Agility's success depends on various variables, including team communication, innovation, project exploration, etc. Agile methodologies are constantly modified to account for shifting software requirements, shifting environments for development, and shifting conditions brought on by development

experiences. Numerous case studies demonstrate that, depending on the kind of the agile methodology itself, there are many situations in which agile is best suited concerning the project factors. However, the following traits are shared by all agile methodologies (M. A. Awad,2007; Keshta, N., & Morgan, Y. 2017):

1. Adaptive: The impact of changing requirements is minimal in projects that employ agile approaches. These days, projects encounter difficulties that cannot be foreseen at the outset, particularly in exploratory ventures. (Awad,2007; Keshta, N., & Morgan, Y. 2017)
2. People-focused: Agile techniques see people as a key to a project's success. In the project development life cycle, the involvement of clients, stakeholders, developers, team members, and end users is viewed as being extremely crucial. (Awad,2007; Keshta, N., & Morgan, Y. 2017)
3. Small self-organizing teams: Agile approaches are best suited for small teams since communication is simpler because it relies on direct interactions between team members. Agile teams plan and organise themselves independently, and they choose their own course through the project. (Awad,2007; Keshta, N., & Morgan, Y. 2017)
4. Collaboration: People play a significant role in the success of the project. The client and the development team are in close proximity in agile projects. Customers help define requirements, establish priorities, resolve misunderstandings, provide feedback, monitor testing, and submit test cases. (Awad,2007; Keshta, N., & Morgan, Y. 2017)

## **2.4 Project Management Process and Small-Scale Project**

Constraints on time, money, and scope are the three main issues that limit most projects. (2006) (Luckey and Phillips). The scheduling and sequencing of activities within a project are determined by the deadline, or timeline. The main components of a schedule are tasks, their dependencies, and their durations. (Kivinen, 2008)

The project's budget is the expected cost of the project, and it determines not just the maximum amount of money that can be spent on the project, but also all of the resources required to finish

it. The materials utilized, as well as any additional occurrences or challenges that require money or someone's attention over the course of a project, are all included in the costs. The project's objectives are defined by the scope of the project. It could be a physical object or a service. (Kivinen, 2008)

The iron triangle of project management is a term that refers to the intersection of three parts, scope, time and budget. (Chatfield and Johnson, 2004). The Figure 2.2 exemplifies the concept of constraint balancing since the triangle's three sides are linked and altering one side impacts at least one other side.

All these three sides can affect the quality of the project. For example, if a company reduces the budget and time for a project, probably with the same quality target the company can get just a part of the project's scope, not all of them, or they can reach the same quality with different scope. These three factors are important and effective for the project's target and quality of product.

What role does quality play in the project triangle? The project triangle is centred on quality. Every side of the triangle has an impact on quality, and any modifications you want to make on each of these three factors are likely to have an impact on quality. Quality is not really an element of the triangle; it is the result of what is done with timeframe, budget, and scope during the project. (Terhi Kivinen, 2008)



Figure 2. 2 Quality in the project triangle

Taken from Kivinen (2008, p. 30)

Luckey and Phillips (2006) identify nine distinct categories of project management knowledge:

1. Scope management: the control of the project's planning, execution, and content;
2. Time management: the management of everything that impacts the project's schedule;
3. Cost management: cost estimation, budgeting, and control;
4. Quality control: ensuring that the manufactured product fulfils the customer's requirements;
5. Human resource management: the process of recruiting, assigning, and managing qualified individuals;
6. Communication management is concerned with determining who requires what information and when;
7. Risk management: emphasis is placed on anticipating risks, resolving them when they occur, and capitalising on opportunities that can benefit a project;
8. Procurement management: working with or as a vendor to acquire goods and/or services may be necessary. This subject area is concerned with the procedures involved in the creation of vendor contracts and the acquisition of products and services;
9. Integration management: its function is to guarantee that all other knowledge areas are coordinated.

Generally, the larger the scope of a project, the more challenging it is to manage. Each management area takes additional effort in a large project: time, risk, and communication management become more difficult to manage in a large project.

Particularly, it is advised to break a large project into smaller, more manageable tasks that are carried either concurrently or sequentially. A project's optimal length is no more than six months. However, even then, more integration and time management are required.

Additionally, scope control is critical for small projects. It is critical to establish the project's objectives and scope and get agreement with the stakeholders. Additionally, they must be documented the same way any other type of agreement would. Without a documented scope of work and a project plan, it's impossible to specify what is included in the project and what should be deemed a modification. (Kivinen, 2008)

Additionally, time management is important when working on a small project. Even modest projects require various activities to be completed, and without planning, documenting, and monitoring them, it's impossible to keep track of the overall project's progress. Simple tools and approaches such as a bar chart or table can be used. (Kivinen, 2008)

Cost management estimation, budgeting, and control are necessary regardless of the project's size. Nonetheless, the effort often increases in proportion to the size of the project. (Kivinen, 2008)

Quality management must also be implemented in some form for small projects. While the procedures may be simple, they must guarantee that the generated product fulfils consumer expectations.

Table 2. 4 Areas of Project management in small project

Taken from Kivinen (2008, p. 28)

<b>Knowledge Area</b>	<b>Small Project</b>
Project Scope Management	Typically, less complicated and with fewer dependencies
Project Time Management	Typically shorter, resulting in fewer modifications. Additionally, there are fewer individuals involved. Simple methods include a table or bar chart.
Project Cost Management	When the project has fewer tasks and a shorter period, the cost estimate is simplified. Controlling takes less time overall since there are fewer tasks to complete. It's possible to standardise methods.
Project Quality Management	Even on a small project with numerous clients, it might take time. However, because small projects have fewer obligations and features, methods may be lighter.
Project Human Resources Management	Less difficult, as the task is often performed by fewer individuals.

<b>Knowledge Area</b>	<b>Small Project</b>
Project Communications Management	Less difficult, as there are typically fewer stakeholders involved
Project Risk Management	Due to the fact that there are fewer activities, and the time is shorter, the overall amount of risk is typically reducing as well. Nonetheless, some over elements, such as risks associated with the development environment, are the same as in larger projects. Generally, the effects are less severe in small undertakings. Risk management can benefit from simplified techniques.
Project Procurement Management	It is more dependent on the sort of project than on its magnitude. Additionally, modest projects may include several vendor contracts and extensive service procurement.
Project Integration Management	It is largely dependent on the sort of product being manufactured. If the product is expected to connect with many other systems, integration management might be challenging.

A few concepts from literature related to the software selection process are discussed in the following sections (2.5 to 2.9).

## **2.5 Three Decision Making Rationalities in Software Selection**

Through the perspective of conflicting decision-making rationalities, research by Albert Boonstra and in 2017, investigated how tendering legislation affects a buyer's software selection process. Contracting legislation aims to increase competition by fostering non-discrimination, transparency, equality, and proportionality. In many nations, this legislation applies to purchasing software packages by public institutions. Three software selection rationalities are inferred from Albert's literature related to the software selection literature's discussion of tendering laws. Following an extended tendering process, Albert Boonstra looked at how a major healthcare provider chose a supplier for an electronic health record system using this perspective. Political rationality ultimately loses out to functional and economic norms of rationality, but it persists, although in a different form than is typically documented for software selection. (A. Boonstra & Marjolein A.G. 2017)



In this part, it has been described how one can interpret the literature's perspectives on software selection techniques and practices to represent one or more of the three rationalities: functional, economic, and political. Table 2.5 summarizes each rationality's underlying philosophical assumption about the nature of software selection, the emphasis of the related decision-making process.

Although, the study of Albert informed the author about evaluating a software selection process, from the point of view of goals, sample size and methodology are different from this study.

Table 2. 5 The three rationalities and their norms for evaluating a software selection process  
Taken from Albert Boonstra & Marjolein A.G. (2017, p.4)

	<b>Functional Rationality</b>	<b>Economic Rationality</b>	<b>Political rationality</b>
<b>Underlying philosophical assumption</b>	One best software package can be selected by functional logic of comparing against available software packages	The most optimal software package can be selected by a quantitative logic of weighing costs and benefits of eligible software packages	The most acceptable software can be selected by a political logic of negotiation among identified stakeholders
<b>Focus of decision-making process</b>	Eligible software packages are technically compared and ranked based on set of explicated criteria of functionality for the user organization	Eligible software packages are compared and ranked to select the economically most advantageous offer in the most cost-effective way	Eligible software packages are implicitly or explicitly ranked by the stakeholders using their power in negotiation processes to select the software package that best suits their interests.

<b>Evaluation norms</b>	Appropriate user requirements to achieve the best technology fit	Costs of the decision making and selecting the economically most advantageous offer	Legitimacy of the decision-making process and acceptable outcomes for identified stakeholders
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### 2.5.1 Economic Rationality of Software Selection

Functional rationality and economic rationality are comparable approaches to software selection. Both techniques presuppose that all stakeholders agree on a rationally established answer. Even the concept of economic rationality requires that it can be quantified. Unlike functional rationality, which focuses on the greatest technological match, economic rationality focuses on selecting the most economically advantageous software package, which may include decision-making process costs (Keil & Tiwana, 2006). This viewpoint emphasizes long-term cost reduction and thinks that organizations are capable of and motivated to pursue economic goals even when alternative possibilities are functionally superior or more acceptable to the most powerful stakeholders. Economic rationality criteria may be used to assess whether a decision-making process supports the selection of the most economically advantageous offer, as well as to compare the costs of the decision-making process (i.e. transaction costs) to those of other decision-making processes. (A.Boonstra, Marjolein A.G. van Offenbeek ,2017)

### 2.5.2 Political Rationality of Software Selection

Different parties fight to attain goals in their own best interests, according to political reason, and evaluation may aid to rationalize earlier judgments (Boonstra, 2003; Howcroft & Light, 2006, 2010; Moe et al., 2017; Pollock & Williams, 2007; Verville & Haltingen, 2002). Software selection is the product of a negotiation between parties with varying authority, aims, and criteria. As a result, the result is never neutral (Wilson & Howcroft, 2005). The buying

department must make compromises between sometimes opposing criteria (Boonstra & van Offenbeek, 2010; Keil & Tiwana, 2006). Suppliers have the capacity to influence purchase decisions, according to Wybo (2007). (Marjolein A.G. van Offenbeek ,2017)

### **2.5.3 Functional Rationality of Software Selection**

In conventional functional rationality literature, the selection process is viewed as formal and linear. Functional and technical criteria take precedence since it is expected that the decision would lead to the optimal technological fit for the company (Howcroft & Light, 2010). All required information regarding the buyer's requirements and the software's properties is expected to be accessible (Pollock & Williams, 2007). Butler (1991), for example, proposes prescriptive procedures for achieving the best fit between the organization and packaged software through a selection and implementation process that includes the following activities: (1) understanding organizational requirements; (2) identifying and evaluating available packages against those requirements; (3) selecting, contracting, and acquiring the package; and (4) customizing the software solution. Functional rationality was dominant in en et al (2009)'s review of 43 software selection approaches (with over 35 quotes referring to functional rationality norms like "appropriate product that meets the customer requirements," "support the business goals and strategies," and "utility for each criterion"). (Marjolein A.G. van Offenbeek ,2017)

## **2.6 PLM Software Selection Model for Project Management**

The nine knowledge areas of the Project Management Body of Knowledge (PMBOK®) are used in the article by J. Eastham and D.Tucker to give a technique for choosing product lifecycle management (PLM) software (A Guide to the Project Management Body of Knowledge (PMBOK® Guide, 2008). The PLM offerings are investigated, categorized, pared down, reviewed, and deployed using a five-process gate technique. Hierarchical decision modelling is used in the main decision model (HDM). A pair-wise comparison survey is used to provide rankings to the PMBOK® knowledge domains, which are then evaluated in relation to the various PLM system options. The recommended choice approach is only intended to be

used as a general direction when choosing PLM software from a project management standpoint. The selection process is used to many applications that span the semiconductor, information technology (IT), and automotive supply industries in order to verify the model. (J. Eastham, D.Tucker, .. & S. Sutton.2014)

## **2.7 Improving ERP Software Selection Process by using QFD-AHP**

According to research from Hasan Al Jafa in 2020, the chosen characteristics that are thought to have an impact on software performance the most are: (H. Al Jafa, 2020)

- 1- Cost: The package's cost includes all necessary features.
- 2- Customization: This refers to the capacity to modify dashboards, a new widget, and the agent interface.
- 3-Flexibility: The ability to integrate with other programmers, platforms, and apps to exchange data. Web-based solutions offer better application or website integration.
- 4- Maintenance time/product support: The company's technical capacity to do routine maintenance, address error reports, offer app training and manuals, and regularly update with improvements.
- 5- The KPI (key performance indicator) and the option to design unique indicators are included in monitoring.
- 6-Functional requirements: support for multiple departments and brands, as well as multiple service channels (phone, chat, and email). E-mail utilities, VoIP standards compatibility, an audit trail, customer contact information, knowledge development and workflow, and audit trails
- 7- Predefined templates, tags, a knowledge base, support for several platforms and languages, and support for various views all contribute to ease of usage.
- 8- Security: Advanced encryption protects information and offers Role-Based Access for various agents or leads. A history of changes is kept preventing misunderstandings across departments. Automatic data backup is provided via a server that is firewall-protected.

9- Support for internal communication: Facilitates team conversations, internal notes, team leader participation, and escalation.

10-Business intelligence (BI): Data gathering, analysis, trends, chatbot support, and virtual agent assistance are all included in business intelligence. In order to help agents, respond more quickly, BI functions measure and carefully monitor service parameters like service level agreements (SLA), offer guidance, and provide tips and reports based on repetitive requests. To obtain the most precise, trustworthy data, it is crucial to build personalized dashboards and include particular market tags.

11- Deployment Environment: Composed of online servers, a web-based platform, a contact history tracker, a payment trail, cloud support, freelancer assistance, and application usability. Cloud-based web-based software servers and data are less expensive to set up and maintain, but they pose more security risks.

12- Reporting: Manages performance, trend, quality, and customizable reports, and supports exporting them to other office software. In order to improve work processes, it is crucial to understand the company's existing situation and if there are any issues or increased expectations.

13- Reliability: Product rating, financial history, accolades the product has received, and market share data.

14- Predictive analytics: Works in tandem with business intelligence to produce useful data that help predict the possible client base and probable trouble areas.

15- Social: Addresses the capacity to control various touch points

## **2.8 APS software selection methodology (experts and decision maker's opinion)**

Software selection has received much attention in the literature. For instance, Sen, Baracli, Sen, and Basligil (2009) created a multi-objective mathematical programming model decision support model for corporate software selection that took both qualitative and quantitative objectives into account. An approach for the evaluation and selection of software work estimating models was put forth by Ashu, Brijesh, and Rakesh (2017). A solid decision-making process for assessing and choosing simulation software packages was described by Azadeh et al. in 2010. A method was created by Eastham et al. (2014) to help with the choice of product

lifecycle management (PLM) software. (F. Chilly Ngamaleu Piengang, Y. Beauregard & J. Kenné, 2019)

Concerning software selection, several approaches have been developed in the literature, either by using basic methods or by integrating them in order to benefit from the strengths of several methods that generally complement each other. As an example of software selection approach, that has been done by F.chilly Ngamaleu , is the one proposed by Azadeh et al. (2010), which is a decision-making methodology based on fuzzy AHP for evaluating and selecting simulation software packages. (F. Chilly Ngamaleu Piengang, Y. Beauregard & J. Kenné, 2019)

In the literature, a number of software selection approaches have been established, either using fundamental techniques or combining them to capitalize on the advantages of multiple, typically complementary techniques.

In a paper by F.chilly Ngamaleu the key contribution is the creation of an APS software selection approach. The multiple criteria decision-making (MCDM) methodology is based on fuzzy quality function deployment (QFD) and the well-known MCDM methodologies analytic hierarchy process (AHP) and VIKOR. (F. Chilly Ngamaleu Piengang, Y. Beauregard & J. Kenné, 2019)

## **2.9 Quality Function Deployment (QFD)**

According to Lam and Dai, the term "quality function deployment" (QFD) is commonly used in product development, and some scholars define it as follows: "QFD is well recognized as a mechanism for translating the "voice" of customers into appropriate business needs." (J. S. L. Lam and J. Dai, 2015)

Furthermore, QFD is an excellent strategy for creating new products that optimize user pleasure at various phases of development. (O. E. Nadiye and M. A. Omid, 2019) (Jianmin Xie, Qin Qin, Maoting Jiang, 2020)

Furthermore, it is a methodology that assists in the translation of customer desires into design criteria in order to ensure that the final product or process meets these goals (J. Huang, X. Y. You, H. C. Liu, and S. L. Si, 2019)

Several solutions have been devised in recent decades to enhance the performance of the conventional QFD (K. G. Fatm and K. Cengiz, 2020), with two key areas for improvement. On the one hand, use MCDM techniques to deal with uncertainty in the standard QFD process. (Y. C. Ko, S. W. Hsiao, H. H. Lin, 2017)

Many researchers in the field of production systems are increasingly interested in it. Through scientific prioritisation of technical descriptors, it is widely used in various industries to improve decision-making, product design, and customer satisfaction (M. Bhuvanesh Kumar & R. Parameshwaran. 2018; Carnevalli and Miguel 2008; Bottani 2009). In QFD, the House of Quality (HOQ) is seen as a key planning instrument. Besterfield et al. (2011) demonstrate how HOQ turns client requirements into design requirements that identify target values and detail how an industry will achieve the objectives. The matrix that connects consumer voice and technical descriptors is at the heart of HOQ, and it examines how customer voice will be satisfied by technical descriptors (M. Bhuvanesh Kumar & R. Parameshwaran. 2018; Cohen and Cohen 1995).

### **2.9.1 House of Quality (HOQ)**

For initiatives to produce sophisticated technology that runs in businesses, the modified "Quality House" technique [8] is recommended. This strategy allows you to assess planning, regulate current results, and compare real and projected results in the future. 2016 (A Al-bashir)

Organizations require regular research and development to meet changing client wants and quick technology advances, hence the notion of continuous improvement is promoted. (Olha Kritskaya, 2020; Dmitriy Kritskiy)

Figure 2 depicts the design scheme's structure. It should be noted that work in the project can be aimed at satisfying such targeted decisions as the creation of a new product (research is required), a standard product (there is a list of work that has been completed in other organizations to create this product), or the repetition of creating your own product (the company has a structure of work that must be performed to obtain the product). (Olha Kritskaya, 2020; Dmitriy Kritskiy)

The following procedures must be followed in order to adopt the modified technique "Quality House" or quality house:

Stage 1: Identifying consumer needs or the customer's voice (VOC). Customers' wants and requirements are defined at this step, which influences the criteria used in the evaluation. It is proposed to use the following stages as estimated indicators for projects to create complex equipment: marketing, research and development, search for ways and justification of the possibility of creation, preliminary project (feasibility study), preliminary design, layout design, technical proposal, design documentation, preparation for prototype production, prototype production, preparation for testing, factory tests, adjustment of decomposition (Olha Kritskaya, 2020; Dmitriy Kritskiy) These stages are crucial, thus assessing them is crucial for generating high-quality goods.



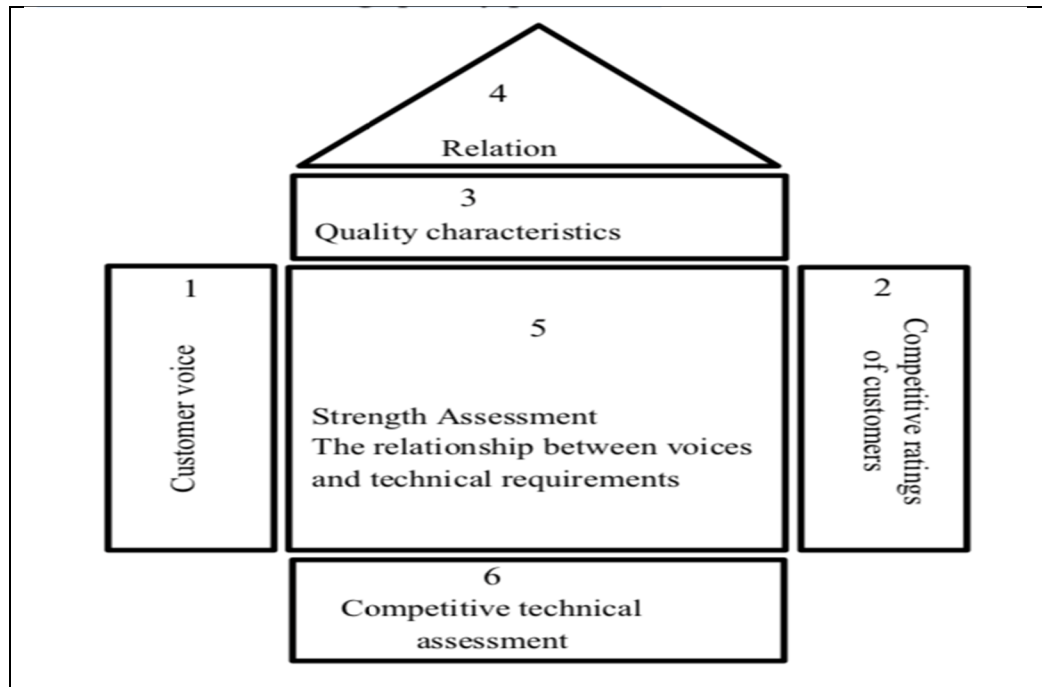


Figure 2. 3 Schematic representation of the HOQ  
 Taken from Dmitriy Kritskiy, Olha Kritskaya (2020, p.169)

Stage 2: Technical needs are defined. This stage deals with the product's technical specifications. It is recommended to utilize flying range, ceiling height, flight time, speed range, load capacity, take-off and landing system, control system, and stabilization as an example of the primary features that will be examined in aircraft development projects. The quality of the items will undoubtedly be described by the identification of technical specifications. (Olha Kritskaya, 2020; Dmitriy Kritskiy)

Stage 3: Quantification of each client's requirement's relative relevance. It is vital to express the proportional relevance of each of the customer's requests at this point. Because this indication is subjective, it is suggested that each of the indicators be assigned a weight coefficient using the Saati nine-point scale. (Olha Kritskaya, 2020; Dmitriy Kritskiy)

## **2.10 Summary of literature review about selected approaches**

In this section, the short summary of each selected method of this research will be introduced.

### **2.10.1 Likert Scale**

A Likert scale is a psychometric scale often used in questionnaire-based research. Although there are other forms of rating scales, it is the most generally used way of scaling responses in survey research, to the point that the phrase (or more properly the Likert-type scale) is sometimes used interchangeably with rating scale. (Karl L. Wuensch, 2005; Sean Taylor, 2018)

The format of a typical five-level Likert item, for example, could be:

1. Strongly disagree
2. Disagree
3. Neither agree nor disagree
4. Agree
5. Strongly agree

Consumer satisfaction data is gathered through surveys, focus groups, individual interviews, product usage, listening and observing, natural field contact, feedback, complaints, warranty data, sales records, and publications, to name a few methods.

### **2.10.2 The Statgraphic Software**

The Statgraphics was the first statistical software program adapted for the PC, the first to introduce integration of graphics into every statistical procedure, and the originator of point-by-point assistance tools and countless other ground-breaking features to simplify the tasks. (statgraphic, 2022)

The current version of the Statgraphics, is a Windows Desktop software with broad features for regression analysis, ANOVA, multivariate statistics, Design of Experiments, statistical process management, life data analysis, data visualization, and more. It has almost 260 procedures. Everything from summary data to complicated statistical models is presented in a very user-friendly manner. Version 18 is available in five languages: English, French, Spanish, German, and Italian, in both 32-bit and 64-bit versions. The 64-bit edition can handle very huge data sets, putting it in the category of "big data" analytics. It includes descriptive statistics, hypothesis testing, regression analysis, analysis of variance, survival analysis, time series analysis and forecasting, sample size determination, multivariate approaches, and Monte Carlo techniques, among other data analysis procedures. (Wikipedia, 2022)

### **2.10.3 Chi-Square Independence Test**

The chi-square ( $\chi^2$ ) test is a nonparametric statistical analyzing method commonly used in experimental work where the data consists of frequencies or 'counts' – for example, the number of boys and girls in a class who have their tonsils removed – rather than quantitative data obtained from measurements of continuous variables like temperature, height, and so on. The test is most commonly used to assess the independence between two variables. (Zibran, M.F., 2007; Robert V. Brill, 2003)

As an example, the researcher wants to find out whether there is an association between smoking status and lung disease.

The null and alternative hypothesis will be:

H<sub>0</sub>: There is no association between smoking status and lung disease.

H<sub>1</sub>: There is an association between smoking status and lung disease.

For the chi-square test, we need to compute the degrees of freedom (df) of the chi-square distribution. The df are computed using the following formula on the contingency table that reports the observed counts:  $(\text{number of columns of the table} - 1) \times (\text{number of rows of the table} - 1)$ , excluding the rows and columns containing the totals.

To make a decision in favor or against the null hypothesis, the researcher fixes the significance level  $\alpha$  to a predetermined value and computes the p-value associated to the test statistic. The p-value is a function of the test statistic and is therefore a random variable.

In null-hypothesis significance testing, the p-value is the probability of generating test results at least as extreme as the actual result, provided the null hypothesis is correct. (Aschwanden, C., 2019; Wasserstein, R.L., and Lazar, N.A., 2016) Academic publications regularly provide p-values of statistical tests in various quantitative fields. Because the precise meaning of p-value is complex, it is frequently misinterpreted and has become a hot topic in metascience. (Hubbard R, Lindsay RM (2008, Nosek BA, Bishop DV, 2017)

#### **2.10.3.1 Frequency Table**

Frequency statistics simply count the number of times each variable appears in the sample or population, such as the number of men and females. Frequency analysis is a branch of statistics that deals with the number (frequency) and proportion of occurrences. (Mishra, P., Pandey, C. M., Singh, U., Gupta, A., Sahu, C., & Keshri, A. ,2019)

#### **2.10.3.2 Fisher Test**

Fisher's approach, commonly known as Fisher's combined probability test in statistics, is a data fusion or "meta-analysis" methodology (analysis of analyses). Ronald Fisher created it and named it after him. It is used to integrate the findings of many independence tests that are relevant to the same general hypothesis ( $H_0$ ). Fisher's exact test is used when the assumptions of the chi-square test are not met. (R.A. Fisher, 1925; R.A. Fisher, 1948)

#### **2.10.3.3 SPSS software**

IBM created SPSS Statistics, a statistical software suite for data management, advanced analytics, multivariate analysis, corporate intelligence, and criminal investigation. SPSS Inc.

used to make it, but IBM bought it in 2009. IBM SPSS Statistics is the brand name for current versions (after 2015).

The name of the program was changed from Statistical Package for the Social Sciences (SPSS) (Quintero, Dino; et al. 2016). to Statistical Product and Service Solutions to reflect the original market. (Hejase, A.J., & Hejase, H.J. (2013).

#### **2.10.4 Multiple Linear Regression**

Linear regression is a method for analyzing data and making predictions. In simple linear regression, a bivariate model is used to predict a response variable ( $y$ ) from an explanatory variable ( $x$ )<sup>1</sup>. Multiple linear regression is used to expand the model to incorporate more than one explanatory variable ( $x_1, x_2, \dots, x_p$ ), resulting in a multivariate model.

This primer covers the essential theory as well as a practical explanation of bivariate and multiple linear regression models. We investigate model construction, regression modeling assumptions, and outcomes evaluation to gain a meaningful understanding of data. (Tranmer, M., Murphy, J., Elliot, M., and Pampaka, M, 2020). As far as possible, complex algebra is avoided, and a reading list is supplied for future study and reference. (Tranmer, M., Murphy, J., Elliot, M., and Pampaka, M, 2020)

Simple linear regression consists in obtaining a line of best fit, minimizing the sum of the squares of the differences between the actual and predicted data (Tranmer, M., Murphy, J., Elliot, M., and Pampaka, M, 2020).

The correct prediction of future events. If there is no uncertainty, then an agent can have perfect foresight if he knows all relevant information and has a correct model to use for prediction. When there is uncertainty, it is not possible to have perfect foresight. Perfect foresight is an occasionally convenient theoretical assumption whose total lack of realism is undisputed, and perhaps unrivalled. (Bray M, 1990).

#### **2.10.4.1 R squared**

In statistics, the coefficient of determination (abbreviated  $R^2$  or  $r^2$ ) is the proportion of the variation in the dependent variable that can be explained by the independent variable (s). It is a statistic that is employed in statistical models with the objective of forecasting future occurrences or evaluating hypotheses based on other data. It offers a measure of how well observed results are reproduced by the model based on the proportion of total variance of outcomes represented by the model. (R. G. D. Steel; J. H. Torrie 1960; Stanton A. Glantz; B. K. Slinker 1990; N. R. Draper; H. Smith 1998).

The quality of fit of a model is measured by the  $R^2$ . The  $R^2$ , or coefficient of determination, is a statistical indicator of how well regression predictions match actual data points. With an  $R^2$  of 1, the regression predictions perfectly fit the data. (Georges Casella, 2002).

#### **2.10.5 Multiple Correspondence Analysis**

The goal of multiple correspondence analysis (MCA) is to analyse the structure of links that exist between a group of categorical variables by explaining the connections through their projection in a space with a smaller number of dimensions, often two. (Manca, F., D'Uggento, A. M., & Convertini, N. (2018)

#### **2.10.6 Classification Tree**

A classification chart, often known as a classification tree, is a diagram that depicts the structure of a categorization scheme. Classification is the act of recognizing, differentiating, and understanding concepts and things, and classification charts are used to assist construct and represent final results. "In a classification chart, the facts, data, and so on are organized so that the place of each in relation to the others is plainly seen," Brinton says. Although a

quantitative analysis adds to the usefulness of a classification chart, it is not required." (Willard Cope Brinton, 1939)

"In any chart-making, the material to be displayed must be carefully prepared before it can be plotted," Karsten (1923) said. We must dig into the complexities of categorization and indexing in order to comprehend the classification chart. The capacity of envisioning a 'whole' with its 'parts' is used in the art of categorisation. Karl G. Karsten, 1923)

#### **2.10.6.1 Dendrogram**

A dendrogram is a tree representation diagram. This diagrammatic depiction is commonly utilized in a variety of situations. It displays the organization of the clusters created by the related studies, for example, in hierarchical clustering. (Brian Everitt, 1998)

### **2.11 Conclusions**

Due to the significant resources required and potential for systems failures, choosing the appropriate APS software is crucial for businesses. (F. Chilly Ngamaleu Piengang, Y. Beauregard & J. Kenné, 2019)

There are some scholars that have been worked in software selection process such as mentioned in the sections 2.5 to 2.8 at this study such as; tree decision making rationalities (section 2.5), PLM software selection model (section 2.6), integrating QFD and AHP (section 2.7) , experts and decision maker's opinion (section 2.8). Little attention has been paid to the selection of project management software for start-ups.

According to research by Garca-Mireles, start-ups are human organisations designed to create new products and services in the face of significant uncertainty. This is one of the reasons most businesses fail over the first five years (Rise, 2011; Morales-Trujillo & Garca-Mireles, 2019). In addition, some authors, such as Sutton (S.M. Sutton, E.C. Cubed, and M. Andretti, 2000) and Giardino (C. Giardino, M. Unterkalmsteiner, 2014) highlight the difficulties encountered

by start-ups, such as high risk, unpredictability, rapid development, and inexperienced teams. Start-ups, on the other hand, are sensitive to changes in technologies and markets (G. Carmine, N. Paternoster, 2016).

To prevent reworking and wasting time, reduce the chance of failure for start-ups and because start-ups are sensitive to changes in technologies, this study desires to help project managers select their project management software. Currently, the literature on choosing project management software in virtual agile start-ups, lacks a defined, organised, and analytical methodology. This study has used different databases, and methods of analysis data while considering different parameters from other literatures.



## **CHAPTER 3**

### **RESEARCH DESIGN AND METHODOLOGIES**

#### **3.1 Introduction**

Brink (1999) states that data analysis is used to simplify and synthesize data to make sense of it. Aims to combine data analysis findings with value statements, criteria, and standards to provide conclusions, judgements, and recommendations. (Brink, 1999) This chapter discusses the procedures used to process, analyze collected data. The research design is descriptive. The chapter also describes the data gathering and analysis procedures. Finally, questions of reliability, validity are addressed.

The quantitative research reports the result based on the data obtained from surveys and interviews with project managers and team members.

The goal of these chapter is to describe six methods of analysis data (1-QFD 2-Average Matrix 3-Multiple Correspondence analysis (MCA) 4-Chi-Square 5-Multiple Linear Regression (MLR) 6-Classification tree) that can be match for the sample size. Because the sample size is small, more descriptive methods have been chosen that they are match with small sample sizes. In each section, the author has tried to find a pattern, recommendation to help project managers in agile start-ups to select the best software.

#### **3.2 Research Process**

The steps of this study are listed below. (Figure. 3.1) The initial steps involved determining the issue and investigating the research questions. After that, focus on the literature review and research design. Data gathering from 37 anonymous participants and quantitative analysis come next. The final one is in charge of gathering all the information and drawing the study to a close.

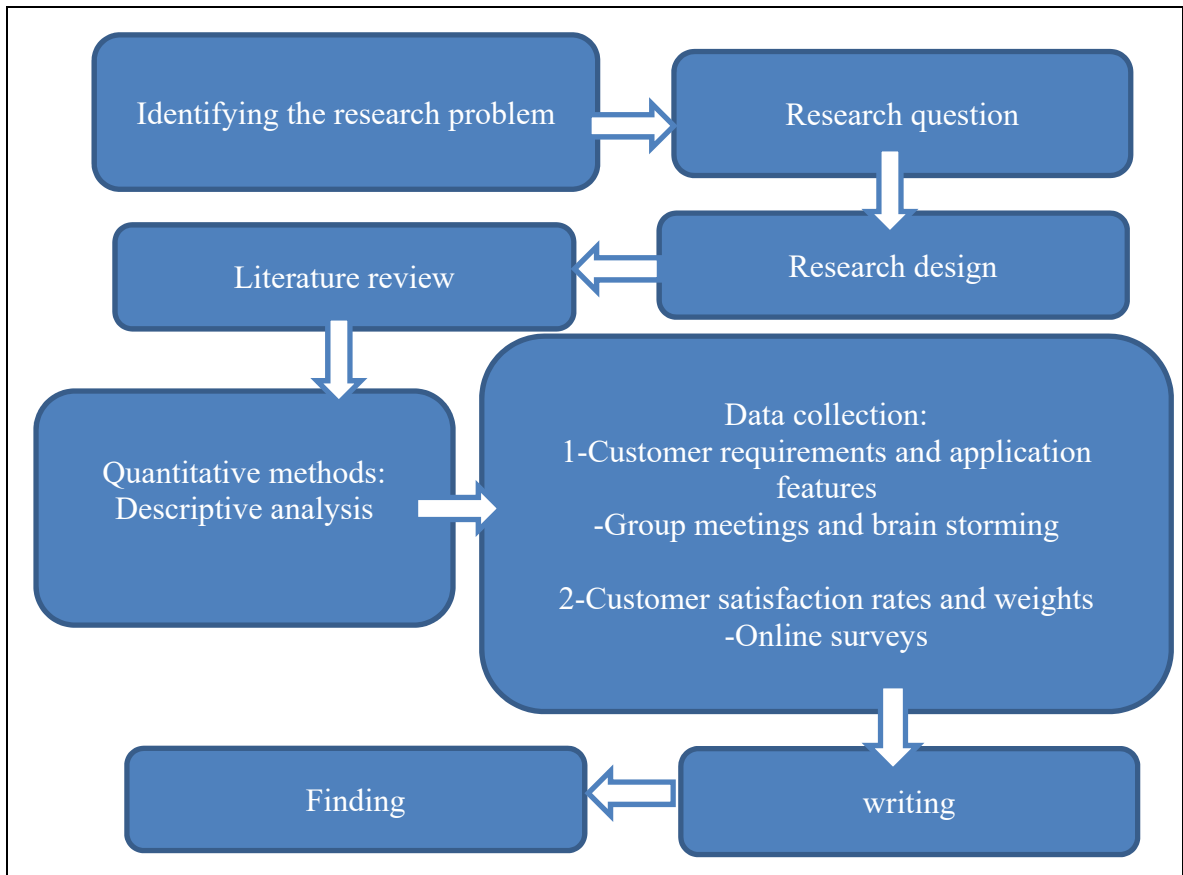


Figure 3. 1 Research process

### 3.3 Research Design

#### 3.3.1 Descriptive Design

Before analyzing data with inferential statistics, descriptive analysis is always undertaken. It summarizes data by summarizing and characterizing it. (Pagano, 2012). Descriptive analysis is commonly used to assess data distribution and trends. For qualitative variables, it gives the number of occurrences stratified by each category. The number of occurrences can be expressed as a count or a percentage. Frequency tables can then be represented graphically with line charts, pie charts, and bar charts, for example, to visualize frequency distributions.

For quantitative variables, central tendency measures, such as the mode, mean and median, describe the centre of the data's distribution. (Thompson, 2009).

### **The Benefits of Descriptive Research**

A descriptive design was chosen for this research due to the small number of participants for the survey (n=37). The study's primary goal is to report the characteristics of the population of project managers at start-ups in terms of what they need from project management software. To prevent wasting time, effort, money, and resources, this research is investigating a pattern that will allow it to advise project managers of start-ups on the best project management software to use.

#### **3.3.2 Quantitative Analysis**

In this thesis there are some qualitative variables like project management requirements from a project management software and also software's features. These qualitative variables have studied by quantitative methods to help the selection interoperation of data collection.

#### **3.3.3 Research Tool/Research Methodology Approach**

An online survey was used to collect the data from n=37 anonymous participants (11 project managers and 26 team members) working in agile start-ups. The required ethical forms before completing the survey have been filled up and a confirmation from ETS university has been received. (APPENDIX III)

### **3.4 Data Collection**

It was required to attend a challenging conversational meeting and start-up events in order to get information about start-ups, their obstacles, and project manager's needs.

Following these occasions, a network of roughly 30 teams from several sectors—including marketing and sales, financial management, computer and IT-based initiatives, and

telecommunications—was built. Their issues, needs, and software they employ were the major themes of conversation. The main items about these start-ups were: 1) working with agile methodology (most of participants use scrum which is one the agile methodologies) 2) working in a Start-up team between 5 to 12 persons 3) familiarity with multiple project management software.

### **3.4.1 Data Collection - Part 1**

The first data collection was in project managers software's features and project manager's requirements (Voice of customer) in agile start-ups. Regarding (section 2.3.3 of this study), the four characteristics of an agile methodology, all the participants were working in agile teams. The size of the team, adaptive, people oriented, also collaboration have been considered.

According to the section 2.1, also table 2.3, all the selected teams have been considered a start-up. For this step meetings with project managers, research and brainstorming for three months were used. This step will be expanded in the future, but for this research, a list with the most common and useful items was obtained. It includes 63 items for software features and around 60 items for project managers.

#### **The five chosen software for survey**

Five software were selected for the surveys in this research based on the experience of the project managers and the members of their team. (Table 3.1) The most recent update from the summer of 2021 indicates that each programme has 3 or 4 versions.

For instance, the basic or free version has some simple features to get familiar with the software or with a basic project. The second version is around 11 to 15 dollars, useful for the budget of early-stage start-ups or for small-scale teams. Table 3.1 shows each software versions, and the chosen ones are highlighted in green. The reason behind this choice is that the participants have worked with them, and their prices are also reasonable for early-stage start-ups budget.

Software also has a third and some of them a fourth version, which are the enterprise or premium versions. They are more expensive and have more options. However, this study has focused on the mentioned versions.

Table 3.1 Versions of selected software

Version	ASANA	Rates USD	ZOHO project	Rates CAD	Monday	Rates CAD	Trello	Rates USD	Teamwork	Rates USD
	Basic	0	Free	0	Individual	0	Free	0	Free	0
	Premium	10.99	Premium	5.25	Basic	11	Standard	5	Deliver	10
	Business	24.99	Enterprise	13	Standard	14	Premium	10	Grow	18
					Pro	22	Enterprise	17.5	Enterprise	-
					Enterprise	-				

In this study for making reading easier, instead of Zoho project, the author used just “Zoho”. And, instead of Monday.com, she/he used “Monday”.

### 3.4.2 Data Collection - Part 2

#### 3.4.2.1 Phase 1-Weights

A total of 63 features grouped in 9 categories were presented to the 11 project managers (shown in Table 3.4), for them to give a weight to each feature category and a weight to each feature. This process has explained in the next section. (Overview of the survey-column 2 and 4 in Table 3.3). These collected data from participants (“Features category wights” (Weights FC) and “feature weights %”) are quantitative variables which are ratio scale.

### 3.4.2.2 Phase 2 - Preferred Ranking

#### Define the Scale and rank in the table

According to Table 3.2, in terms of customer satisfaction, the ranking for the survey ranges from 1(very poor) to 5 (excellent and satisfied).

Table 3. 2 Ranking numbers

Rank	1	2	3	4	5
Meaning	Very poor /strongly disagree	Poor, bad/disagree	Neither very good nor very bad	Good/ agree	Excellent and satisfied / Strongly agree

Participants share their satisfaction score for each 63 features for 5 software in this research. (Table 3.4) These customer satisfaction scores are variables which represents a category. They are on an ordinal scale, which means they are qualitative variables, and their meaning is related to a satisfaction degree.

#### Overview of the survey questions

The 5 following questions and a table (the Table 3.4 which has all 63 features and 9 feature categories) submitted to the participants. The reason for asking each question in the survey has been mentioned in the Table 3.5 in the next pages.

1. What is the business of your start-up?

IT and computer industry- finance industry- Sales and Marketing - ...

2. what is your role in your start-up team?

Project manager – team member

These are main categories of each project managers needs in regarding to project manager's software. (Features category - Column 1 in Table 3.3)

3. How would you rate these categories? Please note that sum of all these rating should be 100 in total. (Features category's weight - Just for project manager- column 2 in Table 3.3)

4. How would you rate each feature in these categories? please note that sum of the features weight % (Column 4 in Table 3.3) in each section should be 100. (feature's category- Just for project manager)

5. How satisfied are you with the below options in each software? You can choose between 1,2,3,4 and 5. Please indicate your rank in each blue cell.

The survey's results have been attached in Appendix I.

Table 3. 3 Overview of part of survey's format

1	2	3	4	Trello	ASANA	Monday	Teamwork	ZOHO
Features category	Features category weight	Features	Features weight %	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)
9 items :	Dedicate a portion of 100% for each category	63 items:	Dedicate a portion of 100% for features of each category	Customer satisfaction's point	Customer satisfaction's point	Customer satisfaction's point	Customer satisfaction's point	Customer satisfaction's point
Obtained by research	Obtained by 11 PM	Obtained by research and meetings	Obtained by PM					
For instance:	Survey	For instance:	( section 2)					
Task		Create task	For instance; 10%					
FIXED		FIXED	Survey					

The followings are brief explanations of each column of the table 3.4.

Column 1: As can be seen in the Figure 3.2, there are 9 items for features category which have been collected in part 1 of the data collection of this research (see 3.4.1 data collection – part 1). For example: Task, report, ... (Table 3.4) The notation FC1, FC2, ..., FC9 have been used for this column.

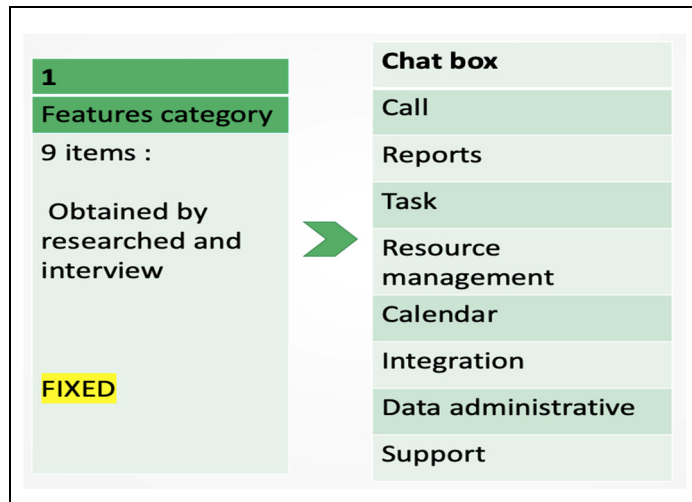


Figure 3. 2 Details of the survey- Features category

Column 2 is the feature categories weight, can be seen in the Figure 3.3. The author asked project managers to rank these categories. The sum of the numbers of this column for each category should be 100. The notations Weight FC1, ..., Weight FC9 have been used for this column.

<b>2</b>	<b>Features</b>	<b>Features category weight</b>
<b>Features category weight</b>	Chat box	13
Dedicate a portion of 100% for each category	Call	8
Obtained by 11 PM	Reports	24
<b>Survey</b>	Task	14
	Resource management	8
	Calendar	9
	Integration	12
	Data administrative	9
	Support	3
	<b>Total</b>	<b>100</b>

Figure 3. 3 Details of the survey- Features category weight



Column 3: there are 63 features which have been collected in part 1 of the data collection of this research. (The second group of this section can be seen in the Figure 3.4) For example: Create task, edit tasks, etc. (Table 3.4) The notations F1, F2, ..., F63 have been used for this column.

3	Features Category	Features Category weight	Features
Features			private Message
63 items:			group Messages
Obtained by research and interview			voice message
For instance: Create task			video message
<b>FIXED</b>	CHAT BOX	18	search in messages
			attach file in chat
			Edit msg
			delete msg
			feed
			member's status

Figure 3. 4 Details of the survey- Features category weight

Table 3. 4 Customer's requirements and their categories

No. FC	Features Category (FC)	No. F	Features (F)
1	CHAT BOX	1	Private Message
		2	Group Messages
		3	Voice message
		4	Video message
		5	Search in messages
		6	Attach file in chat
		7	Edit msg
		8	Delete msg
		9	Feed
		10	Member's status
2	Call	11	Voice call
		12	Video call
		13	Share screen in video call
		14	Call recording
3	REPORTS	15	Planned hours
		16	Actual hours
		17	Task progress
		18	Time tracking
		19	Timeline view
		20	Customize (for new fields)
		21	Milestones
		22	Notification for task progress/ deadline/milestones
		23	Workspace activity and statics
		24	Automate form/workflow builder
4	Task	25	Create task
		26	Delete task
		27	Search for tasks
		28	Accept/reject task
		29	Add /edit fields for tasks
		30	Add a date of beginning of a task
		31	Add a date of finishing the task
		32	Set duration for a task
		33	Submit a final task / set final status for task
		34	Set task status
		35	Set task priority

No. FC	Features Category (FC)	No. F	Features (F)
4	Task	36	Describe a task
		37	Bug tracking
		38	Task dependencies
5	Resource management	39	See the availability of each person
		40	See availability of my timeline
		41	Monitor the availability of project's resource
		42	Budget management
6	Calendar	43	Calendar
		44	Search for events
		45	archive the history of meetings
		46	Schedule meetings for future
		47	Reminders for meeting
		48	Sync with other calendars
7	Integration	49	Integration with file sharing APP
		50	Integrate with Email application
		51	Integration with messaging and call application
		52	Integration with reporting APP
		53	Integration with developing APP
8	Data Administrative	54	Admin console
		55	Import
		56	Export
		57	Availability of backup
		58	Collaboration (share file)
		59	Document management
9	Support	60	Platform
		61	Support
		62	Price
		63	Tutorial

Column 4 contains features weight percentage (Figure 3.5). In this column project managers have attributed a portion of 100% to each feature of each category. The sum of all features weight % in each category should be 100.

4		Features Category	Features Category weight	features	features weight %
Features weight %				private Message	10%
Dedicate a portion of 100% for features of each category				group Messages	20%
Obtained by PM	➔	CHAT BOX	18	voice message	5%
For instance; 10%				video message	5%
Survey				search in messages	9%
				attach file in chat	11%
				Edit msg	10%
				delete msg	5%
				feed	5%
				member's status	20%
			Total		100

Figure 3. 5 Details of the survey- Features category weight

All participants were also asked to rate their customer satisfaction score of each application features for 5 applications: Trello, Asana, Monday, Teamwork, Zoho.

The goals of these questions are shown in Table 3.5, and they were not random questions.

Table 3. 5 Purpose of survey questions

	Question	Goal
1	Business field	To find out their business filed
2	Customer satisfaction score	To find a pattern in terms of choosing project management software
3	weights	To find their preferences and requirements to categorized data easier
4	Their role	To find out is there any correlation between choosing the project management software and role of the participants (PM and TM)

The surveys have been done with an online format, which took around period of 4 months. Also, beside this survey, the author of this study, asked each team's project managers to provide their priorities. For example, the first two teams that were in financial business

mentioned that reports, backup, and integrate video call features are important for them and that they prefer a budget friendly software.

### **3.5 Methods**

In this study 4 different analysis have been used. All details are provided in the next section.

#### **3.5.1 Quality Function Deployment (QFD)**

The first method used in this research is QFD. The House of quality (HOQ) is one of the main planning instruments of QFD which is a systematic tool for satisfying the project manager's requirements (customer's voice).

But after demonstrating HOQ, in terms of weights which should be calculated by Analytic hierarchy process (AHP), the analysis of the data was not feasible. The high similarity between project managers' requirements and software features resulted in a poor usefulness for AHP data. After that some weights was given to the features but couldn't be valid because it was needed to collect from more than one person expert. Therefore, after around 3 months working on this data, another analysis approach was chosen.

#### **Goal: Improves Production Efficiency**

This research uses this method as increase efficiency naturally results in a decrease in overall cost, which can be passed on to customers. HOQ table has also a benchmarking component that can help to compare different software rankings.

#### **3.5.2 Average Matrix**

After all, QFD and AHP tables, the author divided all 37 participants to 3 separate group (according to their businesses and preferences). The first group was for Finance business, and their preferences were similar to each other. For example, reports, backup files, report and budget were their first priorities in terms of project management requirements and software features. The second category was for participants who their start-up busines were related to

IT and computer-based, and also their preferences were export data, bug tracking, reports, and document management and etc. The third group of participants were related to sale and marketing business with preferences like reports, integration, chat, ....

The author categorized all 37 participants into 3 group and prepared just one table for each group that the scores were mean of all scores of participants of that team.

For example, the scores of 12 participants were in finance business transfer to one average matrix. (The author calculated the average of 12 participants for each field of the table)

And compare 3 average table with each other and also interpret separately in each case.

The features category weight column is the average of project managers ranking in each group.

The sum of all these numbers should be 100. For example: example:

$$18+11+18+14+8+14+8+5+4=100 \quad (3.1)$$

The Features weight % column is the average of scores that project managers of this group have given. The sum of the “features weight %” in each category should be 100. For instance, the sum of 11 numbers in chat box section ( $10\%+20\%+5\%+5\%+9\%+11\%+10\%+5\%+5\%+20\%$ ) is 100.

Use that prediction in the report to say, for instance, that Teamwork software may be used by a new project manager at a start-up with comparable preferences (in terms of feature weight score). Software teamwork received the highest score for the first category because category 1 (financial teams) received the greatest collaboration score.

However, because the data (the participant satisfaction score) were collected using a Likert scale, the average approach cannot be used because it would overlook the variety of the data.

This analysis's objective was to divide the data into three categories in order to identify a team's behaviour pattern in relation to its preferences and weight ranking.

### **3.5.2.1 The Category of the survey applicants and their priorities**

#### **Group 1 - Finance Teams**

There were three different start-ups on a small scale in the financial area and wealth management. The main priorities were to be able to have a backup of files, many meetings and calendar features, and chat. The budget and cost of the software were important for them. Regarding document management, reporting, and email, the features in the regular version of each software were enough for them.

#### **Group 2 - Computer and IT based teams**

From three different start-up teams, participants participated in this survey. The basis of these teams was in computers and IT businesses. The focus and priority of these teams were on mobile software and integration with other software like developing software, exporting data, and many features for reports and e-mail. The second priority category was in document management features, chat, and backup options. The price and cost of software were their third priority.

#### **Group 3 - Marketing and Sales teams**

In the third case study, 17 participants filled out the survey. Two of them were project managers, and the rest were team members. The participants were from two different teams, and the focus of their teams and businesses was in sales and marketing. The first category of their priorities was features in chat, e-mail, reports, and budgeting. These priorities have been collected from the start-ups.

### 3.5.3 Analysis with All the Participants (n=37)

Chi-square independence test can be done by Microsoft Excel, SPSS, manually, Statgraphics software, etc. The author of this study used Statgraphics version 18 for which ETS university has a subscription. This software has also a free trial for 19 days.

The whole data collected from the survey is provided in an organized version in appendix (APPENDIX I).

In this part, the chi-square test does not include the weights provided by the project managers. The dataset shown in Table 3.6 must be built to conduct the test. Each participant was assigned a Subject ID, from 1 to 37. The first 11 participants are project managers (PM), and the remaining 27 participants are team members (TM).

Table 3. 6 Data set 1- for the chi-square test

Subject ID	Role	Trello	Asana	Monday	Teamwork	Zoho	Best App
1	PM	119					
2							
3							
...							
37	TM	188					

For each software, a global score was obtained by adding all the points given by each subject to that software. For example, for subject 1 and Trello, all the points subject 1 gave to Trello were added, from FC1 to FC9. In the column “Best”, the software with the highest score was selected for each row. With Table 3.6, a chi-square independence test can be performed for “best app” and “role” variables.

The used pathway for chi-square test in the Statgraphic was click on describe, and then click on categorical data and at the end crosstabulation.



The goal of this analysis is to find out if there is any dependence between the role and the best software chosen. This analysis permits us to see whether the choice of the best software depends on the role or not (if project managers tend to select a software as the best one while the team members prefer another one).

### 3.5.4 Prediction Analysis with the Project Manager's Results (project managers only)

This part includes the weights provided by the project managers. and the dataset shown in Table 3.7 is necessary.

Table 3. 7 Data set 2- for prediction analysis

Subject ID	Weight FC1	..	Weight FC8	Trello	Asana	Monday	Teamwork	Zoho	Best Software
1									
2									
3									
...									
11									

To fill up the grid, the weights attributed by each subject to each category are provided. For the analysis of this section, the weights will be used as predictors and then they cannot have a perfect dependence between themselves. Therefore only 8 feature categories were used as predictors (instead of 9), since the weight attributed to the last feature category is determined by the other 8: it is the difference between 100 and the total obtained with all the 8 feature categories. After that, for each software in Table 3.7, a global score is obtained by adding all the points given by each subject to that software. For example, for subject 1 and Trello, all the points he gave to Trello are added, from FC1 to FC9. These scores were already computed in Table 3.7. In the column “Best App”, the software with the highest score is selected.

### 3.5.4.1 Multiple Linear Regression

In this section, a multiple linear regression is constructed for each software 5 regressions were obtained, where the score for each software is the dependent variable and the 8 feature category weights are the independent variables.

The goal of this analysis is to obtain 5 equations that permits to predict the score attributed to each software for a new project manager with his own 8 feature category weights. The preferred predicted software will be the one with the highest predicted score.

In the Statgraphics, the options selected to build a multiple linear regression are 1) Relate 2) Multiple factors 3) Multiple regression.

As it can be seen in table 3.7, the whole dataset 2 is selected and after choosing multiple regression, each software score is chosen for the dependent variables (first field) and for the independent variables, Weight FC1 to Weight FC 8 are selected. Then figure 3.6 shows the default features for this analysis.

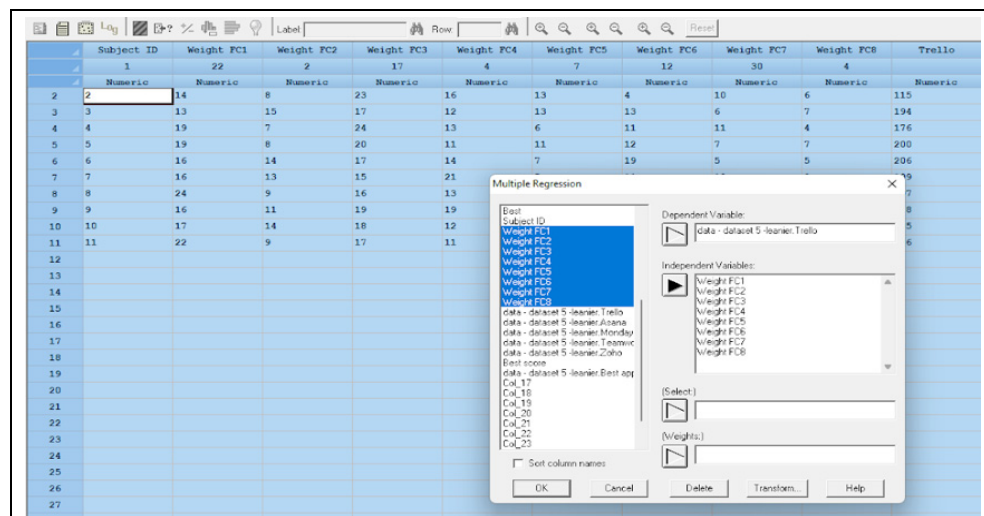


Figure 3. 6 Steps in multiple linear regression

### **3.5.4.2 Multiple Correspondence Analysis**

A statistical tool for visualizing the relationship between the levels of categorical variables is correspondence analysis (CA). In particular, two-way and multiway data are examined using basic and multiple correspondence analysis (MCA), respectively. In the visualization of association, biplots are crucial. (Kamalja, K. K., & Khangar, N. V. 2017)

In this study MCA has been computed for a few datasets. The goal of trying this method is to find out how many features got the highest score by how many participants and what are the role of them and analysis more in details. Also, to try new regrouping the data is another goal of using this technique.

### **3.5.4.3 Classification Tree**

A classification tree, where the author used the feature category weights to determine the best software. This method is interesting as it can predict the best software to use based on the observed feature category weights.

Different methods were used to form the clusters: (nearest Neighbor, furthest neighbor, median, and so on....). The method that gave the most meaningful clustering configuration was chosen.

The subjects (project managers) were clustered, and not the variables (the weights), because the goal is to categorize the participants. (Figure 3.7) These categories can help to predict for future project managers with similar preferences and requirements who can have the same choices at the end.

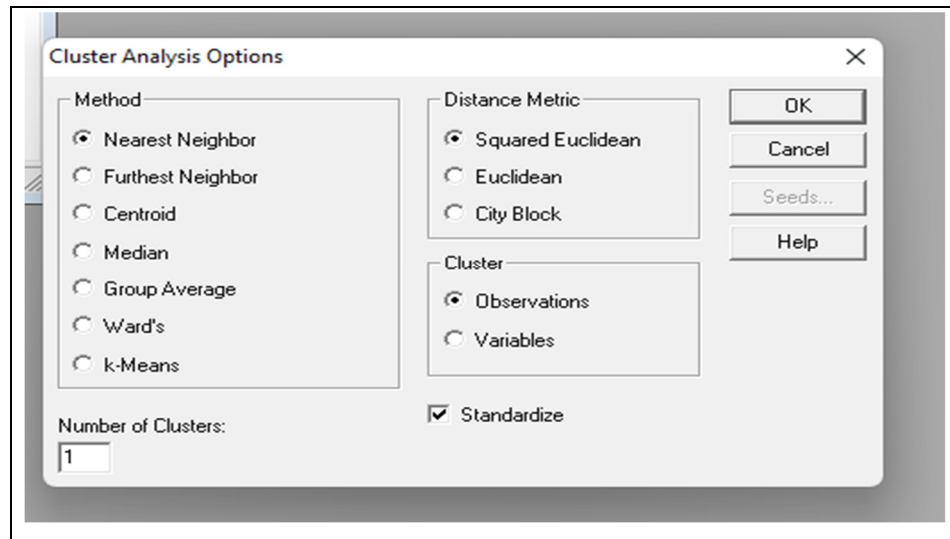


Figure 3. 7 first step of the classification tree

In Statgraphics, the options selected to obtain a classification tree are 1) Describe 2) Multi variable methods 3) Cluster analysis

This chapter explained the research steps, while chapter 4 shows the findings of the collected data and analysis.

### 3.6 Conclusion of the Methodology section

In these section 6 methods of analysis data described. They are particularly for small sample size like this study with 37 surveys. The author of this research tried to consider all the methods that could be match with this data to obtain the goal of this study which is helping project managers in start-ups to select the best software according to their preferences and requirements.

## CHAPTER 4

### RESULTS

In this chapter the results are provided, after applying the methodology of chapter 3. It has 3 parts, first of all analysis the results have been mentioned, then the failed experiments and the last part is about successful experiments. On the report has been explained the results of the experiments and how the recommendation method works.

#### 4.1 Analysis of Survey Results

All of the results from the interpret data and analysis will be reviewed in this chapter.

The figure 4.1 in the below shows a summary of the research steps.

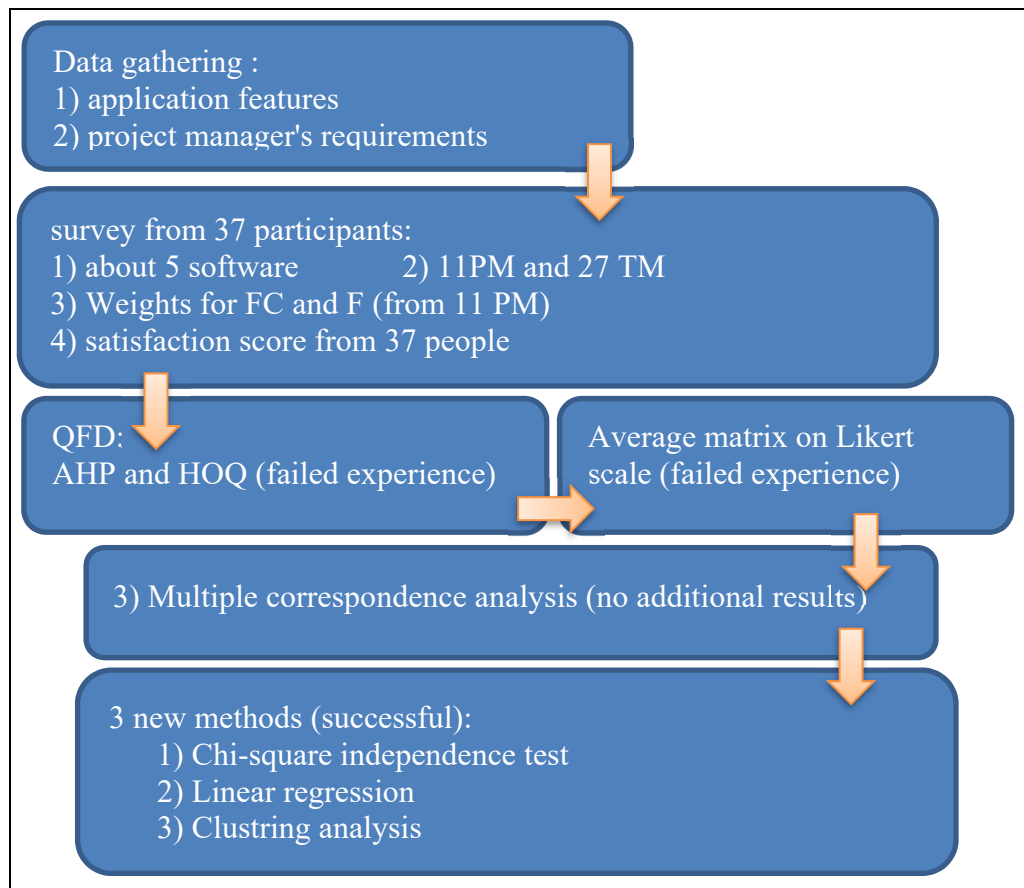


Figure 4. 1 Summary of research steps

## **4.2 Failed Experiment**

### **4.2.1 QFD**

The study was able to create a HOQ table using a combination of VOC and technical software characteristics to assess project manager needs and software features in various software. The survey collected software features (first row) as well as project managers' requirements (last column) for the House of Quality table. There should be some weights in HOQ to compare characteristics to each other, and the researcher attempted to acquire the weight using the AHP approach at first. However, AHP results were not reasonable for this data due to the significant similarity of characteristics and needs. The researcher then attempted to analyze the attributes and came up with some findings. However, because the evaluation and weights were based solely on the perspective of one individual (researcher), they had limited power and validity. This research will continue in the next step using new approaches.

### **4.2.2 Average matrix**

This study divided data into 3 distinct groups based on project managers' preferences and their businesses' after obtaining data from participants and having unsuccessful outcomes in the last phase (HOQ and AHP). Some elements are more crucial for them in each segment.

The two software that received the highest ranking in each category, as well as the two characteristics that received the highest point in the top rank software, are listed in table 4.1. Also, the two apps with the lowest rating point and the two qualities of the weakest software are given. For example, in the first category (finance teams), the best choice may be teamwork, followed by Zoho in second place, based on their criteria, which include the ability to have backup, interact with developing software, and so on.

Table 4. 1 Average matrix - Results summary

	Group 1 (Finance)	Group 2 (IT)	Group 3 (Sales)
Participants	12 (6 Team Members- 6 Project managers)	8 (3 Project Manager- 5 Team members)	17 (2 project managers- 15 Team members)
Main priorities  * = low priority *****=high priority	-Reports *** -Back up**** -Integrate with developing app **** -Video call *** -Price ****	-Reports***** -Export** -Document management** -Budget management** -Bug tracking***	-Reports***** -Integration*** -Chat** -Budget**
	Group 1 (Finance)	Group 2 (IT)	Group 3 (Sales)
Top 2 software	1-Teamwork 2-Zoho	1-Zoho 2-Teamwork	1-Asana 2-Teamwork
Top Features in compared to other software ranking	1-Chat box 2-Call 3-Support	1-Integration	1-Reports 2-Integration 3-Chatbox 4-Task 5-Support
2 software with lowest ranking	4-Monday.com 5-Trello	4-Monday.com 5-Trello	4-Zoho 5-Trello
Features weakness	4-Integration 5-Task	4- 5-support	4- 5-Call

All of these findings may be adjusted to reflect different weights for different circumstances. For example, for a team with preferences like chat, budget friendly, integration and reports, Asana software can be a proper choice same as the third group. But because this study used average calculation on Likert scale, the result cannot be valuable.

### 4.2.3 Multiple correspondence analysis

This study computed multiple correspondence analysis (MCA) on data set, but because of the following reasons the result did not add any additional and valid result for this target.

The dataset from participants has just one division from applicants, their role. This approach can be done if there were more divisions for instance, their sex, origin, age, education background, etc. So, in this case there will be a chance to try to provide new groups. The MCA is perfect method to categorized data and reduced groups into less categories to analysis from another points of view. In this study, the author already has been categorized 63 features into 9 categories, based on the characteristics of the features. And other point of view to compute data in MCA was not the best one and did not have an additional result for this research. Also, this study has been tried to analysis the data from the first version of surveys (not the prepared dataset by the formula and categorized one), which the result was not very match with the goal of this study. For example, 17 participants from 37 person, chose score 2 for the feature 1 in Trello application. It is not match with the target. Also, the author tried to compute the MCA on a data set with the sum of the scores for 9 feature category and software, but the data were not Likert anymore, so it was not valid to proceed.

Also, for a data set like the below, because there were many cases that the participants have chosen more than one software with the high score, so the author should just choose one of the two choices, and at the end the result will not be valid. As can be seen in the Table 4.2 the total scores for software teamwork and asana both are 37, and for this MCA method, just one of them should be choose. Because the number of these cases were more than 50%, also even in some cases they were 3 software at the same time, so the author could not get valid result from this data.



Table 4.2 Part of the MCA dataset for subject ID 1

Subject ID 1							
Feature category	Trello	Asana	Monday	Teamwork	Zoho	Best app-final - removed	Best app-final - mca
FC1	10	37	19	37	20	AS-TK	TK
FC2	4	4	4	10	4	TK	TK
FC3	18	41	33	41	19	AS-TK	TK
FC4	35	59	48	51	34	AS	AS
FC5	9	15	16	10	5	MO	MO
FC6	13	18	23	27	19	TK	TK
FC7	8	18	19	22	16	TK	TK
FC8	12	25	21	27	15	TK	TK
FC9	10	18	12	18	9	AS-TK	TK

### 4.3 Successful Experiment

After two steps failed experiment, the author tried different methods to interpret the collected data from online survey.

The three chosen methods are the Chi-square independence test, Multiple Linear Regression and Classification Tree. In this research the author made decision to use the Statgraphic version 18 software to do this statical analysis.

#### 4.3.1 Chi-Square Independence Test

First of all, a dataset like Table 3.6 was prepared. The Table 4.2 shows part of the table that should be prepared for all 37 participants. In this study and it's tables, each participant is one subject ID. For example, Subject ID 1 is the first participant. Also fro making easier, the first 11 subject IDs are project managers, and the rest 26 subject ID are the team members. The completed data set is provided in appendix. (APPENDIX I- data set 1).

Table 4. 2 Dataset 1 for the chi-square test

Subject ID	Role	Trello	Asana	Monday	Teamwork	Zoho	Best App
1	PM	119	235	195	243	141	Teamwork
2	PM	115	243	191	220	160	Asana
3	PM	194	238	231	221	214	Asana
...	...	...	...	...	...	...	
37	TM	188	226	220	220	223	Asana

In the Statgraphics, 3 options were selected for the chi-square independence test: 1) Frequency Table 2) Table of independence 3) Bar chart for Role by Best app

#### 1- Frequency Table

This process creates a contingency table that displays the frequency of occurrence of each pairwise combination of Role and best app

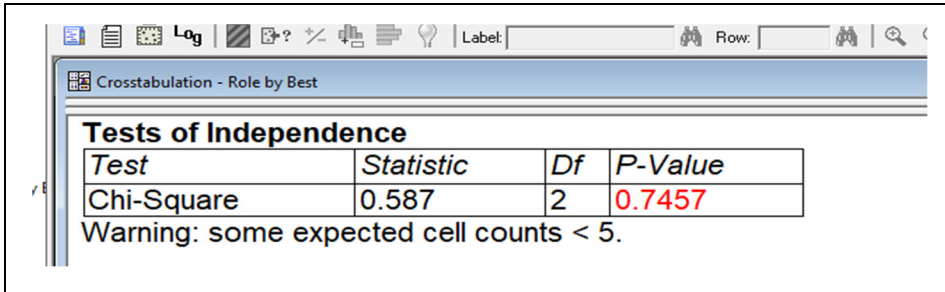
Table 4. 3 Frequency table for role by best software

Observed frequency	Asana	Monday	Teamwork	Row Total
PM	9	0	2	11
	24.32%	0.00%	5.41%	29.73%
TM	19	1	6	26
	51.35%	2.70%	16.22%	70.27%
Column Total	28	1	8	37
	75.68%	2.70%	21.62%	100.00%

Table 4.3 illustrates how frequently the two roles appear with each of the three software as a best app. The count or frequency is the first number in each table field. The second value is the proportion of the total table that that cell represents.

#### 2- Table of independence

Figure 4.2 shows the result of the test of independence



The image shows a screenshot of the SPSS 'Crosstabulation - Role by Best' window. It displays the 'Tests of Independence' section with a table of results. Below the table, a warning message states: 'Warning: some expected cell counts < 5.' The table has four columns: Test, Statistic, Df, and P-Value. The first row shows the Chi-Square test with a statistic of 0.587, 2 degrees of freedom, and a p-value of 0.7457.

Test	Statistic	Df	P-Value
Chi-Square	0.587	2	0.7457

Warning: some expected cell counts < 5.

Figure 4. 2 Tests of Independence

There is a warning in the result that mentioned some expected cell counts are less than 5. For example, frequency for Teamwork software in PM are 2 and both frequency in PM and TM for Monday are less than 5. In this case the p-value should be consider again. In this study, the exact p-value Fisher-Freeman-Halton independence test got collected from SPSS and it was 1.000. It is higher than the p-value that obtained from the statgraphic (0.7457), which got obtained the same score from SPSS. So the reported p-value for this study is the exact p-value (0.7457).

The author reports the exact p-value from the Statgraphic software, which is 0.7457, so it is more than 0.05. This research does not reject the null hypothesis of absence of independence between the 2 variables. It means then that the choice of the best software does not depend on the role of the subject. They can then be mixed together and tend to be consistent for the choice of the best software.

### 3- Barchart for Role by Best app

Figure 4.3 shows the frequencies of occurrence of each pairwise combination of Role and best app

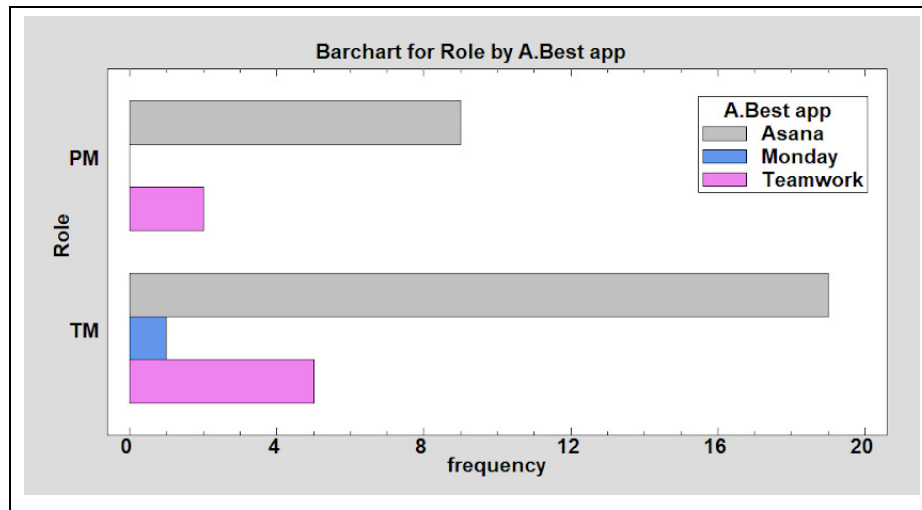


Figure 4. 3 Bar-chart for the best software by role

Prediction Analysis with the project manager's results have been explained in the following.

### 4.3.2 Multiple Linear Regression

The author did multiple linear regression 5 times separately for each software to obtain a formula. Each score be the highest, that software can be the proper choice to choose. The completed data set for this analysis has attached to this study. (APPENDIX II)

#### 4.3.2.1 Part1 – Multiple Linear Regression for Trello

Figure 4.4 shows the results a multiple linear regression model with the score for Trello as a dependent variable.

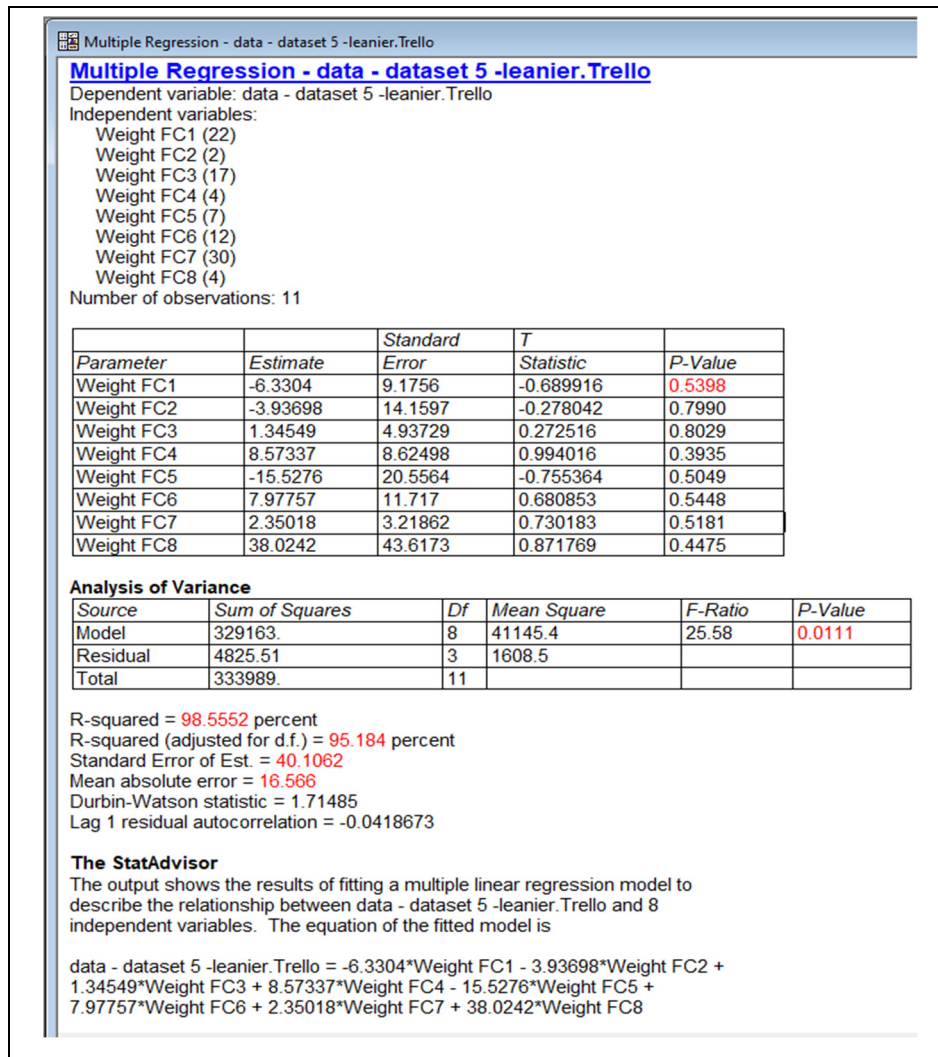


Figure 4. 4 Multiple linear regression for Trello

The equation of the fitted model is:

$$\begin{aligned}
 \text{Trello} = & -6.3304 * \text{Weight FC1} - 3.93698 * \text{Weight FC2} + \\
 & 1.34549 * \text{Weight FC3} + 8.57337 * \text{Weight FC4} - 15.5276 * \text{Weight FC5} + \\
 & 7.97757 * \text{Weight FC6} + 2.35018 * \text{Weight FC7} + 38.0242 * \text{Weight FC8}
 \end{aligned}
 \tag{4.1}$$

According to the R-Squared statistic, the fitted model explains 98.5552 percent of the variability in Trello's score. So, this amount of R-squared can proof that this equation can be valid.

#### **4.3.2.2 Part 2 – Multiple Linear Regression for Asana**

Figure 4.5 shows the results a multiple linear regression model with the score for Asana as a dependent variable.

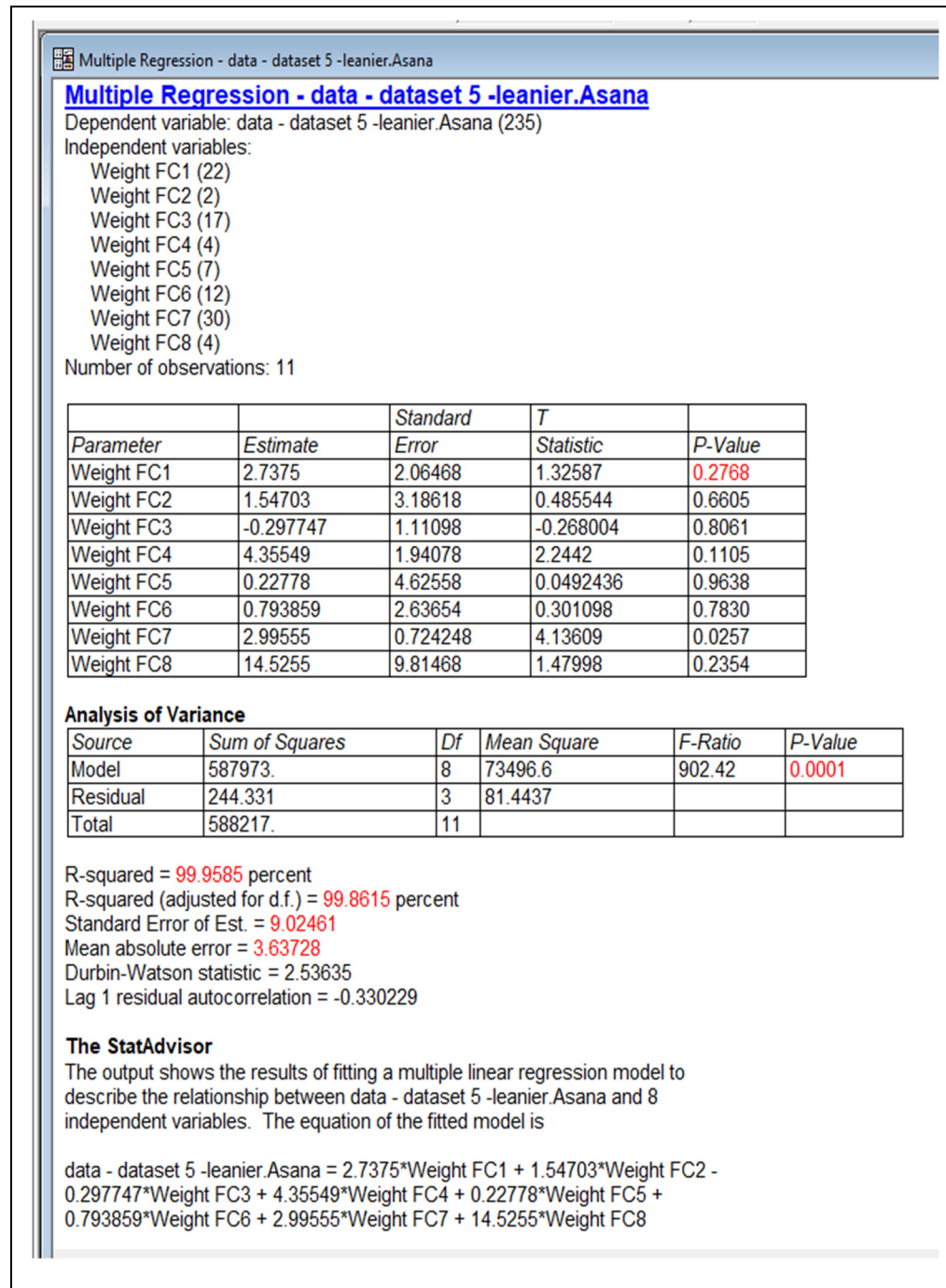


Figure 4. 5 Multiple linear regression for Asana

The equation of the fitted model is:

$$\begin{aligned}
 \text{Asana} = & 2.7375 * \text{Weight FC1} + 1.54703 * \text{Weight FC2} - \\
 & 0.297747 * \text{Weight FC3} + 4.35549 * \text{Weight FC4} + 0.22778 * \text{Weight FC5} + \\
 & 0.793859 * \text{Weight FC6} + 2.99555 * \text{Weight FC7} + 14.5255 * \text{Weight FC8}
 \end{aligned}
 \tag{4.2}$$

The R-Squared statistic indicates that the fitted model explains 99.9585% of the variability in Asana.

#### 4.3.2.3 Part 3 – Multiple Linear Regression for Teamwork

Figure 4.6 shows the results a multiple linear regression model with the score for Teamwork as a dependent variable.

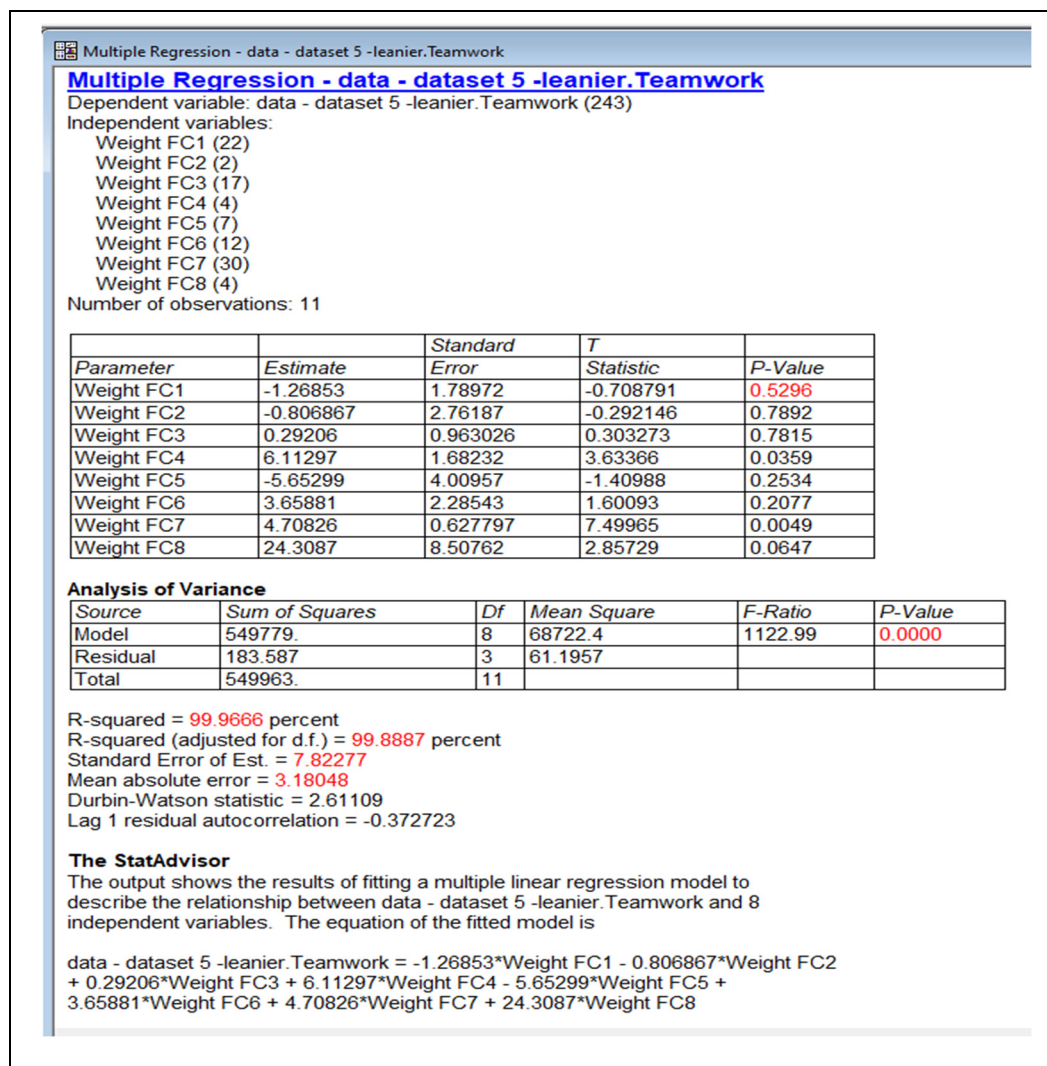


Figure 4. 6 Multiple linear regression for Teamwork



The equation of the fitted model is:

$$\begin{aligned} \text{Teamwork} = & -1.26853 * \text{Weight FC1} - 0.806867 * \text{Weight FC2} \\ & + 0.29206 * \text{Weight FC3} + 6.11297 * \text{Weight FC4} - 5.65299 * \text{Weight FC5} + \\ & 3.65881 * \text{Weight FC6} + 4.70826 * \text{Weight FC7} + 24.3087 * \text{Weight FC8} \end{aligned} \quad (4.3)$$

The R-Squared statistic indicates that the fitted model explains 99.9666 % of the variability in Teamwork.

#### 4.3.2.4 Part 4 – Multiple Linear Regression for Monday

Figure 4.7 shows the results a multiple linear regression model with the score for Monday as a dependent variable.

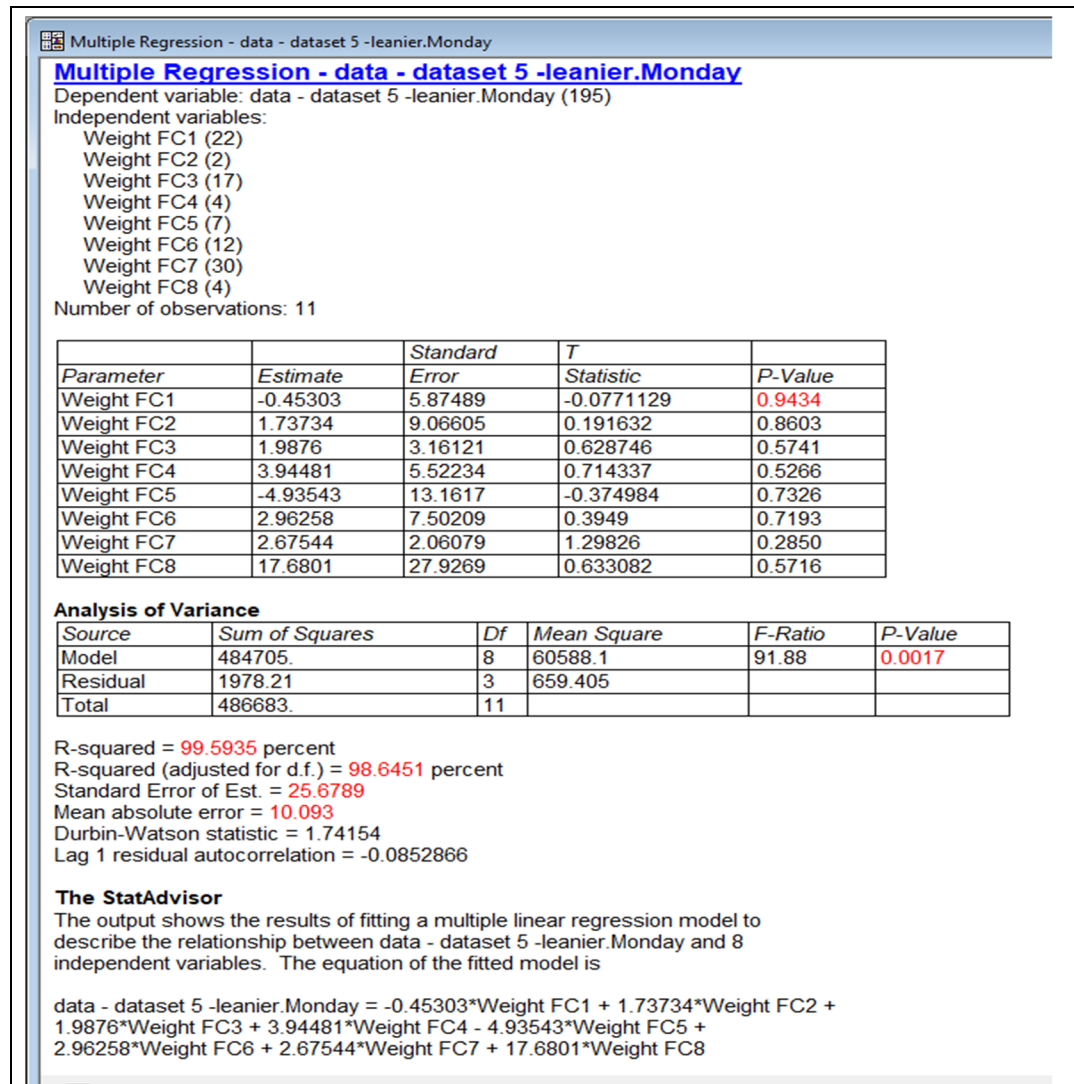


Figure 4. 7 Multiple regression for Monday

The equation of the fitted model is:

$$\begin{aligned}
 \text{Monday} = & -0.45303 * \text{Weight FC1} + 1.73734 * \text{Weight FC2} + \\
 & 1.9876 * \text{Weight FC3} + 3.94481 * \text{Weight FC4} - 4.93543 * \text{Weight FC5} + \\
 & 2.96258 * \text{Weight FC6} + 2.67544 * \text{Weight FC7} + 17.6801 * \text{Weight FC8}
 \end{aligned}
 \tag{4.4}$$

The R-Squared statistic indicates that the fitted model explains 99.5935 % of the variability in Monday.

#### 4.3.2.5 Part 5 – Multiple Linear Regression for Zoho

Figure 4.8 shows the results a multiple linear regression model with the score for Zoho as a dependent variable.

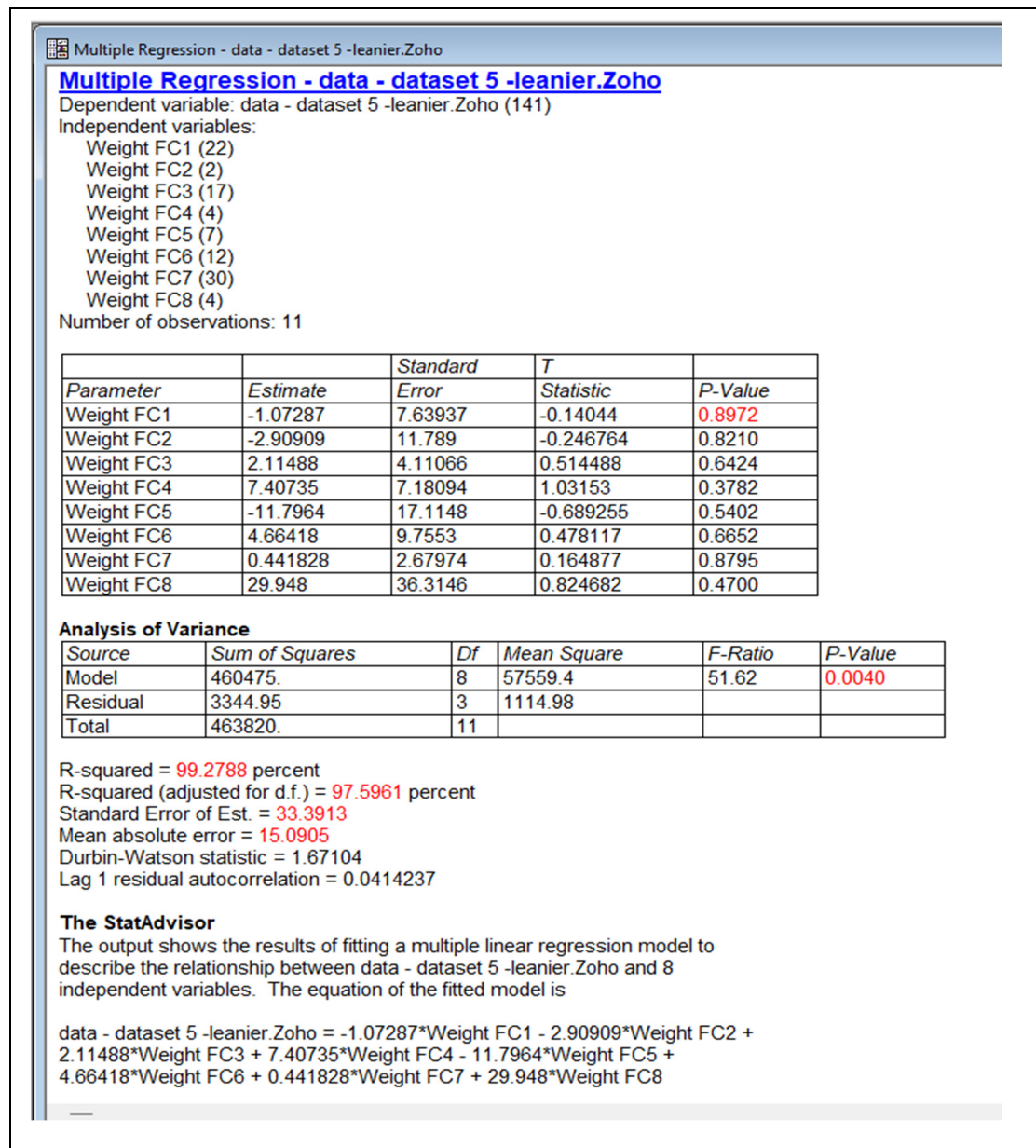


Figure 4. 8 Multiple linear regression for Zoho

The equation of the fitted model is

$$\begin{aligned} \text{Zoho} = & -1.07287 * \text{Weight FC1} - 2.90909 * \text{Weight FC2} + \\ & 2.11488 * \text{Weight FC3} + 7.40735 * \text{Weight FC4} - 11.7964 * \text{Weight FC5} + \\ & 4.66418 * \text{Weight FC6} + 0.441828 * \text{Weight FC7} + 29.948 * \text{Weight FC8} \end{aligned} \quad (4.5)$$

The R-Squared statistic indicates that the fitted model explains 99.278% of the variability in Zoho.

The 5 obtained equations have been tested in the whole dataset provided in Appendix II, to compute the predicted score for each software and each subject. Table 4.4 shows the results obtained with subject 1 and Table 4.5 shows the results obtained with subject 2.

Table 4. 4 Test the equations for Subject ID 1

Subject ID 1		FC1	FC2	FC3	FC4	FC5	FC6	FC7	FC8	Result	Best application
Trello	Factor	-6.3304	-3.93698	1.34549	8.57337	-15.5276	7.97757	2.35018	38.0242	119.66389	5
	weight	22	2	17	4	7	12	30	4		
Asana	Factor	2.7375	1.54703	-0.297747	4.35549	0.22778	0.793859	2.99555	14.5255	234.768589	2
	weight	22	2	17	4	7	12	30	4		
Teamwork	Factor	-1.26853	-0.806867	0.29206	6.11297	-5.65299	3.65881	4.70826	24.3087	242.712896	1
	weight	22	2	17	4	7	12	30	4		
Monday	Factor	-0.45303	1.73734	1.9876	3.94481	-4.93543	2.96258	2.67544	17.6801	195.06301	3
	weight	22	2	17	4	7	12	30	4		
Zoho	Factor	-1.07287	-2.90909	2.11488	7.40735	-11.7964	4.66418	0.441828	29.948	142.60324	4
	weight	22	2	17	4	7	12	30	4		

Table 4. 5 Test the equations for Subject ID 2

Subject ID 2		FC1	FC2	FC3	FC4	FC5	FC6	FC7	FC8	Result	Best application
Trello	Factor	-6.3304	-3.93698	1.34549	8.57337	-15.5276	7.97757	2.35018	38.0242	129.69723	5
	weight	14	8	23	16	13	4	10	6		
Asana	Factor	2.7375	1.54703	-0.297747	4.35549	0.22778	0.793859	2.99555	14.5255	236.785975	1
	weight	14	8	23	16	13	4	10	6		
Teamwork	Factor	-1.26853	-0.806867	0.29206	6.11297	-5.65299	3.65881	4.70826	24.3087	214.391714	2
	weight	14	8	23	16	13	4	10	6		
Monday	Factor	-0.45303	1.73734	1.9876	3.94481	-4.93543	2.96258	2.67544	17.6801	196.91279	3
	weight	14	8	23	16	13	4	10	6		
Zoho	Factor	-1.07287	-2.90909	2.11488	7.40735	-11.7964	4.66418	0.441828	29.948	178.27674	4
	weight	14	8	23	16	13	4	10	6		

For both subjects, the choice of the best software is correctly predicted since subject 1 prefers Teamwork and subject 2 prefers Asana (see Appendix II).

Figure 4.9 compares the result of equations, for subjects 1 and 2, and illustrates that for subject 1, Teamwork was the best-chosen application and for subject 2, Asana has the highest score.

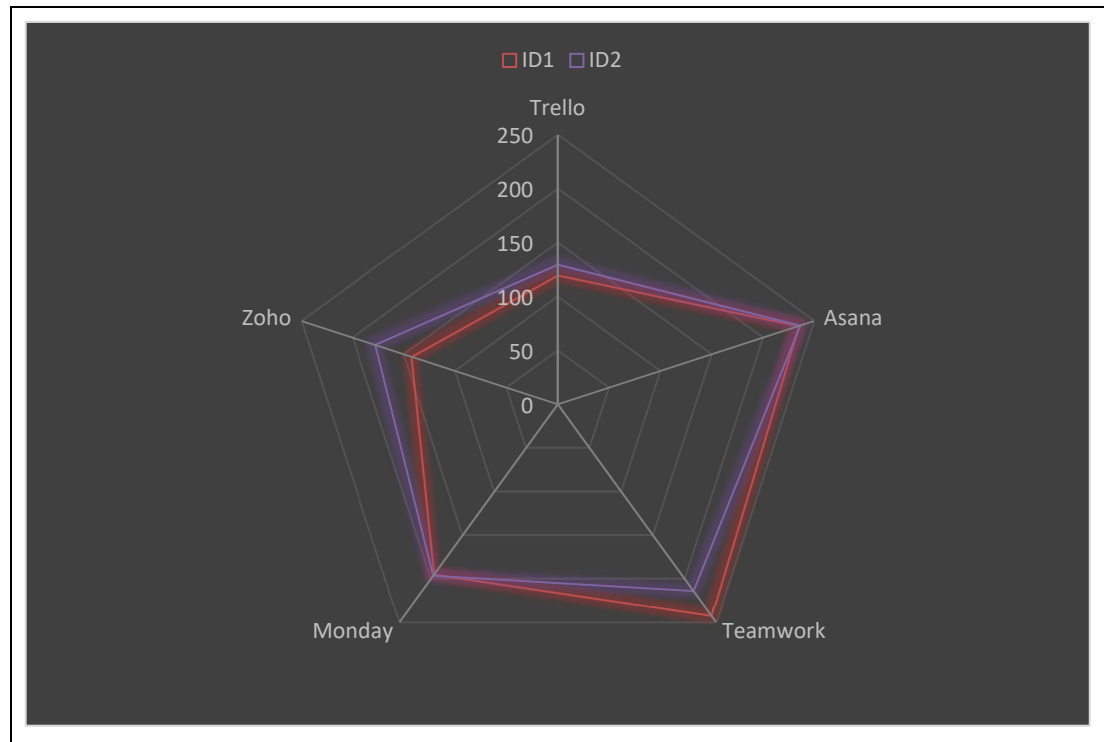


Figure 4. 9 Radar chart for testing the equation- comparison of subject ID 1 & 2

These results are based on the collected data from this study, it suggested to try on other participants. And they have been not implemented on new data because of Covid-19 and lockdown situations, it was not possible to get more survey.

### 4.3.3 Classification Tree

In classification tree analysis, the nearest neighbor has the results that best matches the goal of this study.

Dendrogram for nearest neighbour (Figure 4.10) shows that the subjects 5,11,8,10,6 are in the same cluster and subjects 4,7, 9 are in another same cluster. Also, this dendrogram has 3 isolated clusters (subjects 1, 2 and 3). It means that these group's preferences (in terms of

weights) and in the next step in the final choice (the best application) can be similar to each other.

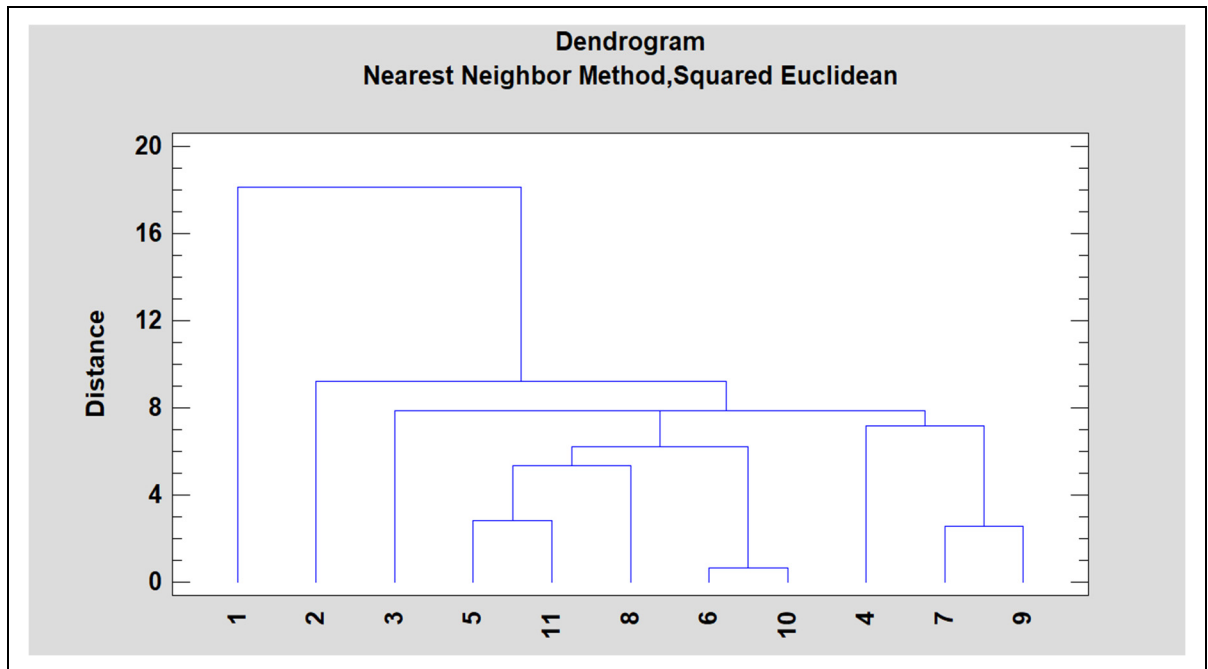


Figure 4. 10 Dendrogram – nearest neighbor

For example, a new project manager with similar weights and preferences to subjects 4, 7 or 9 can be included in this group, so he can choose his best applications that is ASANA- (Table 4.6), since best app for subjects 4,7 and 9, who are one of the groups in dendrogram, is Asana- (Figure 4.10).

Table 4. 6 Part of dataset 1- best app for subjects 4,7,9

Subject ID	Role	Trello	Asana	Monday	Teamwork	Zoho	Best score	Best app
4	PM	176	214	209	212	223	214	Asana
7	PM	199	238	219	237	221	238	Asana
9	PM	178	211	205	210	212	211	Asana

#### 4.4 Conclusion

In the table 4.7, all the results of this chapter have been summarized.

Table 4. 7 Summary of the results

No.	Methods	Results
1	QFD	Based on this data and voice of customer list, no additional information obtained from QFD and AHP
2	Average matrix	Failed experience because of the problem of average on Likert scale data
3	MCA	No additional information because they are limited division in this sample data
4	Chi-Square test	According to the p-value, the null hypothesis (there is no correlation between the best-chosen software and the role of the participants) Also, Asana was the best-chosen software by the 72% of participants
5	MLR	The highlight of this study, that 5 equations have been obtained from this section. It could be useful to recommend to a new project manager with the new preferences
6	Classification tree	Categorized participants into groups; the main group include Subject ID 4,7,9 are in a same preferences and had chosen Asana as a best software. A new project manager with the similar preferences to these 3 persons, can select Asana.





## CONCLUSION AND RECOMMENDATION

The purpose of this study was to provide a recommendation for agile small-scale start-ups when it comes to selecting project management software.

### 5.1 Summary of Research Results

This study has answered to the research questions and also suggest a recommendation for choosing the proper software for project managers in agile start-ups.

This study prepared a list of project managers needs regarding to project management software.

Also, the result shows that Asana was the best choice by 72% of participants. (27 of 37)

In the second part, the result of the multiple linear regression prepared 5 equations that can suggest the best software for the next project managers with 8 weights for features categories.

The equation has tested for subject ID 2 and 3 in the table 4.4 and table 4.5. the suggested tables with these 5 equations have been presented in the Table 4.4. and also, Tables 4.5. these equations have been tested on data from surveys of this thesis, and it will be suggested to test on different data too.

And in the dendrogram categorized the result of participants into 3 groups.

First group is for subject ID 4,7 and 9 who chose ASANA. A new project manager with the similar weights can choose the software for his start-ups.

Regarding the hypothesis of this thesis, in the following paragraphs have been explained.

1- No full featured (calls, messaging, and tasks management) project management software that does not require subscription or payment.

According to this research and 5 software of the markets, just the basic version and limited features of a software is free. Therefore, a full-feature software that can handle most of the project manager's requirement is unavailable.

2- Start-ups and team managers with different backgrounds need and use different features from software and need recommendations to choose the proper project management software to prevent wasting time and reduce risks.

Based on this thesis and collected data from participants, the list of preferences of each project manager and each business sections were different to each other. So, for recommending a proper software to a new start-up, all project managers' and team members' priorities and preferences should be considered.

3- Different project management software can offer various services and features despite their many similarities.

The project managers software has many similarities, but in some cases like reporting, customization, support, being user-friendly and other items are different.

4- There is a correlation between the best-chosen software and the role of survey participants. For instance, team members and project managers have a similar taste in choosing project management's software.

The results of the Chi-square test shows that there is no correlation between best software for team members in start-ups and project manager. Based on this sample size and the p-value from the Fisher exact test, it can be said that the null hypothesis (i.e., no correlation between the role and the best-chosen software) should be accepted or rejected. In this case because the p-value was more than 0.05, so the null hypothesis got accepted based on this data. There is no correlation between the role and the best-chosen software.

It could be because of the small-scale teams and part of the tasks are the same for all the team. So, in the future works and next data collecting it is not necessary to analysis data separately and all the surveys result from project managers and team members can be analysed together.

## 5.2 Drawbacks and Recommendations

The limitations of this study are items like a few participants to take part in the survey, which can be expanded in the future and chosen more carefully without biases about software.

There were multiple limitations for this study. The followings are the main limitations.

1. Number of participants: there were only 37 participants studied in this research. Increasing this number could lead to a more accurate data interpretation in the future. More data can have less biases in terms of preferences and business backgrounds in software.

2. One of our requirements was that the participants have fair amount of familiarity with the most of software that we were studying.

## 5.3 Future Studies

1. Machine learning algorithms are showing very high performance in terms of system recommendation as well as data analysis. (Chen H-K, Chen F-H, Lin S-F, 2021)

One of the huge improvements to this study was the implementing the methodology return AI model in order to automate the final recommendation. The machine learning algorithms take the software features and project managers needs and preferences as inputs and the output the recommended software.

If machine learning and artificial intelligence is implemented on this research, the project managers can have:

- a) More project manager's requirements
  - b) More surveys (with customers and random applicant will be less bias)
1. This study tried to recommend best software by asking the project managers requirements and their preferences (weights). The weights indicated by the project managers. Future work can include analysis of correlation between each weight and start-up business sector that each manager coming from. This will lead to provide a more informative recommendation

2. This study only used a limited parameters such as number of software (n=5) and their features (n=63). Future work can focus on more indexes such as business sectors, the exact number of each team, etc.

The recommended elements may aid future researchers in doing more in-depth investigation. And as a result of their findings, project managers in start-ups may be able to save time and reduce risks.

# APPENDIX I

## SURVEY RESULTS

Table-A I-1 Collected data from subject ID 1 -PM 1

	Role	Features category	Features category weight	Features	Features weight	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  0 1	P r o j e c t  m a n a g e r	FC1	22	F1	9%	1	5	2	4	3
		FC1	22	F2	18%	1	5	3	4	3
		FC1	22	F3	5%	1	1	1	1	1
		FC1	22	F4	4%	1	1	1	1	1
		FC1	22	F5	7%	1	4	2	5	3
		FC1	22	F6	22%	1	5	1	4	3
		FC1	22	F7	6%	1	4	1	5	1
		FC1	22	F8	4%	1	4	1	4	1
		FC1	22	F9	7%	1	5	3	4	2
		FC1	22	F10	18%	1	3	4	5	2
		FC2	2	F11	31%	1	1	1	3	1
		FC2	2	F12	14%	1	1	1	3	1
		FC2	2	F13	40%	1	1	1	3	1
		FC2	2	F14	15%	1	1	1	1	1
		FC3	17	F15	13%	1	4	3	5	2
		FC3	17	F16	8%	1	4	3	5	2
		FC3	17	F17	13%	1	5	3	4	2
		FC3	17	F18	16%	3	3	3	4	4
		FC3	17	F19	9%	2	5	4	3	1
		FC3	17	F20	11%	1	3	4	5	2
		FC3	17	F21	8%	3	5	2	4	1
		FC3	17	F22	12%	1	3	2	4	1
		FC3	17	F23	8%	3	5	5	4	2
		FC3	17	F24	2%	2	4	4	3	2
		FC4	4	F25	9%	4	5	3	5	3
		FC4	4	F26	1%	1	3	2	1	1
		FC4	4	F27	8%	2	4	3	4	1
		FC4	4	F28	6%	3	4	4	3	2
		FC4	4	F29	11%	3	4	4	5	3
		FC4	4	F30	4%	2	5	3	4	1
		FC4	4	F31	4%	3	4	5	3	2
		FC4	4	F32	8%	1	5	3	4	2
		FC4	4	F33	3%	2	3	4	5	3
		FC4	4	F34	8%	4	5	3	4	3
		FC4	4	F35	9%	1	4	2	5	3
		FC4	4	F36	8%	3	5	4	3	3
		FC4	4	F37	10%	3	3	4	4	5
		FC4	4	F38	11%	3	5	4	1	2
		FC5	7	F39	25%	3	4	5	2	1
		FC5	7	F40	18%	2	5	4	3	1
		FC5	7	F41	20%	3	5	4	4	2
		FC5	7	F42	37%	1	1	3	1	1
		FC6	12	F43	10%	2	4	3	5	2
		FC6	12	F44	15%	3	2	4	5	3
		FC6	12	F45	12%	2	4	3	3	4
		FC6	12	F46	30%	3	2	4	5	4
		FC6	12	F47	22%	1	3	5	4	3
		FC6	12	F48	11%	2	3	4	5	3
		FC7	30	F49	10%	3	4	4	5	2
		FC7	30	F50	40%	1	4	3	5	4
		FC7	30	F51	14%	1	3	5	4	3
		FC7	30	F52	24%	2	4	3	5	3
		FC7	30	F53	12%	1	3	4	3	4
		FC8	4	F54	10%	1	5	4	3	2
		FC8	4	F55	25%	2	3	4	5	3
		FC8	4	F56	14%	2	3	4	5	3
		FC8	4	F57	20%	3	5	3	5	4
		FC8	4	F58	9%	2	4	3	5	2
		FC8	4	F59	22%	2	5	3	4	1
		FC9	2	F60	25%	1	4	3	5	2
		FC9	2	F61	40%	3	5	4	4	2
		FC9	2	F62	27%	5	5	3	4	3
		FC9	2	F63	8%	1	4	2	5	2

Table-A I-2 Collected data from subject ID 2- PM 2 in sale team

	Role	Features category	Features category weight	Features	Features weight	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  0 2	P r o j e c t  m a n a g e r	FC1	14	F1	11%	1	5	2	4	3
		FC1	14	F2	22%	1	2	3	4	5
		FC1	14	F3	7%	1	1	1	1	3
		FC1	14	F4	6%	1	1	1	1	1
		FC1	14	F5	9%	1	4	2	5	3
		FC1	14	F6	8%	1	4	1	4	4
		FC1	14	F7	4%	1	4	1	5	1
		FC1	14	F8	6%	1	4	1	4	1
		FC1	14	F9	5%	2	3	4	5	4
		FC1	14	F10	22%	3	4	5	1	2
		FC2	8	F11	39%	1	1	1	3	1
		FC2	8	F12	6%	1	1	1	3	1
		FC2	8	F13	20%	1	1	1	3	1
		FC2	8	F14	35%	1	1	1	1	1
		FC3	23	F15	7%	2	4	1	5	4
		FC3	23	F16	16%	3	5	3	4	2
		FC3	23	F17	11%	2	5	4	1	3
		FC3	23	F18	8%	4	4	3	5	5
		FC3	23	F19	15%	3	5	4	4	2
		FC3	23	F20	5%	1	5	2	3	4
		FC3	23	F21	16%	3	5	4	4	2
		FC3	23	F22	8%	3	5	5	5	3
		FC3	23	F23	6%	2	4	5	3	1
		FC3	23	F24	8%	3	5	3	4	4
		FC4	16	F25	6%	1	4	3	5	2
		FC4	16	F26	5%	1	3	2	2	2
		FC4	16	F27	4%	1	5	3	4	2
		FC4	16	F28	2%	3	5	4	4	3
		FC4	16	F29	9%	3	4	5	2	4
		FC4	16	F30	8%	3	5	2	1	4
		FC4	16	F31	7%	3	5	2	1	4
		FC4	16	F32	4%	3	5	2	1	4
		FC4	16	F33	11%	2	4	5	3	1
		FC4	16	F34	2%	2	5	4	3	1
		FC4	16	F35	15%	1	5	4	4	2
		FC4	16	F36	2%	1	4	5	3	2
		FC4	16	F37	20%	3	3	4	4	2
		FC4	16	F38	5%	2	4	5	3	1
		FC5	13	F39	15%	2	3	4	3	2
		FC5	13	F40	22%	1	5	4	2	3
		FC5	13	F41	30%	1	4	2	5	3
		FC5	13	F42	33%	1	1	2	1	1
		FC6	4	F43	40%	2	3	4	4	3
		FC6	4	F44	5%	2	5	4	3	3
		FC6	4	F45	8%	2	3	5	4	2
		FC6	4	F46	10%	3	4	3	5	4
		FC6	4	F47	18%	2	3	5	4	1
		FC6	4	F48	19%	1	5	4	3	2
		FC7	10	F49	30%	1	5	2	4	3
		FC7	10	F50	10%	1	3	2	5	4
		FC7	10	F51	26%	2	4	1	5	3
		FC7	10	F52	16%	1	4	3	5	3
		FC7	10	F53	18%	1	5	4	3	2
		FC8	6	F54	20%	1	5	3	4	3
		FC8	6	F55	5%	1	3	4	5	4
		FC8	6	F56	30%	1	3	4	5	4
		FC8	6	F57	10%	2	5	3	4	2
		FC8	6	F58	21%	1	4	3	5	3
		FC8	6	F59	14%	3	5	4	5	3
		FC9	6	F60	35%	2	5	3	4	1
		FC9	6	F61	20%	2	4	4	3	2
		FC9	6	F62	33%	5	3	2	3	3
		FC9	6	F63	12%	2	5	3	4	1

Table-A I-3 Collected data from subject ID 3- PM1 – team 5 finance

Subject ID	Role	Features category	Features category weight	Features	Features weight	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
3	Project manager	FC1	13	F1	11%	1	3	1	5	3
		FC1	13	F2	18%	1	3	2	5	3
		FC1	13	F3	7%	1	1	1	4	2
		FC1	13	F4	5%	1	1	1	2	1
		FC1	13	F5	7%	1	3	5	4	2
		FC1	13	F6	9%	1	5	5	3	4
		FC1	13	F7	14%	1	3	1	5	1
		FC1	13	F8	3%	1	4	1	5	1
		FC1	13	F9	8%	3	5	3	3	3
		FC1	13	F10	18%	5	4	5	5	5
		FC2	15	F11	33%	1	1	1	2	1
		FC2	15	F12	31%	1	1	1	1	1
		FC2	15	F13	22%	1	1	1	1	1
		FC2	15	F14	14%	1	1	1	1	1
		FC3	17	F15	15%	3	4	2	4	5
		FC3	17	F16	5%	3	5	5	4	5
		FC3	17	F17	11%	3	5	5	5	3
		FC3	17	F18	16%	3	5	5	5	3
		FC3	17	F19	17%	5	5	5	4	5
		FC3	17	F20	4%	3	4	5	3	4
		FC3	17	F21	11%	2	5	5	5	2
		FC3	17	F22	16%	3	5	3	3	5
		FC3	17	F23	2%	1	1	1	1	1
		FC3	17	F24	3%	2	2	2	3	2
		FC4	12	F25	4%	5	5	5	5	4
		FC4	12	F26	9%	5	5	5	4	4
		FC4	12	F27	4%	5	5	5	4	4
		FC4	12	F28	4%	2	5	5	4	3
		FC4	12	F29	12%	5	5	5	3	4
		FC4	12	F30	4%	4	4	4	5	4
		FC4	12	F31	4%	5	5	5	5	2
		FC4	12	F32	4%	4	5	5	4	3
		FC4	12	F33	7%	4	5	5	1	3
		FC4	12	F34	5%	4	5	5	2	4
		FC4	12	F35	9%	5	5	5	2	2
		FC4	12	F36	9%	5	5	5	2	5
		FC4	12	F37	19%	5	5	4	4	5
		FC4	12	F38	6%	5	5	1	1	5
		FC5	13	F39	24%	2	1	5	5	2
		FC5	13	F40	33%	2	1	5	4	5
		FC5	13	F41	22%	1	1	2	1	1
		FC5	13	F42	21%	1	1	2	1	1
		FC6	13	F43	19%	3	5	5	5	5
		FC6	13	F44	4%	3	5	5	5	3
		FC6	13	F45	17%	2	5	3	2	5
		FC6	13	F46	14%	4	5	3	5	5
		FC6	13	F47	25%	4	5	5	5	5
		FC6	13	F48	21%	4	2	3	2	1
		FC7	6	F49	15%	5	5	5	4	5
		FC7	6	F50	14%	5	5	5	5	5
		FC7	6	F51	28%	4	4	5	3	5
		FC7	6	F52	14%	3	5	5	2	5
		FC7	6	F53	29%	2	4	5	2	5
		FC8	7	F54	12%	5	5	5	5	5
		FC8	7	F55	2%	5	3	5	5	3
		FC8	7	F56	31%	5	3	5	4	3
		FC8	7	F57	27%	5	5	4	5	4
		FC8	7	F58	17%	1	2	3	3	3
		FC8	7	F59	11%	1	2	3	3	2
		FC9	4	F60	25%	4	4	3	5	5
		FC9	4	F61	17%	3	4	1	1	5
		FC9	4	F62	40%	5	5	3	5	5
		FC9	4	F63	18%	4	5	5	5	5

Table-A I-4 Collected data from subject ID 4- PM1 team 6 finance

Subject ID	Role	Features category	Features category weight	Features	Features weight	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  0 4	P r o j e c t  m a n a g e r	FC1	19	F1	11%	1	1	1	4	2
		FC1	19	F2	17%	1	3	2	4	2
		FC1	19	F3	6%	1	1	1	2	5
		FC1	19	F4	4%	1	1	1	2	1
		FC1	19	F5	15%	1	1	4	5	2
		FC1	19	F6	8%	1	4	1	2	4
		FC1	19	F7	11%	1	3	1	5	1
		FC1	19	F8	4%	1	3	1	5	1
		FC1	19	F9	4%	3	5	5	4	3
		FC1	19	F10	20%	5	3	3	5	4
		FC2	7	F11	31%	1	1	1	4	1
		FC2	7	F12	30%	1	1	1	1	1
		FC2	7	F13	25%	1	1	1	1	1
		FC2	7	F14	14%	1	1	1	1	1
		FC3	24	F15	6%	4	3	1	4	5
		FC3	24	F16	6%	5	3	3	4	5
		FC3	24	F17	17%	4	5	3	5	5
		FC3	24	F18	20%	1	5	3	5	5
		FC3	24	F19	16%	4	4	3	3	5
		FC3	24	F20	8%	3	4	5	3	3
		FC3	24	F21	14%	3	5	2	5	4
		FC3	24	F22	3%	4	5	2	2	5
		FC3	24	F23	7%	1	1	1	1	1
		FC3	24	F24	3%	1	5	2	2	5
		FC4	13	F25	6%	5	5	4	5	3
		FC4	13	F26	3%	3	3	4	3	5
		FC4	13	F27	6%	5	5	5	3	5
		FC4	13	F28	7%	3	5	5	4	4
		FC4	13	F29	8%	5	5	5	3	5
		FC4	13	F30	8%	5	5	3	5	3
		FC4	13	F31	3%	5	2	5	5	3
		FC4	13	F32	7%	4	5	5	4	5
		FC4	13	F33	4%	4	4	4	3	5
		FC4	13	F34	7%	3	5	5	3	4
		FC4	13	F35	11%	3	5	5	3	4
		FC4	13	F36	4%	5	5	5	2	5
		FC4	13	F37	20%	4	4	3	3	4
		FC4	13	F38	6%	4	4	3	3	4
		FC5	6	F39	18%	1	1	2	2	1
		FC5	6	F40	33%	2	1	4	4	5
		FC5	6	F41	25%	1	1	1	1	1
		FC5	6	F42	24%	1	1	2	1	1
		FC6	11	F43	25%	1	5	5	3	4
		FC6	11	F44	5%	3	4	4	4	5
		FC6	11	F45	11%	2	2	4	4	5
		FC6	11	F46	16%	3	5	4	4	5
		FC6	11	F47	24%	4	5	4	4	4
		FC6	11	F48	19%	3	1	1	3	2
		FC7	11	F49	18%	3	4	5	3	5
		FC7	11	F50	12%	2	5	5	4	5
		FC7	11	F51	15%	1	4	5	2	5
		FC7	11	F52	25%	1	4	5	3	5
		FC7	11	F53	30%	4	4	5	2	4
		FC8	4	F54	16%	5	5	5	5	5
		FC8	4	F55	3%	4	3	5	4	2
		FC8	4	F56	23%	4	3	5	4	4
		FC8	4	F57	26%	5	5	5	5	4
		FC8	4	F58	16%	1	1	4	4	1
		FC8	4	F59	16%	2	1	1	2	1
		FC9	5	F60	17%	5	4	5	4	5
		FC9	5	F61	22%	3	4	5	5	5
		FC9	5	F62	52%	4	5	3	4	4
		FC9	5	F63	9%	3	5	5	3	4



Table-A I-5 Collected data from subject ID 5-PM1 team 4 finance

	Role	Features category	Features category weight	Features	Features weight	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  5	P r o j e c t  m a n a g e r	FC1	19	F1	6%	1	3	1	5	4
		FC1	19	F2	22%	1	3	2	5	5
		FC1	19	F3	5%	1	1	1	2	5
		FC1	19	F4	8%	1	1	1	2	1
		FC1	19	F5	5%	1	2	4	5	2
		FC1	19	F6	13%	1	5	2	5	5
		FC1	19	F7	11%	1	4	1	5	1
		FC1	19	F8	6%	1	4	1	5	1
		FC1	19	F9	6%	5	5	5	5	3
		FC1	19	F10	18%	3	3	4	5	5
		FC2	8	F11	29%	1	1	1	5	1
		FC2	8	F12	40%	1	1	1	1	1
		FC2	8	F13	14%	1	1	1	1	1
		FC2	8	F14	17%	1	1	1	1	1
		FC3	20	F15	5%	5	5	2	5	5
		FC3	20	F16	15%	3	5	3	4	5
		FC3	20	F17	12%	4	5	5	5	5
		FC3	20	F18	12%	4	5	2	5	5
		FC3	20	F19	17%	5	5	3	4	5
		FC3	20	F20	6%	3	4	5	3	4
		FC3	20	F21	17%	5	5	5	5	5
		FC3	20	F22	6%	3	5	3	3	5
		FC3	20	F23	8%	2	2	3	2	1
		FC3	20	F24	2%	1	4	2	2	5
		FC4	11	F25	6%	5	5	5	5	5
		FC4	11	F26	6%	5	5	5	4	5
		FC4	11	F27	4%	5	5	5	3	4
		FC4	11	F28	5%	2	5	5	3	3
		FC4	11	F29	12%	5	5	5	3	5
		FC4	11	F30	4%	5	4	4	5	3
		FC4	11	F31	6%	5	4	5	5	4
		FC4	11	F32	3%	5	4	5	4	5
		FC4	11	F33	7%	5	5	5	2	5
		FC4	11	F34	4%	5	5	5	3	5
		FC4	11	F35	15%	5	5	5	3	5
		FC4	11	F36	3%	5	5	5	2	5
		FC4	11	F37	14%	5	5	4	4	5
		FC4	11	F38	11%	5	5	4	5	5
		FC5	11	F39	22%	3	1	5	4	2
		FC5	11	F40	31%	2	1	5	3	5
		FC5	11	F41	17%	1	1	2	1	1
		FC5	11	F42	30%	1	1	2	1	1
		FC6	12	F43	15%	3	5	4	5	5
		FC6	12	F44	15%	2	5	4	5	5
		FC6	12	F45	15%	2	5	3	4	5
		FC6	12	F46	11%	3	5	4	5	5
		FC6	12	F47	23%	5	5	4	3	5
		FC6	12	F48	21%	2	5	3	1	1
		FC7	7	F49	25%	5	3	5	2	5
		FC7	7	F50	11%	5	5	5	5	5
		FC7	7	F51	16%	4	5	5	2	5
		FC7	7	F52	15%	3	5	5	3	5
		FC7	7	F53	33%	2	5	5	3	5
		FC8	7	F54	13%	5	5	4	4	4
		FC8	7	F55	3%	4	3	5	4	3
		FC8	7	F56	19%	4	3	5	4	4
		FC8	7	F57	29%	4	5	4	5	4
		FC8	7	F58	15%	3	2	2	2	2
		FC8	7	F59	21%	2	1	3	3	1
		FC9	5	F60	23%	4	4	3	4	4
		FC9	5	F61	14%	1	1	4	1	1
		FC9	5	F62	60%	4	5	4	5	4
		FC9	5	F63	3%	4	5	5	5	5

Table-A I-6 Collected data from subject ID 6-PM1 team 3 finance

	Role	Features category	Features category weight	Features	Features weight	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  6	P r o j e c t  m a n a g e r	FC1	16	F1	7%	1	2	1	5	3
		FC1	16	F2	25%	1	2	1	5	5
		FC1	16	F3	4%	1	1	1	4	3
		FC1	16	F4	4%	1	1	1	2	1
		FC1	16	F5	6%	1	5	2	5	2
		FC1	16	F6	15%	1	5	3	2	3
		FC1	16	F7	9%	1	4	1	4	1
		FC1	16	F8	6%	1	3	1	3	2
		FC1	16	F9	6%	3	5	5	3	3
		FC1	16	F10	18%	4	4	5	5	4
		FC2	14	F11	22%	1	1	1	5	1
		FC2	14	F12	44%	1	1	1	1	1
		FC2	14	F13	15%	1	1	1	1	1
		FC2	14	F14	19%	1	1	1	1	1
		FC3	17	F15	12%	3	3	4	5	5
		FC3	17	F16	5%	3	4	2	4	5
		FC3	17	F17	12%	4	5	5	5	5
		FC3	17	F18	18%	5	5	4	5	5
		FC3	17	F19	13%	5	5	2	4	3
		FC3	17	F20	10%	5	5	5	5	4
		FC3	17	F21	12%	4	5	3	5	4
		FC3	17	F22	11%	5	4	3	3	5
		FC3	17	F23	5%	2	1	3	1	2
		FC3	17	F24	2%	1	3	2	1	5
		FC4	14	F25	8%	5	4	5	5	2
		FC4	14	F26	4%	5	4	5	4	3
		FC4	14	F27	3%	5	5	4	4	3
		FC4	14	F28	7%	4	2	5	3	2
		FC4	14	F29	7%	5	5	4	5	4
		FC4	14	F30	7%	5	5	5	5	3
		FC4	14	F31	4%	5	5	5	5	3
		FC4	14	F32	8%	4	5	4	5	4
		FC4	14	F33	4%	4	5	4	5	5
		FC4	14	F34	7%	4	5	5	5	5
		FC4	14	F35	8%	4	5	5	5	5
		FC4	14	F36	6%	5	4	5	4	5
		FC4	14	F37	18%	5	4	5	3	5
		FC4	14	F38	9%	5	5	5	2	5
		FC5	7	F39	25%	3	2	2	2	3
		FC5	7	F40	33%	2	2	2	5	3
		FC5	7	F41	24%	2	2	1	1	1
		FC5	7	F42	18%	1	1	1	1	1
		FC6	19	F43	23%	3	5	4	5	5
		FC6	19	F44	9%	2	3	4	4	5
		FC6	19	F45	8%	2	3	4	5	5
		FC6	19	F46	14%	3	5	4	5	5
		FC6	19	F47	26%	4	5	4	4	5
		FC6	19	F48	20%	3	5	2	2	1
		FC7	5	F49	11%	5	5	4	3	4
		FC7	5	F50	22%	5	5	4	5	5
		FC7	5	F51	18%	4	3	4	2	5
		FC7	5	F52	19%	3	4	5	2	4
		FC7	5	F53	30%	3	5	5	3	5
		FC8	5	F54	11%	5	5	5	5	4
		FC8	5	F55	3%	5	2	5	5	3
		FC8	5	F56	29%	5	3	5	5	3
		FC8	5	F57	14%	5	4	4	5	5
		FC8	5	F58	22%	2	2	4	3	2
		FC8	5	F59	21%	1	1	1	1	1
		FC9	3	F60	17%	3	3	3	3	3
		FC9	3	F61	26%	5	5	5	5	5
		FC9	3	F62	47%	5	4	3	5	4
		FC9	3	F63	10%	4	4	5	5	5

Table-A I-7 Collected data from subject ID 7-PM1 team 2 finance

Subject ID 07	Role	Features category	Features category weight	Features	Features weight	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
	P r o j e c t m a n a g e r	FC1	16	F1	11%	1	3	1	4	4
		FC1	16	F2	17%	1	3	1	5	4
		FC1	16	F3	6%	1	1	1	3	3
		FC1	16	F4	6%	1	1	1	2	1
		FC1	16	F5	11%	1	3	2	5	2
		FC1	16	F6	12%	1	5	2	4	3
		FC1	16	F7	7%	1	3	1	4	1
		FC1	16	F8	7%	1	3	1	4	1
		FC1	16	F9	4%	2	5	3	3	3
		FC1	16	F10	19%	4	3	5	5	5
		FC2	13	F11	35%	1	1	1	4	1
		FC2	13	F12	39%	1	1	1	1	1
		FC2	13	F13	13%	1	1	1	1	1
		FC2	13	F14	13%	1	1	1	1	1
		FC3	15	F15	7%	2	4	2	4	5
		FC3	15	F16	4%	2	4	2	4	5
		FC3	15	F17	19%	4	5	4	5	5
		FC3	15	F18	13%	5	5	3	5	5
		FC3	15	F19	18%	5	5	2	4	4
		FC3	15	F20	5%	5	5	5	5	4
		FC3	15	F21	20%	4	5	3	4	4
		FC3	15	F22	7%	5	4	3	3	4
		FC3	15	F23	4%	2	1	2	1	2
		FC3	15	F24	3%	1	3	2	1	5
		FC4	21	F25	5%	5	5	5	5	2
		FC4	21	F26	4%	5	5	5	4	3
		FC4	21	F27	8%	5	5	5	4	3
		FC4	21	F28	4%	4	5	5	4	2
		FC4	21	F29	11%	5	5	5	5	4
		FC4	21	F30	3%	5	5	4	5	4
		FC4	21	F31	10%	5	5	5	5	4
		FC4	21	F32	3%	4	5	4	5	4
		FC4	21	F33	3%	4	5	4	5	4
		FC4	21	F34	9%	5	5	5	5	5
		FC4	21	F35	14%	5	5	5	5	5
		FC4	21	F36	4%	5	4	5	4	5
		FC4	21	F37	14%	5	4	5	3	5
		FC4	21	F38	8%	5	5	5	3	5
		FC5	5	F39	16%	3	2	2	2	3
		FC5	5	F40	40%	2	2	2	5	4
		FC5	5	F41	15%	2	2	1	1	1
		FC5	5	F42	29%	1	1	1	1	1
		FC6	11	F43	19%	3	4	5	4	5
		FC6	11	F44	6%	2	5	5	5	3
		FC6	11	F45	16%	2	5	5	3	4
		FC6	11	F46	20%	3	5	3	5	5
		FC6	11	F47	15%	4	3	5	4	5
		FC6	11	F48	24%	2	4	5	2	2
		FC7	10	F49	14%	3	5	5	2	5
		FC7	10	F50	18%	2	5	5	4	5
		FC7	10	F51	22%	4	5	5	4	4
		FC7	10	F52	15%	3	5	5	3	4
		FC7	10	F53	31%	4	5	5	3	5
		FC8	3	F54	17%	5	5	5	5	4
		FC8	3	F55	2%	5	3	5	4	3
		FC8	3	F56	13%	5	3	5	5	3
		FC8	3	F57	35%	5	5	5	5	4
		FC8	3	F58	15%	1	1	3	3	2
		FC8	3	F59	18%	2	1	3	3	1
		FC9	6	F60	16%	4	4	4	5	5
		FC9	6	F61	25%	3	5	5	5	5
		FC9	6	F62	44%	5	5	3	5	4
		FC9	6	F63	15%	4	5	5	5	5

Table-A I-8 Collected data from subject ID 8- PM1 team 1 finance

Subject ID	Project manager	Role	Features category	Features category weight	Features	Features weight	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
8	S u b j e c t I D 0 8	P r o j e c t m a n a g e r	FC1	24	F1	14%	1	2	1	5	4
			FC1	24	F2	21%	1	3	2	5	4
			FC1	24	F3	3%	1	1	1	2	4
			FC1	24	F4	3%	1	1	1	2	1
			FC1	24	F5	9%	1	2	4	4	2
			FC1	24	F6	9%	1	5	2	3	4
			FC1	24	F7	8%	1	3	1	5	1
			FC1	24	F8	5%	1	3	1	5	1
			FC1	24	F9	3%	3	5	3	3	3
			FC1	24	F10	25%	5	3	4	5	5
			FC2	9	F11	31%	1	1	1	5	1
			FC2	9	F12	39%	1	1	1	1	1
			FC2	9	F13	20%	1	1	1	1	1
			FC2	9	F14	10%	1	1	1	1	1
			FC3	16	F15	4%	3	4	2	4	5
			FC3	16	F16	14%	3	4	3	4	5
			FC3	16	F17	17%	4	5	3	5	5
			FC3	16	F18	11%	4	5	3	5	5
			FC3	16	F19	11%	5	5	3	4	5
			FC3	16	F20	11%	3	4	5	3	4
			FC3	16	F21	14%	3	5	4	5	5
			FC3	16	F22	15%	3	5	3	3	5
			FC3	16	F23	2%	2	2	2	2	1
			FC3	16	F24	1%	1	4	2	2	5
			FC4	13	F25	11%	5	5	5	5	4
			FC4	13	F26	4%	5	5	5	4	5
			FC4	13	F27	6%	5	5	5	3	4
			FC4	13	F28	3%	2	5	5	3	3
			FC4	13	F29	9%	5	5	5	3	5
			FC4	13	F30	6%	5	4	4	5	3
			FC4	13	F31	3%	5	4	5	5	3
			FC4	13	F32	6%	5	4	5	4	5
			FC4	13	F33	5%	5	5	5	2	4
			FC4	13	F34	6%	5	5	5	3	5
			FC4	13	F35	13%	5	5	5	3	5
			FC4	13	F36	6%	5	5	5	2	5
			FC4	13	F37	15%	5	5	4	4	5
			FC4	13	F38	7%	5	5	4	3	4
			FC5	6	F39	17%	2	1	4	3	2
			FC5	6	F40	37%	2	1	4	3	5
			FC5	6	F41	18%	1	1	2	1	1
			FC5	6	F42	28%	1	1	2	1	1
			FC6	18	F43	17%	3	5	5	4	5
			FC6	18	F44	11%	3	5	5	4	4
			FC6	18	F45	7%	2	5	4	4	4
			FC6	18	F46	25%	3	5	3	5	5
			FC6	18	F47	17%	5	5	5	4	5
			FC6	18	F48	23%	3	5	5	2	2
			FC7	9	F49	21%	3	5	5	2	5
			FC7	9	F50	14%	2	5	5	5	5
			FC7	9	F51	19%	3	5	5	2	5
			FC7	9	F52	13%	3	5	5	2	5
			FC7	9	F53	33%	3	5	5	3	5
			FC8	4	F54	22%	5	5	5	5	4
			FC8	4	F55	1%	5	3	5	5	3
			FC8	4	F56	17%	5	3	5	5	3
			FC8	4	F57	16%	5	5	4	5	4
			FC8	4	F58	25%	2	2	3	3	2
			FC8	4	F59	19%	2	2	3	3	2
			FC9	1	F60	22%	4	4	3	5	5
			FC9	1	F61	17%	3	4	5	5	5
			FC9	1	F62	55%	5	5	3	5	4
			FC9	1	F63	6%	4	4	5	4	5

Table-A I-9 Collected data from subject ID 9- PM1 team 2 IT

Subject ID 9	Role	Features category	Features category weight	Features	Features weight	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  0 9	P r o j e c t  m a n a g e r	FC1	16	F1	13%	1	2	1	4	5
		FC1	16	F2	15%	1	3	2	4	3
		FC1	16	F3	7%	1	1	1	3	4
		FC1	16	F4	4%	1	1	1	3	3
		FC1	16	F5	11%	1	4	4	3	4
		FC1	16	F6	7%	1	5	3	4	5
		FC1	16	F7	7%	1	3	1	5	1
		FC1	16	F8	7%	1	4	1	5	1
		FC1	16	F9	10%	5	5	4	4	5
		FC1	16	F10	19%	4	4	4	5	4
		FC2	11	F11	42%	1	1	1	2	1
		FC2	11	F12	22%	1	1	1	1	1
		FC2	11	F13	17%	1	1	1	1	1
		FC2	11	F14	19%	1	1	1	1	1
		FC3	19	F15	11%	3	5	2	3	3
		FC3	19	F16	4%	3	5	3	4	4
		FC3	19	F17	22%	4	5	5	5	4
		FC3	19	F18	23%	3	4	5	3	5
		FC3	19	F19	6%	5	3	4	5	5
		FC3	19	F20	6%	4	4	5	3	5
		FC3	19	F21	11%	3	5	5	5	5
		FC3	19	F22	12%	4	5	3	3	4
		FC3	19	F23	3%	2	3	3	3	1
		FC3	19	F24	2%	1	5	1	4	4
		FC4	19	F25	5%	5	4	5	5	5
		FC4	19	F26	4%	5	5	5	4	3
		FC4	19	F27	7%	4	3	5	3	5
		FC4	19	F28	6%	2	5	5	3	3
		FC4	19	F29	8%	5	4	4	5	5
		FC4	19	F30	4%	5	4	3	5	3
		FC4	19	F31	4%	2	2	3	4	4
		FC4	19	F32	9%	5	4	3	5	4
		FC4	19	F33	3%	4	5	5	1	2
		FC4	19	F34	6%	4	5	5	4	4
		FC4	19	F35	11%	5	3	3	3	3
		FC4	19	F36	4%	2	4	5	2	3
		FC4	19	F37	25%	5	4	3	5	5
		FC4	19	F38	4%	5	4	3	1	4
		FC5	6	F39	14%	1	1	4	2	1
		FC5	6	F40	22%	1	1	2	2	2
		FC5	6	F41	26%	1	1	1	1	1
		FC5	6	F42	38%	1	1	1	1	1
		FC6	11	F43	19%	1	5	5	5	4
		FC6	11	F44	6%	3	4	5	4	5
		FC6	11	F45	16%	3	4	2	1	5
		FC6	11	F46	20%	4	4	4	4	4
		FC6	11	F47	15%	3	5	5	5	4
		FC6	11	F48	24%	4	2	5	2	1
		FC7	10	F49	11%	2	5	3	3	4
		FC7	10	F50	16%	2	4	5	4	4
		FC7	10	F51	21%	1	4	4	3	4
		FC7	10	F52	18%	3	2	1	2	5
		FC7	10	F53	34%	4	4	4	3	3
		FC8	3	F54	14%	2	5	5	5	4
		FC8	3	F55	6%	3	3	5	4	3
		FC8	3	F56	29%	5	3	4	2	3
		FC8	3	F57	8%	5	2	5	5	5
		FC8	3	F58	12%	1	1	3	3	3
		FC8	3	F59	31%	2	1	3	2	1
		FC9	5	F60	18%	4	2	5	3	5
		FC9	5	F61	40%	3	5	3	2	5
		FC9	5	F62	14%	5	4	1	4	1
		FC9	5	F63	28%	3	2	1	5	2

Table-A I-10 Collected data from subject ID 10- PM1 team 1 IT

	Role	Features category	Features category weight	Features	Features weight	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  1 0	P r o j e c t  m a n a g e r	FC1	17	F1	15%	1	3	1	5	5
		FC1	17	F2	13%	1	4	4	3	3
		FC1	17	F3	3%	1	1	1	3	4
		FC1	17	F4	4%	1	1	1	2	1
		FC1	17	F5	9%	1	2	5	3	2
		FC1	17	F6	13%	1	5	3	4	5
		FC1	17	F7	13%	1	1	1	5	4
		FC1	17	F8	9%	1	3	1	5	4
		FC1	17	F9	6%	3	3	3	3	3
		FC1	17	F10	15%	4	5	4	5	3
		FC2	14	F11	28%	1	1	1	2	1
		FC2	14	F12	39%	1	1	1	1	1
		FC2	14	F13	18%	1	1	1	1	1
		FC2	14	F14	15%	1	1	1	1	1
		FC3	18	F15	5%	3	5	2	4	4
		FC3	18	F16	12%	3	5	3	5	4
		FC3	18	F17	12%	4	5	5	5	5
		FC3	18	F18	19%	5	5	3	3	3
		FC3	18	F19	18%	5	4	4	5	5
		FC3	18	F20	5%	3	4	5	2	5
		FC3	18	F21	21%	3	5	5	5	2
		FC3	18	F22	4%	3	5	3	5	5
		FC3	18	F23	2%	2	2	3	2	1
		FC3	18	F24	2%	1	4	1	3	4
		FC4	12	F25	11%	5	5	5	5	4
		FC4	12	F26	2%	5	5	2	4	5
		FC4	12	F27	1%	5	5	5	3	5
		FC4	12	F28	5%	2	5	5	3	2
		FC4	12	F29	9%	5	5	5	3	5
		FC4	12	F30	7%	2	4	4	5	3
		FC4	12	F31	3%	5	4	3	5	1
		FC4	12	F32	3%	5	5	5	5	5
		FC4	12	F33	7%	2	5	5	3	4
		FC4	12	F34	8%	5	3	5	4	3
		FC4	12	F35	18%	5	5	5	5	5
		FC4	12	F36	5%	5	5	5	3	5
		FC4	12	F37	15%	5	5	3	5	5
		FC4	12	F38	6%	5	5	4	4	4
		FC5	7	F39	22%	1	1	2	3	2
		FC5	7	F40	35%	2	4	4	2	2
		FC5	7	F41	18%	1	1	1	1	1
		FC5	7	F42	25%	1	1	1	1	1
		FC6	17	F43	23%	3	4	4	4	5
		FC6	17	F44	11%	2	3	4	2	3
		FC6	17	F45	8%	2	5	4	2	3
		FC6	17	F46	12%	4	2	4	5	4
		FC6	17	F47	26%	3	5	5	5	3
		FC6	17	F48	20%	3	2	3	2	1
		FC7	5	F49	9%	2	5	5	4	2
		FC7	5	F50	25%	4	5	4	4	4
		FC7	5	F51	15%	3	5	5	4	4
		FC7	5	F52	13%	3	2	4	1	5
		FC7	5	F53	38%	4	1	4	3	3
		FC8	5	F54	10%	3	5	5	5	4
		FC8	5	F55	2%	5	3	4	4	3
		FC8	5	F56	28%	5	3	5	2	2
		FC8	5	F57	12%	2	2	1	5	4
		FC8	5	F58	18%	1	1	3	3	2
		FC8	5	F59	30%	2	1	2	2	1
		FC9	5	F60	27%	5	5	5	3	5
		FC9	5	F61	33%	3	4	5	4	2
		FC9	5	F62	11%	5	3	3	5	1
		FC9	5	F63	29%	4	5	5	1	3

Table-A I-11 Collected data from subject ID 11- PM3 team 1 IT

	Role	Features category	Features category weight	Features	Features weight	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  1 1	P r o j e c t  m a n a g e r	FC1	22	F1	18%	1	4	1	5	4
		FC1	22	F2	18%	1	5	2	3	4
		FC1	22	F3	4%	1	1	1	1	3
		FC1	22	F4	6%	1	1	1	1	1
		FC1	22	F5	9%	1	5	2	5	4
		FC1	22	F6	11%	1	4	1	5	4
		FC1	22	F7	9%	1	3	1	5	1
		FC1	22	F8	6%	1	5	1	4	1
		FC1	22	F9	9%	3	4	5	4	4
		FC1	22	F10	10%	3	4	3	1	1
		FC2	9	F11	27%	1	1	1	3	1
		FC2	9	F12	34%	1	1	1	2	1
		FC2	9	F13	25%	1	1	1	1	1
		FC2	9	F14	14%	1	1	1	1	1
		FC3	17	F15	6%	2	5	1	5	3
		FC3	17	F16	5%	1	5	3	4	1
		FC3	17	F17	15%	2	4	4	1	4
		FC3	17	F18	11%	5	5	5	5	5
		FC3	17	F19	25%	3	5	3	4	3
		FC3	17	F20	13%	1	4	3	4	3
		FC3	17	F21	13%	2	5	3	5	4
		FC3	17	F22	7%	2	5	3	5	3
		FC3	17	F23	3%	1	4	5	3	2
		FC3	17	F24	2%	3	5	3	4	1
		FC4	11	F25	3%	1	4	2	5	2
		FC4	11	F26	6%	1	3	2	2	4
		FC4	11	F27	5%	1	5	3	4	4
		FC4	11	F28	2%	3	5	2	4	4
		FC4	11	F29	15%	2	5	5	2	4
		FC4	11	F30	3%	2	4	3	1	5
		FC4	11	F31	7%	3	5	2	1	4
		FC4	11	F32	3%	3	4	2	1	4
		FC4	11	F33	4%	2	4	5	3	1
		FC4	11	F34	8%	1	5	4	3	1
		FC4	11	F35	9%	1	5	3	4	2
		FC4	11	F36	9%	1	4	5	3	1
		FC4	11	F37	21%	1	3	4	5	2
		FC4	11	F38	5%	2	4	5	3	1
		FC5	10	F39	9%	2	3	4	3	2
		FC5	10	F40	32%	1	5	4	2	3
		FC5	10	F41	16%	1	4	2	5	3
		FC5	10	F42	43%	1	1	1	1	1
		FC6	14	F43	17%	2	3	4	4	3
		FC6	14	F44	13%	2	5	4	3	3
		FC6	14	F45	7%	1	3	2	4	2
		FC6	14	F46	25%	3	4	3	5	4
		FC6	14	F47	16%	2	3	4	5	1
		FC6	14	F48	22%	1	5	4	3	2
		FC7	9	F49	15%	1	5	2	4	3
		FC7	9	F50	19%	1	3	2	5	5
		FC7	9	F51	12%	2	5	1	4	5
		FC7	9	F52	21%	1	4	2	4	4
		FC7	9	F53	33%	3	4	4	2	3
		FC8	6	F54	9%	1	4	3	5	5
		FC8	6	F55	2%	1	3	4	4	4
		FC8	6	F56	33%	1	4	4	5	5
		FC8	6	F57	11%	1	5	3	4	2
		FC8	6	F58	17%	1	4	3	5	3
		FC8	6	F59	28%	3	5	4	2	3
		FC9	2	F60	29%	1	4	1	4	1
		FC9	2	F61	22%	2	1	4	3	1
		FC9	2	F62	15%	5	3	2	3	2
		FC9	2	F63	34%	2	2	3	4	1

Table-A I-12 Collected data from subject ID 12- TM1 team 1 sale

Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  1 2	T e a m	CHAT BOX	FC1	F1 private Message	1	4	2	5	3
			FC1	F2 group Messages	1	5	2	4	3
			FC1	F3 voice message	1	1	1	1	1
			FC1	F4 video message	1	1	1	1	1
			FC1	F5 search in messages	1	4	2	5	3
			FC1	F6 attach file in chat	1	3	1	4	2
			FC1	F7 Edit msg	1	4	1	5	2
			FC1	F8 delete msg	1	3	1	4	1
			FC1	F9 feed	1	5	3	4	2
			FC1	F10 member's status	1	3	4	5	2
		Call	FC2	F11 Voice call	1	1	1	2	1
			FC2	F12 Video call	1	1	1	2	1
			FC2	F13 Share screen in video call	1	1	1	2	1
			FC2	F14 Call recording	1	1	1	1	1
		REPORTS	FC3	F15 Planned hours	1	4	3	4	2
			FC3	F16 Actual hours	1	3	3	5	2
			FC3	F17 Task progress	1	5	4	3	2
			FC3	F18 Time tracking	4	5	3	4	4
			FC3	F19 Timeline view	2	4	3	5	1
			FC3	F20 customize (for new fields)	1	3	4	5	2
			FC3	F21 Milestones	3	5	2	4	1
			FC3	F22 Notification for task	1	4	3	5	2
			FC3	F23 work space activity and statics	1	4	5	4	3
			FC3	F24 Automate form/workflow builder	1	5	4	3	2
		Task	FC4	F25 create task	4	5	3	4	2
			FC4	F26 delete task	1	3	2	1	1
			FC4	F27 search for tasks	2	4	3	4	1
			FC4	F28 accept/reject task	3	4	4	3	2
			FC4	F29 Add /edit fields for tasks	2	4	4	5	3
			FC4	F30 add a date of beginning of a task	2	5	3	4	1
			FC4	F31 add a date of finishing the task	2	5	3	4	1
			FC4	F32 set duration for a task	2	5	3	4	1
			FC4	F33 submit a final task / set final status for task	1	3	4	5	3
			FC4	F34 set task status	2	5	3	4	3
			FC4	F35 set task priority	1	5	3	4	2
			FC4	F36 to describe a task	3	5	4	3	3
			FC4	F37 submit issue / bug	2	3	4	4	5
			FC4	F38 Task dependencies	3	5	4	1	2
			FC5	F39 see the availability of each person	2	4	5	3	1
			FC5	F40 see availability of my timeline	2	5	4	3	1
			FC5	F41 monitor the availability of project's resource	3	5	4	4	2
		Resoure management	FC5	F42 budget management	1	1	2	1	1
			FC6	F43 calendar	2	4	3	5	2
		Calender	FC6	F44 search for events	2	4	3	5	2
			FC6	F45 archive the history of meetings	2	4	3	5	2
			FC6	F46 Schedule meetings for future	2	4	3	5	2
			FC6	F47 Reminders for meeting	2	4	3	5	2
			FC6	F48 Sync with other calendars	2	4	3	5	2
			FC7	F49 Integration with file sharing APP	3	5	4	4	2
		Integration	FC7	F50 Integrate with email	1	4	3	5	4
			FC7	F51 Integration with messaging and call APP	1	3	5	4	3
			FC7	F52 Integration with reporting APP	1	4	2	5	3
			FC7	F53 Integration with developing APP	1	3	2	5	4
		Data administrativ e	FC8	F54 Admin console	1	5	4	3	2
			FC8	F55 Import	1	3	4	5	3
			FC8	F56 Export	1	3	4	5	3
			FC8	F57 Availability of backup	2	5	3	5	4
			FC8	F58 Collaboration ( share file )	3	4	3	5	1
			FC8	F59 Document management	2	5	3	4	1
		Support	FC9	F60 Platform	2	4	3	5	1
			FC9	F61 Support		3	5	4	4	2
			FC9	F62 Price		5	5	2	4	3
			FC9	F63 Tutorial		1	4	2	4	2



Table-A I-13 Collected data from subject ID 13- TM1 team 2 sale

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  1 3  e r	T e a m	FC1	CHAT BOX	F1	private Message	1	3	2	4	3
		FC1		F2	group Messages	1	5	3	5	3
		FC1		F3	voice message	1	1	1	1	1
		FC1		F4	video message	1	1	1	1	1
		FC1		F5	search in messages	1	3	2	5	3
		FC1		F6	attach file in chat	1	5	1	4	2
		FC1		F7	Edit msg	1	4	1	5	1
		FC1		F8	delete msg	1	5	1	4	1
		FC1		F9	feed	1	5	3	4	2
		FC1		F10	member's status	1	3	5	4	2
		FC2	Call	F11	Voice call	1	1	1	3	1
		FC2		F12	Video call	1	1	1	2	1
		FC2		F13	Share screen in video call	1	1	1	2	1
		FC2		F14	Call recording	1	1	1	1	1
		FC3	REPORTS	F15	Planned hours	1	4	3	5	2
		FC3		F16	Actual hours	1	5	3	4	2
		FC3		F17	Task progress	1	5	3	4	2
		FC3		F18	Time tracking	5	5	3	3	4
		FC3		F19	Timeline view	2	5	4	3	1
		FC3		F20	customize (for new fields)	1	3	5	4	2
		FC3		F21	Milestones	3	5	2	3	1
		FC3		F22	Notification for task	1	3	2	4	1
		FC3		F23	work space activity and statics	3	5	4	4	2
		FC3		F24	Automate form/workflow builder	1	5	4	3	2
		FC4	Task	F25	create task	4	5	3	5	3
		FC4		F26	delete task	1	3	2	1	1
		FC4		F27	search for tasks	2	4	3	4	1
		FC4		F28	accept/reject task	3	4	4	3	2
		FC4		F29	Add /edit fields for tasks	3	4	4	5	3
		FC4		F30	add a date of beginning of a task	2	5	3	4	1
		FC4		F31	add a date of finishing the task	3	4	5	3	2
		FC4		F32	set duration for a task	1	5	3	4	2
		FC4		F33	submit a final task / set final status for task	2	3	4	5	3
		FC4		F34	set task status	4	5	3	4	3
		FC4		F35	set task priority	1	5	3	3	3
		FC4		F36	to describe a task	3	5	4	3	3
		FC4		F37	submit issue / bug	3	3	4	4	5
		FC4		F38	Task dependencies	3	5	4	1	2
		FC5	Resoure management	F39	see the availability of each person	3	4	5	2	1
		FC5		F40	see availability of my timeline	2	5	4	3	2
		FC5		F41	monitor the availability of project's resource	2	5	3	4	1
		FC5		F42	budget management	1	1	2	1	1
		FC6	Calender	F43	calendar	2	4	3	5	2
		FC6		F44	search for events	3	2	4	5	3
		FC6		F45	archive the history of meetings	2	4	3	3	4
		FC6		F46	Schedule meetings for future	2	3	4	5	3
		FC6		F47	Reminders for meeting	1	3	5	4	3
		FC6		F48	Sync with other calendars	1	3	4	5	2
		FC7	Integration	F49	Integration with file sharing APP	3	4	4	5	2
		FC7		F50	Integrate with email	1	4	3	5	4
		FC7		F51	Integration with messaging and call APP	2	5	4	3	3
		FC7		F52	Integration with reporting APP	2	5	4	3	3
		FC7	Data administrative	F53	Integration with developing APP	1	3	4	3	4
		FC8		F54	Admin console	1	4	5	3	2
		FC8		F55	Import	2	5	3	4	3
		FC8		F56	Export	2	5	3	5	3
		FC8		F57	Availability of backup	3	5	3	5	4
		FC8		F58	Collaboration ( share file )	2	4	3	5	2
		FC8		F59	Document management	2	5	3	4	1
		FC9	Support	F60	Platform	2	4	3	5	2
		FC9		F61	Support		3	5	4	3	2
		FC9		F62	Price		5	5	2	4	3
		FC9		F63	Tutorial		1	4	2	3	2

Table-A I-14 Collected data from subject ID 14- TM2 team 1 sale

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  1 4	T e a m	FC1	CHAT BOX	F1	private Message	1	4	1	4	3
		FC1		F2	group Messages	1	5	3	2	4
		FC1		F3	voice message	1	1	1	1	3
		FC1		F4	video message	1	1	1	1	1
		FC1		F5	search in messages	1	5	2	5	3
		FC1		F6	attach file in chat	1	4	1	4	4
		FC1		F7	Edit msg	1	3	1	5	1
		FC1		F8	delete msg	1	4	1	4	1
		FC1		F9	feed	2	3	5	4	4
		FC1		F10	member's status	3	4	3	1	2
		FC2	Call	F11	Voice call	1	1	1	3	1
		FC2		F12	Video call	1	1	1	3	1
		FC2		F13	Share screen in video call	1	1	1	2	1
		FC2		F14	Call recording	1	1	1	1	1
		FC3	REPORTS	F15	Planned hours	2	4	1	5	3
		FC3		F16	Actual hours	2	5	3	4	1
		FC3		F17	Task progress	2	5	4	1	3
		FC3		F18	Time tracking	5	5	5	5	5
		FC3		F19	Timeline view	3	5	4	5	2
		FC3		F20	customize (for new fields)	1	4	2	5	3
		FC3		F21	Milestones	2	5	3	4	1
		FC3		F22	Notification for task	2	5	4	5	3
		FC3		F23	work space activity and statics	2	4	5	3	1
		FC3		F24	Automate form/workflow builder	3	5	3	4	2
		FC4	Task	F25	create task	1	4	3	5	2
		FC4		F26	delete task	1	3	2	2	2
		FC4		F27	search for tasks	1	5	3	4	2
		FC4		F28	accept/reject task	3	5	2	4	3
		FC4		F29	Add/edit fields for tasks	2	4	5	2	3
		FC4		F30	add a date of beginning of a task	3	4	2	1	4
		FC4		F31	add a date of finishing the task	3	4	2	1	4
		FC4		F32	set duration for a task	3	4	2	1	4
		FC4		F33	submit a final task / set final status for task	2	4	5	3	1
		FC4		F34	set task status	2	5	4	3	1
		FC4		F35	set task priority	1	5	3	4	2
		FC4		F36	to describe a task	1	4	5	3	2
		FC4		F37	submit issue / bug	1	3	4	5	2
		FC4		F38	Task dependencies	2	4	5	3	1
		FC5	Resoure management	F39	see the availability of each person	2	3	4	3	2
		FC5		F40	see availability of my timeline	1	5	4	2	3
		FC5		F41	monitor the availability of project's resource	1	4	2	5	3
		FC5		F42	budget management	1	1	1	1	1
		FC6	Calender	F43	calendar	2	3	4	4	3
		FC6		F44	search for events	2	5	4	3	3
		FC6		F45	archive the history of meetings	1	3	2	4	2
		FC6		F46	Schedule meetings for future	3	4	3	5	4
		FC6		F47	Reminders for meeting	2	3	4	5	1
		FC6		F48	Sync with other calendars	1	5	4	3	2
		FC7	Integration	F49	Integration with file sharing APP	1	5	2	4	3
		FC7		F50	Integrate with email	1	3	2	5	4
		FC7		F51	Integration with messaging and call APP	2	5	1	4	3
		FC7		F52	Integration with reporting APP	1	4	2	5	3
		FC7		F53	Integration with developing APP	1	5	4	3	2
		FC8	Data administrativ e	F54	Admin console	1	4	3	4	3
		FC8		F55	Import	1	3	4	5	2
		FC8		F56	Export	1	3	4	5	2
		FC8		F57	Availability of backup	1	5	3	4	2
		FC8		F58	Collaboration ( share file )	1	4	3	5	2
		FC8		F59	Document management	3	5	4	5	3
		FC9	Support	F60	Platform	2	4	3	4	1
		FC9		F61	Support		2	3	4	3	2
		FC9		F62	Price		5	3	2	3	2
		FC9		F63	Tutorial		2	4	3	4	1

Table-A I-15 Collected data from subject ID 15- TM2 team 2 sale

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  1 5	T e a m		CHAT BOX	F1	private Message	1	5	2	4	3
				F2	group Messages	1	2	3	4	5
				F3	voice message	1	1	1	1	2
				F4	video message	1	1	1	1	1
				F5	search in messages	1	5	2	4	3
				F6	attach file in chat	1	4	2	3	4
				F7	Edit msg	1	4	2	5	1
				F8	delete msg	1	4	1	3	1
				F9	feed	1	3	4	5	4
				F10	member's status	3	4	5	3	2
			Call	F11	Voice call	1	1	1	3	1
				F12	Video call	1	1	1	2	1
				F13	Share screen in video call	1	1	1	2	1
				F14	Call recording	1	1	1	1	1
			REPORTS	F15	Planned hours	2	4	1	5	3
				F16	Actual hours	3	4	3	5	2
				F17	Task progress	1	5	4	3	2
				F18	Time tracking	4	5	3	3	5
				F19	Timeline view	2	5	4	4	3
				F20	customize (for new fields)	1	5	2	3	4
				F21	Milestones	3	5	4	4	2
				F22	Notification for task	2	5	4	5	3
				F23	work space activity and statics	2	4	5	3	1
				F24	Automate form/workflow builder	3	4	3	5	4
			Task	F25	create task	1	4	3	5	2
				F26	delete task	1	3	2	2	2
				F27	search for tasks	1	5	3	4	2
				F28	accept/reject task	2	4	3	5	3
				F29	Add/edit fields for tasks	2	3	5	2	4
				F30	add a date of beginning of a task	3	4	2	1	2
				F31	add a date of finishing the task	3	4	2	1	2
				F32	set duration for a task	3	5	2	1	4
				F33	submit a final task / set final status for task	2	4	3	3	1
				F34	set task status	2	5	4	3	1
				F35	set task priority	1	5	4	4	2
				F36	to describe a task	1	4	5	3	2
				F37	submit issue / bug	2	3	4	5	2
				F38	Task dependencies	2	4	5	3	1
			Resoure management	F39	see the availability of each person	2	3	4	3	2
				F40	see availability of my timeline	1	5	4	3	2
				F41	monitor the availability of project's resource	1	4	2	5	3
			Calender	F42	budget management	1	1	2	1	1
				F43	calendar	2	3	4	5	3
				F44	search for events	2	5	4	3	3
				F45	archive the history of meetings	2	3	5	4	2
				F46	Schedule meetings for future	1	4	2	5	3
				F47	Reminders for meeting	2	3	5	4	1
				F48	Sync with other calendars	1	5	3	4	2
				F49	Integration with file sharing APP	1	4	2	5	3
			Integration	F50	Integrate with email	1	4	2	5	3
				F51	Integration with messaging and call APP	2	5	1	4	3
				F52	Integration with reporting APP	1	4	3	5	3
				F53	Integration with developing APP	1	3	2	4	2
			Data administrative	F54	Admin console	1	4	3	5	3
				F55	Import	1	3	2	5	4
				F56	Export	1	3	2	5	4
				F57	Availability of backup	2	5	3	4	2
				F58	Collaboration ( share file )	1	4	3	5	3
				F59	Document management	2	5	4	4	3
			Support	F60	Platform	2	4	3	5	1
				F61	Support	1		5	4	3	2
				F62	Price	5		3	2	3	2
				F63	Tutorial	2		4	3	3	1

Table-A I-16 Collected data from subject ID 16- TM1 team 3 sale

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  1 6	T e a m  m e m b e r	FC1	CHAT BOX	F1	private Message	1	4	2	4	2
		FC1		F2	group Messages	1	5	3	4	3
		FC1		F3	voice message	1	1	1	1	1
		FC1		F4	video message	1	1	1	1	1
		FC1		F5	search in messages	1	3	2	4	2
		FC1		F6	attach file in chat	1	4	1	3	2
		FC1		F7	Edit msg	1	3	1	5	2
		FC1		F8	delete msg	1	5	1	4	1
		FC1		F9	feed	2	4	3	5	2
		FC1		F10	member's status	2	3	4	4	2
		FC2		F11	Voice call	1	1	1	3	1
		FC2	Call	F12	Video call	1	1	1	3	1
		FC2		F13	Share screen in video call	1	1	1	2	1
		FC2		F14	Call recording	1	1	1	1	1
		FC3		F15	Planned hours	1	4	3	5	2
		FC3	REPORTS	F16	Actual hours	1	5	3	3	2
		FC3		F17	Task progress	1	4	2	4	2
		FC3		F18	Time tracking	2	2	2	3	3
		FC3		F19	Timeline view	2	5	3	3	2
		FC3		F20	customize (for new fields)	1	3	4	5	2
		FC3		F21	Milestones	3	5	2	3	1
		FC3		F22	Notification for task	2	3	2	4	1
		FC3		F23	work space activity and statics	3	5	3	4	2
		FC3		F24	Automate form/workflow builder	1	5	4	3	2
		FC4	Task	F25	create task	4	5	3	5	2
		FC4		F26	delete task	1	2	2	1	1
		FC4		F27	search for tasks	2	4	3	4	1
		FC4		F28	accept/reject task	3	5	4	3	2
		FC4		F29	Add /edit fields for tasks	3	4	3	5	2
		FC4		F30	add a date of beginning of a task	3	4	5	4	2
		FC4		F31	add a date of finishing the task	3	4	5	4	2
		FC4		F32	set duration for a task	1	3	4	4	2
		FC4		F33	submit a final task / set final status for task	2	3	4	5	3
		FC4		F34	set task status	2	5	3	4	3
		FC4		F35	set task priority	1	5	2	3	2
		FC4		F36	to describe a task	3	5	4	3	3
		FC4		F37	submit issue / bug	3	3	4	4	5
		FC4		F38	Task dependencies	3	5	4	1	2
		FC5	Resoure management	F39	see the availability of each person	3	4	5	2	1
		FC5		F40	see availability of my timeline	2	5	4	3	2
		FC5		F41	monitor the availability of project's resource	2	4	3	5	1
		FC5		F42	budget management	1	1	2	1	1
		FC6	Calender	F43	calendar	2	4	3	5	2
		FC6		F44	search for events	2	3	4	5	3
		FC6		F45	archive the history of meetings	1	5	3	3	4
		FC6		F46	Schedule meetings for future	2	3	4	5	3
		FC6		F47	Reminders for meeting	1	4	5	3	3
		FC6		F48	Sync with other calendars	1	3	4	5	2
		FC7	Integration	F49	Integration with file sharing APP	3	4	4	5	2
		FC7		F50	Integrate with email	1	4	3	5	4
		FC7		F51	Integration with messaging and call APP	2	5	3	4	2
		FC7		F52	Integration with reporting APP	2	5	4	3	3
		FC7		F53	Integration with developing APP	1	3	4	3	4
		FC8	Data administrative	F54	Admin console	1	5	4	3	2
		FC8		F55	Import	2	4	3	5	3
		FC8		F56	Export	2	4	3	5	3
		FC8		F57	Availability of backup	3	4	3	5	4
		FC8		F58	Collaboration ( share file )	1	4	4	5	2
		FC8		F59	Document management	2	5	3	4	1
		FC9	Support	F60	Platform	1	5	3	5	2
		FC9		F61	Support		3	5	4	3	2
		FC9		F62	Price		5	5	2	4	3
		FC9		F63	Tutorial		1	4	2	3	2

Table-A I-17 Collected data from subject ID 17- TM2 team 3 sale

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  1 7	T e a m		CHAT BOX	F1	private Message	1	5	3	5	3
				F2	group Messages	1	3	3	4	5
				F3	voice message	1	1	1	1	2
				F4	video message	1	1	1	1	1
				F5	search in messages	1	5	2	3	3
				F6	attach file in chat	1	5	2	3	3
				F7	Edit msg	1	4	3	5	1
				F8	delete msg	1	4	1	3	1
				F9	feed	1	4	4	5	3
				F10	member's status	3	5	3	4	2
			Call	F11	Voice call	1	1	1	3	1
				F12	Video call	1	1	1	2	1
				F13	Share screen in video call	1	1	1	3	1
			REPORTS	F14	Call recording	1	1	1	1	1
				F15	Planned hours	1	5	2	4	3
				F16	Actual hours	2	4	3	5	2
				F17	Task progress	1	5	4	3	2
				F18	Time tarking	1	3	3	3	3
				F19	Timeline view	2	5	3	5	1
				F20	customize (for new fields)	1	4	2	3	4
				F21	Milestones	3	5	3	4	1
				F22	Notification for task	1	5	3	4	3
				F23	work space activity and statics	2	4	5	3	1
				F24	Automate form/workflow builder	2	4	3	5	2
			Task	F25	create task	2	4	3	5	2
				F26	delete task	1	3	2	3	2
				F27	search for tasks	1	5	3	4	2
				F28	accept/reject task	1	4	3	5	3
				F29	Add /edit fields for tasks	2	3	4	2	4
				F30	add a date of beginning of a task	3	4	5	1	2
				F31	add a date of finishing the task	3	4	5	1	2
				F32	set duration for a task	3	4	5	1	2
				F33	submit a final task / set final status for task	2	4	3	5	1
				F34	set task status	2	5	4	3	1
				F35	set task priority	1	5	3	4	2
				F36	to describe a task	2	4	5	3	2
				F37	submit issue / bug	2	3	4	5	1
				F38	Task dependencies	3	4	5	3	2
			Resoure management	F39	see the availability of each person	2	3	4	5	2
				F40	see availability of my timeline	1	4	4	3	2
				F41	monitor the availability of project's resource	1	3	4	5	2
			Calender	F42	budget management	1	1	3	1	1
				F43	calendar	2	5	4	3	1
				F44	search for events	2	4	5	3	3
				F45	archive the history of meetings	1	3	4	4	2
				F46	Schedule meetings for future	1	4	2	5	3
				F47	Reminders for meeting	2	5	3	4	1
			Integration	F48	Sync with other calendars	1	4	3	5	2
				F49	Integration with file sharing APP	1	4	2	5	3
				F50	Integrate with email	2	5	1	4	3
				F51	Integration with messaging and call APP	2	5	1	4	3
				F52	Integration with reporting APP	1	5	3	4	3
			Data administrativ e	F53	Integration with developing APP	1	3	2	4	2
				F54	Admin console	1	4	3	5	3
				F55	Import	2	3	2	5	4
				F56	Export	2	3	2	5	4
				F57	Availability of backup	2	4	3	4	2
				F58	Collaboration ( share file )	2	4	3	3	2
			Support	F59	Document management	2	5	4	4	3
				F60	Platform	2	4	3	5	1
				F61	Support	1		5	4	3	2
				F62	Price	4		3	1	3	1
				F63	Tutorial	2		4	3	2	1

Table-A I-18 Collected data from subject ID 18- TM1 team 2 sale

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  1 8	T e a m	CHAT BOX	CHAT BOX	F1	private Message	1	5	2	4	2
				F2	group Messages	1	4	3	5	2
				F3	voice message	1	1	1	1	2
				F4	video message	1	1	1	1	1
				F5	search in messages	1	4	2	5	2
				F6	attach file in chat	1	5	1	4	2
				F7	Edit msg	1	3	1	5	2
				F8	delete msg	1	4	1	3	1
				F9	feed	1	4	2	5	2
				F10	member's status	1	4	5	3	2
				F11	Voice call	1	1	1	2	1
				F12	Video call	1	1	1	3	1
		Call	Call	F13	Share screen in video call	1	1	1	2	1
				F14	Call recording	1	1	1	1	1
				F15	Planned hours	1	4	3	5	1
		REPORTS	REPORTS	F16	Actual hours	1	5	4	4	1
				F17	Task progress	1	4	3	5	2
				F18	Time tracking	4	3	3	4	5
				F19	Timeline view	2	5	4	3	1
				F20	customize (for new fields)	2	3	5	4	2
				F21	Milestones	3	4	2	5	1
				F22	Notification for task	2	4	3	5	1
				F23	work space activity and statics	2	5	3	4	2
				F24	Automate form/workflow builder	1	5	4	3	2
		Task	Task	F25	create task	3	4	3	5	2
				F26	delete task	1	3	2	2	1
				F27	search for tasks	2	5	3	4	1
				F28	accept/reject task	3	4	5	3	2
				F29	Add/edit fields for tasks	3	5	4	5	3
				F30	add a date of beginning of a task	2	4	3	4	1
				F31	add a date of finishing the task	2	4	3	4	1
				F32	set duration for a task	2	4	3	4	1
				F33	submit a final task / set final status for task	2	3	4	5	2
				F34	set task status	4	5	3	4	2
				F35	set task priority	1	4	3	5	1
				F36	to describe a task	3	5	4	3	3
				F37	submit issue / bug	2	3	2	5	3
				F38	Task dependencies	2	5	3	1	2
		Resoure management	Resoure management	F39	see the availability of each person	3	4	5	2	1
				F40	see availability of my timeline	2	3	4	5	2
				F41	monitor the availability of project's resource	2	5	2	4	1
				F42	budget management	1	1	2	1	1
		Calender	Calender	F43	calendar	2	4	3	5	2
				F44	search for events	3	5	2	4	3
				F45	archive the history of meetings	2	4	3	3	2
				F46	Schedule meetings for future	2	3	4	5	3
				F47	Reminders for meeting	1	4	3	4	1
				F48	Sync with other calendars	1	3	4	5	2
		Integration	Integration	F49	Integration with file sharing APP	3	4	4	5	2
				F50	Integrate with email	1	5	3	4	3
				F51	Integration with messaging and call APP	2	4	3	5	2
				F52	Integration with reporting APP	2	5	4	3	3
				F53	Integration with developing APP	1	3	4	3	4
		Data administrative	Data administrative	F54	Admin console	1	4	5	3	2
				F55	Import	2	4	3	4	2
				F56	Export	2	4	3	4	2
				F57	Availability of backup	3	5	3	5	4
				F58	Collaboration ( share file )	1	4	2	5	1
				F59	Document management	2	5	3	4	1
		Support	Support	F60	Platform	2	5	3	4	2
				F61	Support			3	4	3	5	2
				F62	Price			5	3	2	4	2
				F63	Tutorial			1	3	2	3	2

Table-A I-19 Collected data from subject ID 19- TM2 team 4 sale

	Role	Features category	features Category	Features	features	Trello- premium	Asana- premium	Monday- standard	Teamwork- deliver	Zoho project- enterprise
S u b j e c t  I D  1 9	T e a m	FC1	CHAT BOX	F1	private Message	1	3	2	5	1
				F2	group Messages	1	4	3	4	3
				F3	voice message	1	1	1	1	3
				F4	video message	1	1	1	1	1
				F5	search in messages	1	5	3	4	2
				F6	attach file in chat	1	5	2	3	4
				F7	Edit msg	1	5	3	4	2
				F8	delete msg	1	3	1	4	1
				F9	feed	1	4	3	5	4
				F10	member's status	3	5	4	3	2
		FC2	Call	F11	Voice call	1	1	1	3	1
				F12	Video call	1	1	1	2	1
				F13	Share screen in video call	1	1	1	3	1
		FC3	REPORTS	F14	Call recording	1	1	1	1	1
				F15	Planned hours	2	5	1	4	3
				F16	Actual hours	2	4	2	5	2
				F17	Task progress	1	5	4	3	2
				F18	Time tracking	1	4	3	4	5
				F19	Timeline view	2	5	4	4	1
				F20	customize (for new fields)	1	4	2	3	5
				F21	Milestones	3	5	3	4	2
				F22	Notification for task	1	5	3	5	3
				F23	work space activity and statics	2	4	5	3	1
				F24	Automate form/workflow builder	3	4	3	5	4
				F25	create task	1	4	3	5	2
				F26	delete task	1	3	2	2	2
				F27	search for tasks	1	3	3	4	2
				F28	accept/reject task	2	4	3	5	2
				F29	Add/edit fields for tasks	2	3	5	2	4
				F30	add a date of beginning of a task	3	4	2	1	2
				F31	add a date of finishing the task	3	4	2	1	2
				F32	set duration for a task	3	5	2	1	4
				F33	submit a final task / set final status for task	2	4	3	3	1
				F34	set task status	2	5	4	3	1
				F35	set task priority	1	5	4	4	2
				F36	to describe a task	1	4	5	3	2
				F37	submit issue / bug	2	3	4	5	2
				F38	Task dependencies	2	4	5	3	1
		FC5	Resoure management	F39	see the availability of each person	2	3	4	3	2
				F40	see availability of my timeline	1	5	4	3	2
				F41	monitor the availability of project's resource	1	4	2	5	2
		FC6	Calender	F42	budget management	1	1	2	1	1
				F43	calendar	2	3	4	5	2
				F44	search for events	1	5	4	3	3
				F45	archive the history of meetings	2	3	5	4	2
				F46	Schedule meetings for future	1	4	3	5	2
				F47	Reminders for meeting	2	4	5	4	1
				F48	Sync with other calendars	1	3	3	4	2
				F49	Integration with file sharing APP	1	5	2	4	3
		FC7	Integration	F50	Integrate with email	1	4	2	3	2
				F51	Integration with messaging and call APP	2	5	1	4	3
				F52	Integration with reporting APP	1	3	3	4	3
				F53	Integration with developing APP	1	3	2	4	2
		FC8	Data administrativ e	F54	Admin console	1	4	2	5	3
				F55	Import	1	3	3	5	4
				F56	Export	1	2	2	4	3
				F57	Availability of backup	2	5	3	4	1
				F58	Collaboration ( share file )	1	4	3	5	3
				F59	Document management	2	5	3	4	3
		FC9	Support	F60	Platform	2	4	3	4	1
				F61	Support			1	5	4	3	2
				F62	Price			4	3	2	3	2
				F63	Tutorial			2	4	3	2	1

Table-A I-20 Collected data from subject ID 20- TM1 team 5 sale

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  2 0	T e a m  m e m b e r	FC1	CHAT BOX	F1	private Message	1	5	3	4	2
		FC1		F2	group Messages	1	5	3	4	3
		FC1		F3	voice message	1	1	1	1	2
		FC1		F4	video message	1	1	1	1	1
		FC1		F5	search in messages	1	5	3	4	2
		FC1		F6	attach file in chat	1	4	1	4	3
		FC1		F7	Edit msg	1	3	1	5	2
		FC1		F8	delete msg	1	5	1	4	1
		FC1		F9	feed	1	4	3	5	3
		FC1		F10	member's status	2	5	4	4	2
		FC2	Call	F11	Voice call	1	1	1	2	1
		FC2		F12	Video call	1	1	1	2	1
		FC2		F13	Share screen in video call	1	1	1	3	1
		FC2	REPORTS	F14	Call recording	1	1	1	1	1
		FC3		F15	Planned hours	1	5	3	5	2
		FC3		F16	Actual hours	1	5	3	4	2
		FC3		F17	Task progress	1	4	2	3	2
		FC3		F18	Time tracking	1	3	3	3	5
		FC3		F19	Timeline view	2	5	3	3	2
		FC3		F20	customize (for new fields)	1	4	4	5	2
		FC3		F21	Milestones	2	5	2	3	1
		FC3		F22	Notification for task	2	3	2	5	1
		FC3		F23	work space activity and statics	3	5	3	4	2
		FC3		F24	Automate form/workflow builder	1	5	4	3	1
		FC4	Task	F25	create task	3	5	3	4	2
		FC4		F26	delete task	1	2	2	1	1
		FC4		F27	search for tasks	2	3	3	4	1
		FC4		F28	accept/reject task	3	5	4	3	2
		FC4		F29	Add /edit fields for tasks	2	4	3	5	2
		FC4		F30	add a date of beginning of a task	3	4	5	4	1
		FC4		F31	add a date of finishing the task	2	4	5	4	2
		FC4		F32	set duration for a task	1	3	4	5	2
		FC4		F33	submit a final task / set final status for task	2	3	4	5	3
		FC4		F34	set task status	3	5	3	4	2
		FC4		F35	set task priority	1	5	1	3	2
		FC4		F36	to describe a task	2	5	4	3	2
		FC4		F37	submit issue / bug	2	3	1	4	5
		FC4		F38	Task dependencies	3	5	4	1	2
		FC5	Resoure management	F39	see the availability of each person	3	4	5	2	1
		FC5		F40	see availability of my timeline	2	5	4	3	2
		FC5		F41	monitor the availability of project's resource	1	4	3	5	2
		FC5	Calender	F42	budget management	1	1	3	1	1
		FC6		F43	calendar	2	4	3	5	2
		FC6		F44	search for events	2	3	4	4	3
		FC6		F45	archive the history of meetings	1	5	3	3	4
		FC6		F46	Schedule meetings for future	2	3	4	5	3
		FC6		F47	Reminders for meeting	1	4	5	3	3
		FC7	Integration	F48	Sync with other calendars	1	3	4	5	2
		FC7		F49	Integration with file sharing APP	2	3	4	5	2
		FC7		F50	Integrate with email	1	4	3	5	3
		FC7		F51	Integration with messaging and call APP	2	5	3	4	2
		FC7		F52	Integration with reporting APP	2	5	4	3	3
		FC8	Data administrative	F53	Integration with developing APP	1	3	2	3	2
		FC8		F54	Admin console	1	5	4	3	2
		FC8		F55	Import	1	4	3	5	3
		FC8		F56	Export	2	4	3	5	3
		FC8		F57	Availability of backup	1	4	3	5	4
		FC8		F58	Collaboration ( share file )	1	4	4	5	1
		FC9	Support	F59	Document management	2	5	3	4	1
		FC9		F60	Platform	1	5	3	5	2
		FC9		F61	Support		3	5	4	3	2
		FC9		F62	Price		5	4	2	4	3
		FC9		F63	Tutorial		1	3	2	3	2



Table-A I-21 Collected data from subject ID 21- TM2 team 5 sale

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  2 1	T e a m  m e m b e r	FC1	CHAT BOX	F1	private Message	1	5	3	4	3
		FC1		F2	group Messages	1	3	2	4	5
		FC1		F3	voice message	1	1	1	1	1
		FC1		F4	video message	1	1	1	1	1
		FC1		F5	search in messages	1	4	2	4	3
		FC1		F6	attach file in chat	1	5	2	4	3
		FC1		F7	Edit msg	1	4	3	5	1
		FC1		F8	delete msg	1	3	1	3	1
		FC1		F9	feed	1	4	3	5	3
		FC1		F10	member's status	2	5	3	4	2
		FC2	Call	F11	Voice call	1	1	1	3	1
		FC2		F12	Video call	1	1	1	2	1
		FC2		F13	Share screen in video call	1	1	1	1	1
		FC2		F14	Call recording	1	1	1	1	1
		FC3	REPORTS	F15	Planned hours	1	5	2	4	3
		FC3		F16	Actual hours	2	4	3	4	2
		FC3		F17	Task progress	1	5	4	3	2
		FC3		F18	Time tarking	1	4	3	4	5
		FC3		F19	Timeline view	2	4	3	5	1
		FC3		F20	customize (for new fields)	1	4	2	3	3
		FC3		F21	Milestones	2	5	3	4	1
		FC3		F22	Notification for task	1	5	3	4	3
		FC3		F23	work space activity and statics	2	4	5	3	2
		FC3		F24	Automate form/workflow builder	2	4	3	5	2
		FC4	Task	F25	create task	3	4	3	5	2
		FC4		F26	delete task	1	3	2	3	2
		FC4		F27	search for tasks	1	4	3	4	2
		FC4		F28	accept/reject task	2	4	3	5	3
		FC4		F29	Add /edit fields for tasks	2	3	4	2	4
		FC4		F30	add a date of beginning of a task	3	4	4	1	2
		FC4		F31	add a date of finishing the task	3	4	5	1	2
		FC4		F32	set duration for a task	3	4	5	1	2
		FC4		F33	submit a final task / set final status for task	1	4	3	5	1
		FC4		F34	set task status	2	5	4	3	1
		FC4		F35	set task priority	1	5	3	4	2
		FC4		F36	to describe a task	2	4	5	3	2
		FC4		F37	submit issue / bug	2	3	4	4	1
		FC4		F38	Task dependencies	3	4	5	3	1
		FC5	Resoure management	F39	see the availability of each person	2	3	4	5	1
		FC5		F40	see availability of my timeline	1	5	4	3	1
		FC5		F41	monitor the availability of project's resource	1	3	4	5	2
		FC5		F42	budget management	1	1	3	1	1
		FC6	Calender	F43	calendar	2	5	4	3	1
		FC6		F44	search for events	2	4	5	4	3
		FC6		F45	archive the history of meetings	1	3	4	4	2
		FC6		F46	Schedule meetings for future	1	4	2	5	3
		FC6		F47	Reminders for meeting	2	5	3	4	1
		FC6		F48	Sync with other calendars	1	4	2	5	2
		FC7	Integration	F49	Integration with file sharing APP	1	4	2	5	3
		FC7		F50	Integrate with email	2	5	1	4	3
		FC7		F51	Integration with messaging and call APP	2	5	1	4	3
		FC7		F52	Integration with reporting APP	1	5	3	4	3
		FC7		F53	Integration with developing APP	1	3	2	4	1
		FC8	Data administrativ e	F54	Admin console	1	4	3	5	2
		FC8		F55	Import	2	3	2	5	4
		FC8		F56	Export	2	3	2	5	4
		FC8		F57	Availability of backup	2	5	3	4	2
		FC8		F58	Collaboration ( share file )	2	4	3	3	2
		FC8		F59	Document management	2	5	4	3	3
		FC9	Support	F60	Platform	2	4	3	5	1
		FC9		F61	Support		1	5	4	3	2
		FC9		F62	Price		5	3	1	2	1
		FC9		F63	Tutorial		2	2	3	2	1

Table-A I-22 Collected data from subject ID 22- TM1 team 6 sale

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  2 2	T e a m	FC1	CHAT BOX	F1	private Message	1	5	2	3	2
		FC1		F2	group Messages	1	4	3	5	2
		FC1		F3	voice message	1	1	1	1	2
		FC1		F4	video message	1	1	1	1	1
		FC1		F5	search in messages	1	4	2	5	3
		FC1		F6	attach file in chat	1	5	1	4	2
		FC1		F7	Edit msg	1	3	1	5	2
		FC1		F8	delete msg	1	4	1	3	1
		FC1		F9	feed	1	5	2	4	2
		FC1		F10	member's status	1	4	5	3	2
		FC2	Call	F11	Voice call	1	1	1	2	1
		FC2		F12	Video call	1	1	1	1	1
		FC2		F13	Share screen in video call	1	1	1	2	1
		FC2		F14	Call recording	1	1	1	1	1
		FC3	REPORTS	F15	Planned hours	1	3	3	5	1
		FC3		F16	Actual hours	1	5	4	3	1
		FC3		F17	Task progress	1	4	3	5	2
		FC3		F18	Time tracking	5	4	3	4	4
		FC3		F19	Timeline view	2	5	4	3	1
		FC3		F20	customize (for new fields)	2	3	5	3	2
		FC3		F21	Milestones	3	4	2	5	1
		FC3		F22	Notification for task	2	4	3	5	2
		FC3		F23	work space activity and statics	2	5	3	4	1
		FC3		F24	Automate form/workflow builder	1	5	4	3	2
		FC4	Task	F25	create task	2	4	3	5	2
		FC4		F26	delete task	1	2	2	2	1
		FC4		F27	search for tasks	2	4	3	4	1
		FC4		F28	accept/reject task	3	4	4	3	2
		FC4		F29	Add /edit fields for tasks	3	5	4	5	3
		FC4		F30	add a date of beginning of a task	2	4	3	5	1
		FC4		F31	add a date of finishing the task	2	4	3	5	1
		FC4		F32	set duration for a task	2	4	3	4	1
		FC4		F33	submit a final task / set final status for task	2	3	4	5	2
		FC4		F34	set task status	4	5	3	4	2
		FC4		F35	set task priority	2	4	3	5	1
		FC4		F36	to describe a task	3	4	4	3	3
		FC4		F37	submit issue / bug	2	3	2	4	3
		FC4		F38	Task dependencies	2	4	3	1	2
		FC5	Resoure management	F39	see the availability of each person	3	4	5	3	2
		FC5		F40	see availability of my timeline	2	3	4	5	2
		FC5		F41	monitor the availability of project's resource	2	5	2	4	1
		FC5		F42	budget management	1	1	2	1	1
		FC6	Calender	F43	calendar	2	4	3	5	1
		FC6		F44	search for events	3	5	2	4	3
		FC6		F45	archive the history of meetings	2	4	3	3	2
		FC6		F46	Schedule meetings for future	1	3	4	5	3
		FC6		F47	Reminders for meeting	1	4	3	4	1
		FC6		F48	Sync with other calendars	1	3	4	5	3
		FC7	Integration	F49	Integration with file sharing APP	3	4	4	5	2
		FC7		F50	Integrate with email	1	5	3	4	3
		FC7		F51	Integration with messaging and call APP	2	4	3	5	1
		FC7		F52	Integration with reporting APP	2	5	4	3	3
		FC7		F53	Integration with developing APP	1	4	4	3	4
		FC8	Data administrativ e	F54	Admin console	1	4	5	3	2
		FC8		F55	Import	1	4	3	4	1
		FC8		F56	Export	1	4	3	4	1
		FC8		F57	Availability of backup	2	5	3	5	4
		FC8		F58	Collaboration ( share file )	1	4	2	5	1
		FC8		F59	Document management	2	5	2	4	1
		FC9	Support	F60	Platform	2	5	3	4	2
		FC9		F61	Support		3	4	3	5	2
		FC9		F62	Price		4	3	2	2	2
		FC9		F63	Tutorial		1	3	2	3	2

Table-A I-23 Collected data from subject ID 23- TM2 team 6 sale

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  2 3	T e a m	FC1	CHAT BOX	F1	private Message	1	3	2	4	1
		FC1		F2	group Messages	1	5	3	4	3
		FC1		F3	voice message	1	1	1	1	1
		FC1		F4	video message	1	1	1	1	1
		FC1		F5	search in messages	1	4	3	4	2
		FC1		F6	attach file in chat	1	5	2	3	4
		FC1		F7	Edit msg	1	5	3	4	2
		FC1		F8	delete msg	1	2	1	4	1
		FC1		F9	feed	1	4	3	5	4
		FC1		F10	member's status	3	4	4	3	2
		FC2	Call	F11	Voice call	1	1	1	2	1
		FC2		F12	Video call	1	1	1	2	1
		FC2		F13	Share screen in video call	1	1	1	2	1
		FC2		F14	Call recording	1	1	1	1	1
		FC3	REPORTS	F15	Planned hours	2	5	1	4	3
		FC3		F16	Actual hours	2	4	2	5	2
		FC3		F17	Task progress	1	5	4	3	3
		FC3		F18	Time tracking	5	4	2	4	5
		FC3		F19	Timeline view	2	5	3	3	1
		FC3		F20	customize (for new fields)	1	3	2	3	5
		FC3		F21	Milestones	2	5	3	4	2
		FC3		F22	Notification for task	1	5	3	5	3
		FC3		F23	work space activity and statics	2	4	5	3	1
		FC3		F24	Automate for m/workflow builder	3	5	3	5	4
		FC4	Task	F25	create task	1	3	3	5	2
		FC4		F26	delete task	1	3	2	2	2
		FC4		F27	search for tasks	1	3	3	5	2
		FC4		F28	accept/reject task	2	4	3	5	2
		FC4		F29	Add /edit fields for tasks	1	4	5	2	3
		FC4		F30	add a date of beginning of a task	3	5	2	1	2
		FC4		F31	add a date of finishing the task	3	5	2	1	2
		FC4		F32	set duration for a task	3	5	2	1	2
		FC4		F33	submit a final task / set final status for task	2	4	3	3	2
		FC4		F34	set task status	2	5	4	3	1
		FC4		F35	set task priority	1	5	4	4	2
		FC4		F36	to describe a task	1	4	5	3	3
		FC4		F37	submit issue / bug	2	3	4	5	1
		FC4		F38	Task dependencies	2	4	5	3	1
		FC5	Resoure management	F39	see the availability of each person	2	3	4	3	2
		FC5		F40	see availability of my timeline	1	5	4	4	2
		FC5		F41	monitor the availability of project's resource	1	4	2	5	2
		FC5		F42	budget management	1	1	3	1	1
		FC6	Calender	F43	calendar	1	3	4	5	2
		FC6		F44	search for events	1	5	4	3	3
		FC6		F45	archive the history of meetings	2	3	5	4	3
		FC6		F46	Schedule meetings for future	1	4	3	5	2
		FC6		F47	Reminders for meeting	3	4	5	4	2
		FC6		F48	Svnc with other calendars	1	3	3	4	2
		FC7	Integration	F49	Integration with file sharing APP	2	5	2	4	3
		FC7		F50	Integrate with email	1	4	2	3	2
		FC7		F51	Integration with messaging and call APP	2	5	1	3	3
		FC7		F52	Integration with reporting APP	1	3	3	4	3
		FC7	Data administrativ e	F53	Integration with developing APP	1	3	2	5	2
		FC8		F54	Admin console	1	4	2	5	3
		FC8		F55	Import	1	3	3	4	3
		FC8		F56	Export	1	3	3	4	3
		FC8		F57	Availability of backup	2	5	3	4	1
		FC8		F58	Collaboration ( share file )	1	4	3	5	3
		FC8		F59	Document management	2	5	3	5	3
		FC9	Support	F60	Platform	2	4	3	4	1
		FC9		F61	Support		1	5	4	4	2
		FC9		F62	Price		4	3	2	3	2
		FC9		F63	Tutorial		1	2	3	2	1

Table-A I-24 Collected data from subject ID 24- TM1 team 7 sale

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  2 4	T e a m			FC1	private Message	1	4	3	4	2
				FC1	group Messages	1	5	3	4	2
				FC1	voice message	1	1	1	1	2
				FC1	video message	1	1	1	1	1
				FC1	search in messages	1	5	3	5	2
				FC1	attach file in chat	1	4	1	4	3
				FC1	Edit msg	1	4	1	5	3
				FC1	delete msg	1	5	1	4	1
				FC1	feed	1	5	3	5	3
				FC1	member's status	3	5	4	4	2
				FC2	Voice call	1	1	1	2	1
				FC2	Video call	1	1	1	1	1
				FC2	Share screen in video call	1	1	1	2	1
				FC2	Call recording	1	1	1	1	1
				FC3	Planned hours	1	5	4	5	2
				FC3	Actual hours	1	5	3	4	2
				FC3	Task progress	1	4	2	3	2
				FC3	Time tracking	4	5	2	4	5
				FC3	Timeline view	2	5	3	4	2
				FC3	customize (for new fields)	1	4	4	5	2
				FC3	Milestones	2	5	2	3	2
				FC3	Notification for task	2	3	2	5	1
				FC3	work space activity and statics	3	5	3	5	2
				FC3	Automate form/workflow builder	1	5	4	4	2
				FC4	create task	4	5	3	5	2
				FC4	delete task	1	2	2	1	1
				FC4	search for tasks	2	4	3	4	1
				FC4	accept/reject task	3	5	4	3	2
				FC4	Add/edit fields for tasks	2	5	3	5	2
				FC4	add a date of beginning of a task	3	4	5	4	1
				FC4	add a date of finishing the task	2	5	5	4	2
				FC4	set duration for a task	1	3	4	5	2
				FC4	submit a final task / set final status for task	2	3	4	5	3
				FC4	set task status	3	5	3	4	1
				FC4	set task priority	1	5	1	3	1
				FC4	to describe a task	2	5	4	3	2
				FC4	submit issue / bug	2	4	1	4	5
				FC4	Task dependencies	3	5	4	1	2
				FC5	see the availability of each person	3	5	5	2	1
				FC5	see availability of my timeline	2	5	4	3	2
				FC5	monitor the availability of project's resource	1	4	3	5	2
				FC5	budget management	1	1	2	1	1
				FC6	calendar	2	5	3	5	2
				FC6	search for events	2	3	4	4	3
				FC6	archive the history of meetings	1	5	3	3	4
				FC6	Schedule meetings for future	2	4	4	5	3
				FC6	Reminders for meeting	1	4	5	3	4
				FC6	Sync with other calendars	1	3	4	5	2
				FC7	Integration with file sharing APP	2	4	4	5	2
				FC7	Integrate with email	1	4	3	5	3
				FC7	Integration with messaging and call APP	2	5	3	4	2
				FC7	Integration with reporting APP	2	5	4	3	2
				FC7	Integration with developing APP	1	3	2	3	2
				FC8	Admin console	2	5	4	3	2
				FC8	Import	2	4	3	5	3
				FC8	Export	2	4	3	5	3
				FC8	Availability of backup	2	4	3	5	4
				FC8	Collaboration ( share file )	1	4	4	5	2
				FC8	Document management	2	5	3	4	1
				FC9	Platform	1	5	3	5	2
				FC9	Support	3	5	4	4	2
				FC9	Price	4	4	2	3	3
				FC9	Tutorial	1	3	2	3	2

Table-A I-25 Collected data from subject ID 25- TM2 team 7 sale

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  2 5	T e a m  m e m b e r	FC1	CHAT BOX	F1	private Message	1	5	3	3	1
		FC1		F2	group Messages	1	3	2	4	4
		FC1		F3	voice message	1	1	1	1	2
		FC1		F4	video message	1	1	1	1	1
		FC1		F5	search in messages	1	5	2	5	3
		FC1		F6	attach file in chat	1	5	2	4	2
		FC1		F7	Edit msg	1	4	3	5	1
		FC1		F8	delete msg	1	3	1	3	1
		FC1		F9	feed	1	4	3	5	3
		FC1		F10	member's status	2	4	3	4	2
		FC2	Call	F11	Voice call	1	1	1	2	1
		FC2		F12	Video call	1	1	1	2	1
		FC2		F13	Share screen in video call	1	1	1	1	1
		FC2		F14	Call recording	1	1	1	1	1
		FC3	REPORTS	F15	Planned hours	1	4	2	4	3
		FC3		F16	Actual hours	2	5	3	5	2
		FC3		F17	Task progress	1	5	4	3	3
		FC3		F18	Time tracking	4	5	2	4	5
		FC3		F19	Timeline view	2	4	3	5	1
		FC3		F20	customize (for new fields)	1	4	2	3	3
		FC3		F21	Milestones	2	5	3	4	1
		FC3		F22	Notification for task	1	4	3	4	3
		FC3		F23	work space activity and statics	2	4	5	3	2
		FC3		F24	Automate form/workflow builder	3	4	3	5	3
		FC4	Task	F25	create task	3	4	3	4	2
		FC4		F26	delete task	1	3	2	3	2
		FC4		F27	search for tasks	1	4	3	4	2
		FC4		F28	accept/reject task	2	4	3	5	3
		FC4		F29	Add/edit fields for tasks	2	3	3	2	4
		FC4		F30	add a date of beginning of a task	3	4	3	1	2
		FC4		F31	add a date of finishing the task	3	4	4	1	2
		FC4		F32	set duration for a task	3	4	5	1	2
		FC4		F33	submit a final task / set final status for task	1	4	3	5	2
		FC4		F34	set task status	2	5	4	3	1
		FC4		F35	set task priority	1	5	3	4	2
		FC4		F36	to describe a task	2	4	5	4	2
		FC4		F37	submit issue / bug	2	3	4	3	1
		FC4		F38	Task dependencies	3	4	4	3	1
		FC5	Resoure management	F39	see the availability of each person	2	3	4	4	1
		FC5		F40	see availability of my timeline	1	5	3	3	1
		FC5		F41	monitor the availability of project's resource	1	3	4	4	2
		FC5	Calender	F42	budget management	1	1	2	1	1
		FC6		F43	calendar	2	5	4	3	1
		FC6		F44	search for events	2	4	5	4	3
		FC6		F45	archive the history of meetings	1	3	4	4	3
		FC6		F46	Schedule meetings for future	1	4	2	5	3
		FC6		F47	Reminders for meeting	2	4	3	4	1
		FC6		F48	Sync with other calendars	1	4	2	5	2
		FC7	Integration	F49	Integration with file sharing APP	1	4	2	4	3
		FC7		F50	Integrate with email	2	5	1	4	2
		FC7		F51	Integration with messaging and call APP	2	5	1	4	3
		FC7		F52	Integration with reporting APP	1	4	3	4	3
		FC7	Data administrativ e	F53	Integration with developing APP	1	3	2	3	1
		FC8		F54	Admin console	1	4	3	5	11
		FC8		F55	Import	2	3	2	5	3
		FC8		F56	Export	2	3	2	5	4
		FC8		F57	Availability of backup	2	5	3	4	2
		FC8		F58	Collaboration ( share file )	2	4	3	3	1
		FC8		F59	Document management	2	5	4	3	3
		FC9	Support	F60	Platform	2	4	3	4	1
		FC9		F61	Support		1	5	4	3	2
		FC9		F62	Price		5	3	2	2	1
		FC9		F63	Tutorial		2	2	3	2	1

Table-A I-26 Collected data from subject ID 26- TM1 team 8 sale

Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
Sub ject ID 26	Team member	FC1	F1	private Message	1	3	2	3	2
		FC1	F2	group Messages	1	5	3	4	3
		FC1	F3	voice message	1	1	1	1	2
		FC1	F4	video message	1	1	1	1	1
		FC1	F5	search in messages	1	4	3	4	3
		FC1	F6	attach file in chat	1	5	2	3	4
		FC1	F7	Edit msg	1	5	3	3	2
		FC1	F8	delete msg	1	2	1	4	1
		FC1	F9	feed	1	4	3	5	4
		FC1	F10	member's status	3	4	3	3	2
		FC2	F11	Voice call	1	1	1	3	1
		FC2	F12	Video call	1	1	1	3	1
		FC2	F13	Share screen in video call	1	1	1	3	1
		FC2	F14	Call recording	1	1	1	1	1
		FC3	F15	Planned hours	2	5	1	4	3
		FC3	F16	Actual hours	2	3	2	5	2
		FC3	F17	Task progress	1	5	4	3	3
		FC3	F18	Time tracking	4	5	3	5	5
		FC3	F19	Timeline view	2	5	3	4	1
		FC3	F20	customize (for new fields)	1	3	2	3	5
		FC3	F21	Milestones	2	5	3	4	2
		FC3	F22	Notification for task	1	5	3	5	3
		FC3	F23	work space activity and statics	2	3	5	3	1
		FC3	F24	Automate form/workflow builder	3	5	3	5	4
		FC4	F25	create task	1	3	3	5	2
		FC4	F26	delete task	1	3	2	2	2
		FC4	F27	search for tasks	1	3	3	5	2
		FC4	F28	accept/reject task	2	4	3	5	2
		FC4	F29	Add /edit fields for tasks	1	3	5	2	3
		FC4	F30	add a date of beginning of a task	3	5	2	1	2
		FC4	F31	add a date of finishing the task	3	5	2	1	1
		FC4	F32	set duration for a task	3	5	2	1	1
		FC4	F33	submit a final task / set final status for task	2	4	3	3	2
		FC4	F34	set task status	2	5	4	3	1
		FC4	F35	set task priority	1	5	3	4	2
		FC4	F36	to describe a task	1	4	5	3	3
		FC4	F37	submit issue / bug	2	3	4	5	1
		FC4	F38	Task dependencies	2	4	5	3	2
		FC5	F39	see the availability of each person	2	3	4	3	2
		FC5	F40	see availability of my timeline	1	5	3	4	1
		FC5	F41	monitor the availability of project's resource	1	4	2	5	1
		FC5	F42	budget management	1	1	3	1	1
		FC6	F43	calendar	1	3	4	5	2
		FC6	F44	search for events	1	5	4	3	3
		FC6	F45	archive the history of meetings	2	3	5	4	3
		FC6	F46	Schedule meetings for future	1	4	3	5	2
		FC6	F47	Reminders for meeting	3	5	3	4	2
		FC6	F48	Sync with other calendars	1	3	3	4	2
		FC7	F49	Integration with file sharing APP	2	5	2	4	3
		FC7	F50	Integrate with email	1	4	2	3	1
		FC7	F51	Integration with messaging and call APP	2	5	1	3	3
		FC7	F52	Integration with reporting APP	1	3	3	4	3
		FC7	F53	Integration with developing APP	1	3	2	5	2
		FC8	F54	Admin console	1	4	2	5	3
		FC8	F55	Import	1	3	3	4	3
		FC8	F56	Export	1	3	3	4	3
		FC8	F57	Availability of backup	2	5	2	4	1
		FC8	F58	Collaboration ( share file )	1	4	3	5	2
		FC8	F59	Document management	2	5	3	5	3
		FC9	F60	Platform	2	4	3	4	1
		FC9	F61	Support	1	5	4	4	2
		FC9	F62	Price	3	3	2	2	2
		FC9	F63	Tutorial	1	2	3	2	1

Table-A I-27 Collected data from subject ID 27- TM3 team 2 finance

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  2 7	T e a m	FC1	CHAT BOX	F1	private Message	1	2	1	4	4
		FC1		F2	group Messages	1	3	2	4	3
		FC1		F3	voice message	1	1	1	2	4
		FC1		F4	video message	1	1	1	2	1
		FC1		F5	search in messages	1	2	4	4	2
		FC1		F6	attach file in chat	1	4	2	3	3
		FC1		F7	Edit msg	1	2	1	4	1
		FC1		F8	delete msg	1	2	1	4	1
		FC1		F9	feed	3	5	3	2	3
		FC1		F10	member's status	5	3	3	3	4
		FC2	Call	F11	Voice call	1	1	1	4	1
		FC2		F12	Video call	1	1	1	1	1
		FC2		F13	Share screen in video call	1	1	1	1	1
		FC2		F14	Call recording	1	1	1	1	1
		FC3	REPORTS	F15	Planned hours	2	3	1	3	4
		FC3		F16	Actual hours	2	3	3	3	4
		FC3		F17	Task progress	3	4	3	4	4
		FC3		F18	Time tracking	4	5	3	5	4
		FC3		F19	Timeline view	4	5	3	4	5
		FC3		F20	customize (for new fields)	3	4	5	3	4
		FC3		F21	Milestones	3	5	3	4	4
		FC3		F22	Notification for task	3	5	3	3	4
		FC3		F23	work space activity and statics	2	2	1	2	1
		FC3		F24	Automate for m/workflow builder	1	4	2	2	5
		FC4	Task	F25	create task	4	5	5	5	4
		FC4		F26	delete task	4	5	5	4	5
		FC4		F27	search for tasks	5	5	4	3	4
		FC4		F28	accept/reject task	2	5	4	3	3
		FC4		F29	Add/edit fields for tasks	5	5	5	3	5
		FC4		F30	add a date of beginning of a task	5	4	4	5	3
		FC4		F31	add a date of finishing the task	5	4	5	5	3
		FC4		F32	set duration for a task	4	4	5	3	5
		FC4		F33	submit a final task / set final status for task	5	5	5	1	4
		FC4		F34	set task status	4	4	5	4	5
		FC4		F35	set task priority	5	5	5	3	4
		FC4		F36	to describe a task	5	4	4	2	4
		FC4		F37	submit issue / bug	5	5	4	4	5
		FC4		F38	Task dependencies	5	5	4	3	4
		FC5	Resoure management	F39	see the availability of each person	1	1	3	3	1
		FC5		F40	see availability of my timeline	2	1	3	3	5
		FC5		F41	monitor the availability of project's resource	1	1	1	1	1
		FC5		F42	budget management	1	1	1	1	1
		FC6	Calender	F43	calendar	3	5	5	3	5
		FC6		F44	search for events	3	5	5	3	3
		FC6		F45	archive the history of meetings	2	4	4	4	4
		FC6		F46	Schedule meetings for future	3	4	2	5	5
		FC6		F47	Reminders for meeting	5	5	5	4	4
		FC6		F48	Sync with other calendars	3	4	4	2	2
		FC7	Integration	F49	Integration with file sharing APP	3	4	5	2	5
		FC7		F50	Integrate with email	2	5	3	5	5
		FC7		F51	Integration with messaging and call APP	3	5	5	1	5
		FC7		F52	Integration with reporting APP	3	5	5	1	5
		FC7	Data administrative	F53	Integration with developing APP	4	5	6	3	5
		FC8		F54	Admin console	5	5	5	5	4
		FC8		F55	Import	4	4	4	4	3
		FC8		F56	Export	5	4	5	5	3
		FC8	Support	F57	Availability of backup	5	5	4	5	5
		FC8		F58	Collaboration ( share file )	2	2	3	3	1
		FC8		F59	Document management	1	1	3	3	1
		FC9		F60	Platform	4	4	3	5	5
		FC9		F61	Support	2	3	4	5	5
		FC9		F62	Price	4	4	1	4	4
		FC9		F63	Tutorial	3	4	2	2	2

Table-A I-28 Collected data from subject ID 28- TM3 team 1 finance

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  2 8	T e a m	CHAT BOX	CHAT BOX	F1	private Message	1	2	1	5	4
				F2	group Messages	1	3	2	5	4
				F3	voice message	1	1	1	2	4
				F4	video message	1	1	1	2	1
				F5	search in messages	1	2	4	4	2
				F6	attach file in chat	1	5	2	3	4
				F7	Edit msg	1	3	1	5	1
				F8	delete msg	1	3	1	5	1
				F9	feed	3	5	3	3	3
				F10	member's status	5	3	4	5	5
		Call	Call	F11	Voice call	1	1	1	5	1
				F12	Video call	1	1	1	1	1
				F13	Share screen in video call	1	1	1	1	1
				F14	Call recording	1	1	1	1	1
		REPORTS	REPORTS	F15	Planned hours	3	4	2	4	5
				F16	Actual hours	3	4	3	4	5
				F17	Task progress	4	5	3	5	5
				F18	Time tracking	4	5	3	5	5
				F19	Timeline view	5	5	3	4	5
				F20	customize (for new fields)	3	4	5	3	4
				F21	Milestones	3	5	4	5	5
				F22	Notification for task	3	5	3	3	5
				F23	work space activity and statics	2	2	2	2	1
				F24	Automate form/workflow builder	1	4	2	2	5
		Task	Task	F25	create task	5	5	5	5	4
				F26	delete task	5	5	5	4	5
				F27	search for tasks	5	5	5	3	4
				F28	accept/reject task	2	5	5	3	3
				F29	Add/edit fields for tasks	2	5	4	2	4
				F30	add a date of beginning of a task	5	4	4	5	3
				F31	add a date of finishing the task	5	4	5	5	3
				F32	set duration for a task	5	4	5	4	5
				F33	submit a final task / set final status for task	5	5	5	1	4
				F34	set task status	5	5	5	3	5
				F35	set task priority	5	5	5	3	5
				F36	to describe a task	5	5	5	2	5
				F37	submit issue / bug	5	5	4	4	5
				F38	Task dependencies	5	5	4	3	4
		Resoure management	Resoure management	F39	see the availability of each person	2	1	4	3	2
				F40	see availability of my timeline	2	1	4	3	5
				F41	monitor the availability of project's resource	1	1	2	1	1
				F42	budget management	1	1	2	1	1
		Calender	Calender	F43	calendar	3	4	5	5	5
				F44	search for events	3	4	5	5	5
				F45	archive the history of meetings	2	4	5	2	5
				F46	Schedule meetings for future	3	5	3	5	5
				F47	Reminders for meeting	3	5	5	3	5
				F48	Sync with other calendars	3	2	2	1	2
		Integration	Integration	F49	Integration with file sharing APP	3	4	5	2	5
				F50	Integrate with email	5	4	5	5	5
				F51	Integration with messaging and call APP	2	5	5	2	4
				F52	Integration with reporting APP	3	4	5	2	4
				F53	Integration with developing APP	4	5	5	3	5
		Data administrative	Data administrative	F54	Admin console	5	5	5	5	5
				F55	Import	5	3	5	5	5
				F56	Export	5	4	5	5	5
				F57	Availability of backup	3	3	3	3	5
				F58	Collaboration ( share file )	1	1	2	2	1
		Support	Support	F59	Document management	1	1	1	1	1
				F60	Platform	4	4	3	5	5
				F61	Support			1	4	5	4	5
				F62	Price			5	3	2	5	2
				F63	Tutorial			2	5	5	5	5



Table-A I-29 Collected data from subject ID 29- TM2 team 2 finance

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  2 9	T e a m  m e m b e r	FC1	CHAT BOX	F1	private Message	1	1	1	4	4
		FC1		F2	group Messages	1	4	2	5	4
		FC1		F3	voice message	1	1	1	2	5
		FC1		F4	video message	1	1	1	2	1
		FC1		F5	search in messages	1	2	4	5	2
		FC1		F6	attach file in chat	1	5	2	3	5
		FC1		F7	Edit msg	1	4	1	5	1
		FC1		F8	delete msg	1	4	1	5	1
		FC1		F9	feed	5	5	3	5	3
		FC1		F10	member's status	5	3	4	5	5
		FC2	Call	F11	Voice call	1	1	1	2	1
		FC2		F12	Video call	1	1	1	1	1
		FC2		F13	Share screen in video call	1	1	1	1	1
		FC2		F14	Call recording	1	1	1	1	1
		FC3	REPORTS	F15	Planned hours	3	4	2	4	4
		FC3		F16	Actual hours	3	4	3	4	4
		FC3		F17	Task progress	5	5	4	5	5
		FC3		F18	Time tracking	5	5	4	5	5
		FC3		F19	Timeline view	5	5	4	4	5
		FC3		F20	customize (for new fields)	3	4	5	3	4
		FC3		F21	Milestones	3	5	4	5	5
		FC3		F22	Notification for task	5	5	4	4	5
		FC3		F23	work space activity and statics	2	2	2	2	1
		FC3		F24	Automate form/workflow builder	1	4	2	2	5
		FC4	Task	F25	create task	5	5	5	5	4
		FC4		F26	delete task	5	5	5	4	5
		FC4		F27	search for tasks	4	5	5	2	3
		FC4		F28	accept/reject task	1	4	4	2	2
		FC4		F29	Add /edit fields for tasks	5	5	5	4	4
		FC4		F30	add a date of beginning of a task	5	4	4	5	3
		FC4		F31	add a date of finishing the task	4	4	4	4	4
		FC4		F32	set duration for a task	5	4	5	4	5
		FC4		F33	submit a final task / set final status for task	4	4	4	2	4
		FC4		F34	set task status	3	5	3	2	5
		FC4		F35	set task priority	5	5	5	3	4
		FC4		F36	to describe a task	4	4	3	2	4
		FC4		F37	submit issue / bug	5	5	4	4	5
		FC4		F38	Task dependencies	5	3	4	3	3
		FC5	Resoure management	F39	see the availability of each person	2	1	5	3	2
		FC5		F40	see availability of my timeline	3	1	3	3	3
		FC5		F41	monitor the availability of project's resource	1	1	3	1	1
		FC5		F42	budget management	1	1	2	1	1
		FC6	Calender	F43	calendar	3	4	5	5	5
		FC6		F44	search for events	3	3	5	4	3
		FC6		F45	archive the history of meetings	2	4	4	2	5
		FC6		F46	Schedule meetings for future	3	5	4	5	5
		FC6		F47	Reminders for meeting	3	5	3	4	5
		FC6		F48	Sync with other calendars	3	3	3	2	1
		FC7	Integration	F49	Integration with file sharing APP	3	3	5	3	5
		FC7		F50	Integrate with email	5	5	5	5	5
		FC7		F51	Integration with messaging and call APP	4	5	4	2	5
		FC7		F52	Integration with reporting APP	4	4	4	2	5
		FC8	Data administrativ e	F53	Integration with developing APP	4	3	5	3	5
		FC8		F54	Admin console	5	5	5	4	4
		FC8		F55	Import	5	3	5	4	3
		FC8		F56	Export	5	3	5	5	3
		FC8		F57	Availability of backup	3	3	3	3	3
		FC8		F58	Collaboration ( share file )	1	1	1	1	1
		FC9	Support	F59	Document management	1	1	1	1	1
		FC9		F60	Platform	4	4	3	5	5
		FC9		F61	Support		1	1	5	1	5
		FC9		F62	Price		5	3	1	5	2
		FC9		F63	Tutorial		1	1	1	2	2

Table-A I-30 Collected data from subject ID 30- TM2 team 1 finance

Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
Subject ID 30	Team	CHAT BOX	F1	private Message	1	1	1	5	4
			F2	group Messages	1	1	1	5	4
			F3	voice message	1	1	1	4	4
			F4	video message	1	1	1	2	1
			F5	search in messages	1	4	2	4	2
			F6	attach file in chat	1	5	3	2	3
			F7	Edit msg	1	4	1	4	1
			F8	delete msg	1	2	1	2	2
			F9	feed	3	5	5	3	2
			F10	member's status	5	4	5	5	5
		Call	F11	Voice call	1	1	1	3	1
			F12	Video call	1	1	1	1	1
			F13	Share screen in video call	1	1	1	1	1
			F14	Call recording	1	1	1	1	1
		REPORTS	F15	Planned hours	2	2	4	5	5
			F16	Actual hours	3	4	2	5	5
			F17	Task progress	4	5	5	5	5
			F18	Time tracking	5	5	4	5	4
			F19	Timeline view	5	5	2	3	3
			F20	customize (for new fields)	5	5	5	5	4
			F21	Milestones	4	5	3	5	4
			F22	Notification for task	4	4	3	3	5
			F23	work space activity and statics	2	1	3	1	3
			F24	Automate form/workflow builder	1	2	2	1	5
		Task	F25	create task	5	4	4	4	2
			F26	delete task	5	4	5	4	2
			F27	search for tasks	5	5	4	4	2
			F28	accept/reject task	4	2	5	3	2
			F29	Add /edit fields for tasks	5	5	5	5	4
			F30	add a date of beginning of a task	5	5	5	5	2
			F31	add a date of finishing the task	5	5	5	5	2
			F32	set duration for a task	4	5	3	5	4
			F33	submit a final task / set final status for task	3	5	3	5	5
			F34	set task status	3	5	5	5	5
			F35	set task priority	4	5	5	5	5
			F36	to describe a task	5	3	5	3	5
			F37	submit issue / bug	5	3	5	3	5
			F38	Task dependencies	5	5	5	2	5
		Resource management	F39	see the availability of each person	3	2	2	2	3
			F40	see availability of my timeline	3	3	3	5	4
			F41	monitor the availability of project's resource	2	2	1	1	1
			F42	budget management	1	1	1	1	1
		Calendar	F43	calendar	3	5	5	5	5
			F44	search for events	2	3	5	4	5
			F45	archive the history of meetings	1	4	5	5	5
			F46	Schedule meetings for future	3	5	4	5	5
			F47	Reminders for meeting	4	5	4	4	5
			F48	Sync with other calendars	1	3	3	3	1
		Integration	F49	Integration with file sharing APP	5	5	5	3	4
			F50	Integrate with email	5	5	5	5	5
			F51	Integration with messaging and call APP	4	2	5	2	5
			F52	Integration with reporting APP	3	4	5	2	4
		Data administrative	F53	Integration with developing APP	3	5	5	2	5
			F54	Admin console	5	5	5	5	5
			F55	Import	5	2	4	5	2
			F56	Export	5	3	5	5	3
			F57	Availability of backup	5	5	4	5	5
			F58	Collaboration ( share file )	1	2	1	1	1
		Support	F59	Document management	1	1	1	1	1
			F60	Platform	3	3	3	3	3
			F61	Support		1	1	5	1	1
			F62	Price		5	4	3	5	4
			F63	Tutorial		2	4	2	5	2

Table-A I-31 Collected data from subject ID 31- TM1 team 2 finance

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  3 1	T e a m			FC1	private Message	1	3	1	5	5
				FC1	group Messages	1	2	2	5	3
				FC1	voice message	1	1	1	2	4
				FC1	video message	1	1	1	2	1
				FC1	search in messages	1	2	5	3	2
				FC1	attach file in chat	1	5	3	4	5
				FC1	Edit msg	1	2	1	5	1
				FC1	delete msg	1	3	1	5	1
				FC1	feed	3	5	3	4	3
				FC1	member's status	5	4	4	5	5
				FC2	Voice call	1	1	1	4	1
				FC2	Video call	1	1	1	1	1
				FC2	Share screen in video call	1	1	1	1	1
				FC2	Call recording	1	1	1	1	1
				FC3	Planned hours	3	5	2	4	4
				FC3	Actual hours	3	5	3	4	4
				FC3	Task progress	4	5	4	5	5
				FC3	Time tracking	4	5	3	5	5
				FC3	Timeline view	5	4	4	5	5
				FC3	customize (for new fields)	3	4	5	3	5
				FC3	Milestones	3	5	5	5	5
				FC3	Notification for task	3	5	3	4	4
				FC3	work space activity and statics	2	2	2	2	1
				FC3	Automate form/workflow builder	1	4	2	2	5
				FC4	create task	5	5	5	5	4
				FC4	delete task	5	5	5	3	5
				FC4	search for tasks	5	5	5	3	5
				FC4	accept/reject task	2	5	5	3	3
				FC4	Add/edit fields for tasks	5	5	5	3	5
				FC4	add a date of beginning of a task	5	4	4	5	3
				FC4	add a date of finishing the task	5	4	5	5	3
				FC4	set duration for a task	5	4	5	5	5
				FC4	submit a final task / set final status for task	5	5	5	2	4
				FC4	set task status	5	5	5	4	5
				FC4	set task priority	5	5	5	5	5
				FC4	to describe a task	5	5	5	2	5
				FC4	submit issue / bug	5	5	3	5	5
				FC4	Task dependencies	5	5	4	3	4
				FC5	see the availability of each person	2	1	4	3	2
				FC5	see availability of my timeline	2	1	2	2	5
				FC5	monitor the availability of project's resource	1	1	2	1	1
				FC5	budget management	1	1	2	1	1
				FC6	calendar	2	5	5	5	5
				FC6	search for events	3	4	5	4	5
				FC6	archive the history of meetings	2	5	5	3	5
				FC6	Schedule meetings for future	4	5	4	5	5
				FC6	Reminders for meeting	5	5	5	5	5
				FC6	Sync with other calendars	4	2	5	2	1
				FC7	Integration with file sharing APP	3	5	5	4	3
				FC7	Integrate with email	3	5	5	4	5
				FC7	Integration with messaging and call APP	3	5	5	4	5
				FC7	Integration with reporting APP	3	3	4	3	5
				FC7	Integration with developing APP	4	3	4	3	3
				FC8	Admin console	5	5	5	5	4
				FC8	Import	5	3	5	4	3
				FC8	Export	5	3	5	5	4
				FC8	Availability of backup	5	5	5	5	4
				FC8	Collaboration ( share file )	1	1	3	3	2
				FC8	Document management	2	1	2	2	1
				FC9	Platform	4	5	5	5	5
				FC9	Support	3	5	5	5	5
				FC9	Price	5	5	3	5	4
				FC9	Tutorial	4	5	5	5	5

Table-A I-32 Collected data from subject ID 32- TM1 team 1 finance

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  3 2	T e a m	FC1	CHAT BOX	F1	private Message	1	2	1	5	3
		FC1		F2	group Messages	1	3	2	5	3
		FC1		F3	voice message	1	1	1	2	4
		FC1		F4	video message	1	1	1	2	1
		FC1		F5	search in messages	1	2	5	5	2
		FC1		F6	attach file in chat	1	5	2	3	5
		FC1		F7	Edit msg	1	3	1	5	1
		FC1		F8	delete msg	1	3	1	5	1
		FC1		F9	feed	4	5	5	5	3
		FC1		F10	member's status	5	3	4	5	5
		FC2	Call	F11	Voice call	1	1	1	3	1
		FC2		F12	Video call	1	1	1	1	1
		FC2		F13	Share screen in video call	1	1	1	1	1
		FC2	REPORTS	F14	Call recording	1	1	1	1	1
		FC3		F15	Planned hours	4	3	2	4	5
		FC3		F16	Actual hours	5	3	3	4	5
		FC3		F17	Task progress	4	5	3	5	5
		FC3		F18	Time tracking	1	5	3	5	5
		FC3		F19	Timeline view	5	5	5	5	5
		FC3		F20	customize (for new fields)	3	4	5	3	3
		FC3		F21	Milestones	3	5	4	5	5
		FC3		F22	Notification for task	3	5	3	3	5
		FC3		F23	work space activity and statics	2	2	2	2	2
		FC3		F24	Automate form/workflow builder	1	4	2	2	5
		FC4	Task	F25	create task	5	5	4	5	3
		FC4		F26	delete task	4	4	4	4	5
		FC4		F27	search for tasks	5	5	4	3	4
		FC4		F28	accept/reject task	2	5	5	3	3
		FC4		F29	Add/edit fields for tasks	5	5	5	3	5
		FC4		F30	add a date of beginning of a task	5	5	4	5	3
		FC4		F31	add a date of finishing the task	4	3	5	5	3
		FC4		F32	set duration for a task	4	4	5	4	5
		FC4		F33	submit a final task / set final status for task	5	5	5	2	5
		FC4		F34	set task status	5	5	5	3	5
		FC4		F35	set task priority	5	5	5	3	5
		FC4		F36	to describe a task	5	5	5	2	5
		FC4		F37	submit issue / bug	5	5	4	4	5
		FC4		F38	Task dependencies	5	5	4	4	5
		FC5	Resoure management	F39	see the availability of each person	2	1	2	2	2
		FC5		F40	see availability of my timeline	2	1	5	3	5
		FC5	Calender	F41	monitor the availability of project's resource	1	1	2	1	1
		FC5		F42	budget management	1	1	2	1	1
		FC6		F43	calendar	2	5	5	3	4
		FC6		F44	search for events	3	4	5	5	4
		FC6		F45	archive the history of meetings	2	3	5	5	4
		FC6		F46	Schedule meetings for future	3	5	4	4	4
		FC6		F47	Reminders for meeting	4	5	4	4	4
		FC6		F48	Sync with other calendars	3	2	2	2	2
		FC7	Integration	F49	Integration with file sharing APP	3	4	5	3	5
		FC7		F50	Integrate with email	2	5	5	5	5
		FC7		F51	Integration with messaging and call APP	2	4	5	2	5
		FC7		F52	Integration with reporting APP	2	4	5	3	5
		FC7	Data administrativ e	F53	Integration with developing APP	4	4	5	2	4
		FC8		F54	Admin console	5	5	5	5	5
		FC8		F55	Import	5	3	5	4	3
		FC8		F56	Export	5	3	5	5	5
		FC8		F57	Availability of backup	5	5	5	5	4
		FC8		F58	Collaboration ( share file )	1	1	3	3	2
		FC8		F59	Document management	2	1	2	2	1
		FC9	Support	F60	Platform	5	5	5	5	5
		FC9		F61	Support		3	5	5	5	5
		FC9		F62	Price		5	5	3	5	5
		FC9		F63	Tutorial		4	5	5	5	5

Table-A I-33 Collected data from subject ID 33- TM2 team 1 IT

Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  3 3	T e a m  m e m b e r	CHAT BOX	FC1	private Message	1	4	1	4	4
			FC1	group Messages	1	3	2	5	4
			FC1	voice message	1	1	1	2	5
			FC1	video message	1	1	1	4	1
			FC1	search in messages	1	4	5	3	3
			FC1	attach file in chat	1	5	3	5	5
			FC1	Edit msg	1	2	1	5	1
			FC1	delete msg	3	3	3	5	3
			FC1	feed	4	5	3	5	5
			FC1	member's status	3	4	3	5	5
		Call	FC2	Voice call	1	1	1	2	1
			FC2	Video call	1	1	1	1	1
			FC2	Share screen in video call	1	1	1	1	1
			FC2	Call recording	1	1	1	1	1
		REPORTS	FC3	Planned hours	1	5	2	4	2
			FC3	Actual hours	3	2	5	4	5
			FC3	Task progress	4	5	5	5	4
			FC3	Time tracking	5	5	4	5	5
			FC3	Timeline view	5	4	1	5	5
			FC3	customize (for new fields)	4	4	5	3	4
			FC3	Milestones	3	5	5	5	5
			FC3	Notification for task	3	3	4	5	4
			FC3	work space activity and statics	1	4	3	1	1
			FC3	Automate form/workflow builder	1	5	1	3	4
		Task	FC4	create task	5	3	5	5	4
			FC4	delete task	5	3	5	3	3
			FC4	search for tasks	4	3	4	3	4
			FC4	accept/reject task	1	5	5	3	3
			FC4	Add/edit fields for tasks	5	5	5	3	4
			FC4	add a date of beginning of a task	5	4	4	5	2
			FC4	add a date of finishing the task	4	4	4	4	2
			FC4	set duration for a task	5	4	3	5	5
			FC4	submit a final task / set final status for task	5	5	5	2	4
			FC4	set task status	4	5	5	4	4
			FC4	set task priority	4	5	5	5	5
			FC4	to describe a task	3	3	5	2	4
			FC4	submit issue / bug	4	3	3	5	5
			FC4	Task dependencies	5	5	5	3	3
		Resoure management	FC5	see the availability of each person	1	1	4	2	2
			FC5	see availability of my timeline	5	4	4	2	4
			FC5	monitor the availability of project's resource	1	1	2	1	1
		Calender	FC5	budget management	1	1	1	1	1
			FC6	calendar	1	5	5	5	5
			FC6	search for events	3	4	5	4	4
			FC6	archive the history of meetings	3	5	5	3	3
			FC6	Schedule meetings for future	4	5	4	3	5
			FC6	Reminders for meeting	5	4	3	5	4
		Integration	FC6	Sync with other calendars	2	1	5	3	2
			FC7	Integration with file sharing APP	2	5	3	3	4
			FC7	Integrate with email	3	4	5	5	5
			FC7	Integration with messaging and call APP	1	5	4	3	4
			FC7	Integration with reporting APP	3	3	2	2	4
		Data administrative	FC7	Integration with developing APP	5	3	5	3	4
			FC8	Admin console	1	5	4	4	4
			FC8	Import	5	4	5	5	4
			FC8	Export	4	4	4	1	4
			FC8	Availability of backup	5	2	5	5	4
			FC8	Collaboration ( share file )	1	1	3	4	2
			FC8	Document management	2	1	2	1	1
		Support	FC9	Platform	5	5	4	4	5
			FC9	Support		3	4	5	4	5
			FC9	Price		5	5	1	3	1
			FC9	Tutorial		4	3	3	4	2

Table-A I-34 Collected data from subject ID 34- TM1 team 2 IT

Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D 3 4	T e a m	CHAT BOX	FC1	private Message	1	3	1	3	4
			FC1	group Messages	1	3	2	5	4
			FC1	voice message	1	1	1	2	4
			FC1	video message	1	1	1	4	1
			FC1	search in messages	1	2	5	3	3
			FC1	attach file in chat	1	5	3	5	5
			FC1	Edit msg	1	2	1	5	1
			FC1	delete msg	1	3	1	5	1
			FC1	feed	4	5	3	5	5
			FC1	member's status	3	4	3	5	5
		Call	FC2	Voice call	1	1	1	2	1
			FC2	Video call	1	1	1	1	1
			FC2	Share screen in video call	1	1	1	1	1
			FC2	Call recording	1	1	1	1	1
		REPORTS	FC3	Planned hours	1	5	2	3	2
			FC3	Actual hours	3	5	5	4	5
			FC3	Task progress	4	5	4	5	5
			FC3	Time tracking	5	5	4	5	5
			FC3	Timeline view	5	4	1	5	5
			FC3	customize (for new fields)	3	4	5	3	3
			FC3	Milestones	3	5	5	5	5
			FC3	Notification for task	3	3	3	5	4
			FC3	work space activity and statics	1	3	3	1	1
			FC3	Automate form/workflow builder	1	5	1	3	5
		Task	FC4	create task	5	3	5	5	4
			FC4	delete task	5	3	5	3	3
			FC4	search for tasks	4	3	4	3	4
			FC4	accept/reject task	1	5	5	3	3
			FC4	Add /edit fields for tasks	5	5	5	3	5
			FC4	add a date of beginning of a task	5	4	4	5	2
			FC4	add a date of finishing the task	4	4	4	4	2
			FC4	set duration for a task	5	5	3	5	5
			FC4	submit a final task / set final status for task	5	5	5	2	4
			FC4	set task status	4	5	5	4	5
		Resoure management	FC4	set task priority	4	5	5	5	5
			FC4	to describe a task	3	5	5	2	4
			FC4	submit issue / bug	4	5	3	5	5
			FC4	Task dependencies	5	5	5	3	5
		Calender	FC5	see the availability of each person	1	1	4	2	2
			FC5	see availability of my timeline	5	5	5	5	4
			FC5	monitor the availability of project's resource	1	1	2	1	1
			FC5	budget management	1	1	1	1	1
		Integration	FC6	calendar	1	5	5	5	5
			FC6	search for events	3	4	5	4	4
			FC6	archive the history of meetings	2	5	5	3	5
			FC6	Schedule meetings for future	4	5	4	3	4
		Data administrativ e	FC6	Reminders for meeting	5	4	4	5	4
			FC6	Sync with other calendars	2	1	5	2	1
			FC7	Integration with file sharing APP	2	5	3	3	4
			FC7	Integrate with email	5	4	5	4	5
		Support	FC7	Integration with messaging and call APP	1	5	4	3	4
			FC7	Integration with reporting APP	3	2	2	2	5
			FC7	Integration with developing APP	5	3	5	3	5
			FC8	Admin console	1	5	4	4	4
		Support	FC8	Import	5	4	5	5	3
			FC8	Export	5	4	4	1	5
			FC8	Availability of backup	5	2	5	5	4
			FC8	Collaboration ( share file )	1	1	3	3	2
		Support	FC9	Document management	2	1	2	1	1
			FC9	Platform	5	5	4	4	5
			FC9	Support		3	5	5	5	5
			FC9	Price		3	3	1	3	1
			FC9	Tutorial		5	3	3	5	2

Table-A I-35 Collected data from subject ID 35- TM1 team 1 IT

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D 3 5	T e a m	I d e n t i f i c a t i o n	CHAT BOX	FC1	F1 private Message	1	2	1	3	3
				FC1	F2 group Messages	1	2	2	5	3
				FC1	F3 voice message	1	1	1	2	4
				FC1	F4 video message	1	1	1	2	1
				FC1	F5 search in messages	1	2	5	3	3
				FC1	F6 attach file in chat	1	4	3	4	4
				FC1	F7 Edit msg	1	2	1	5	1
				FC1	F8 delete msg	1	3	1	5	1
				FC1	F9 feed	3	5	3	3	5
				FC1	F10 member's status	3	4	3	5	5
			Call	FC2	F11 Voice call	1	1	1	1	1
				FC2	F12 Video call	1	1	1	1	1
				FC2	F13 Share screen in video call	1	1	1	1	1
				FC2	F14 Call recording	1	1	1	1	1
			REPORTS	FC3	F15 Planned hours	1	5	2	2	2
				FC3	F16 Actual hours	3	5	3	4	5
				FC3	F17 Task progress	4	5	4	5	5
				FC3	F18 Time tracking	5	5	4	5	5
				FC3	F19 Timeline view	5	4	1	5	5
				FC3	F20 customize (for new fields)	2	4	5	2	5
				FC3	F21 Milestones	3	5	5	5	5
				FC3	F22 Notification for task	3	5	3	5	4
				FC3	F23 work space activity and statics	1	3	3	1	1
				FC3	F24 Automate form/workflow builder	1	5	1	3	5
			Task	FC4	F25 create task	5	3	5	5	4
				FC4	F26 delete task	5	3	5	3	5
				FC4	F27 search for tasks	4	3	4	3	4
				FC4	F28 accept/reject task	2	5	4	3	3
				FC4	F29 Add/edit fields for tasks	5	5	5	3	5
				FC4	F30 add a date of beginning of a task	5	4	4	5	2
				FC4	F31 add a date of finishing the task	4	4	4	4	2
				FC4	F32 set duration for a task	5	4	3	5	4
				FC4	F33 submit a final task / set final status for task	5	5	5	2	4
				FC4	F34 set task status	4	5	5	4	5
				FC4	F35 set task priority	3	5	5	5	5
				FC4	F36 to describe a task	3	5	5	2	3
				FC4	F37 submit issue / bug	4	5	3	5	5
				FC4	F38 Task dependencies	5	5	4	1	4
			Resoure management	FC5	F39 see the availability of each person	1	1	4	2	2
				FC5	F40 see availability of my timeline	2	1	2	2	4
				FC5	F41 monitor the availability of project's resource	1	1	2	1	1
				FC5	F42 budget management	1	1	1	1	1
			Calender	FC6	F43 calendar	1	5	5	5	5
				FC6	F44 search for events	3	4	5	4	5
				FC6	F45 archive the history of meetings	2	5	5	3	5
				FC6	F46 Schedule meetings for future	4	5	4	3	4
				FC6	F47 Reminders for meeting	5	5	5	5	5
				FC6	F48 Sync with other calendars	2	1	5	2	1
			Integration	FC7	F49 Integration with file sharing APP	2	5	3	3	4
				FC7	F50 Integrate with email	5	5	5	4	5
				FC7	F51 Integration with messaging and call APP	1	4	4	3	4
				FC7	F52 Integration with reporting APP	3	2	2	2	5
			Data administrativ e	FC8	F53 Integration with developing APP	5	3	4	3	5
				FC8	F54 Admin console	1	5	5	5	4
				FC8	F55 Import	5	3	5	4	3
				FC8	F56 Export	5	3	4	1	4
				FC8	F57 Availability of backup	5	2	5	5	4
				FC8	F58 Collaboration ( share file )	1	1	3	3	2
			Support	FC8	F59 Document management	2	1	2	1	1
				FC9	F60 Platform	5	5	5	5	5
				FC9	F61 Support	3		5	5	5	5
				FC9	F62 Price	3		3	1	3	1
				FC9	F63 Tutorial	5	3	2	5	3

Table-A I-36 Collected data from subject ID 36- TM3 team 2 IT

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
S u b j e c t  I D  3 6	T e a m		CHAT BOX	F1	private Message	1	2	1	4	5
				F2	group Messages	1	2	2	4	3
				F3	voice message	1	1	1	2	4
				F4	video message	1	1	1	3	1
				F5	search in messages	1	3	4	3	3
				F6	attach file in chat	1	5	3	4	5
				F7	Edit msg	1	3	1	5	1
				F8	delete msg	1	3	1	5	1
				F9	feed	5	5	4	3	5
				F10	member's status	4	4	4	5	3
			Call	F11	Voice call	1	1	1	3	1
				F12	Video call	1	1	1	1	1
				F13	Share screen in video call	1	1	1	1	1
				F14	Call recording	1	1	1	1	1
			REPORTS	F15	Planned hours	4	5	2	3	3
				F16	Actual hours	3	5	3	4	5
				F17	Task progress	4	5	4	5	4
				F18	Time tarking	3	3	4	3	5
				F19	Timeline view	5	3	4	5	5
				F20	customize (for new fields)	3	4	5	3	4
				F21	Milestones	3	5	5	5	5
				F22	Notification for task	3	5	3	3	4
				F23	work space activity and statics	2	3	3	2	1
				F24	Automate form/workflow builder	1	5	1	3	4
			Task	F25	create task	4	4	5	5	5
				F26	delete task	5	5	5	3	3
				F27	search for tasks	4	3	5	3	4
				F28	accept/reject task	2	5	5	2	3
				F29	Add /edit fields for tasks	5	5	5	5	5
				F30	add a date of beginning of a task	5	4	4	5	3
				F31	add a date of finishing the task	2	2	4	4	4
				F32	set duration for a task	5	4	3	5	4
				F33	submit a final task / set final status for task	5	5	5	2	4
				F34	set task status	4	5	5	4	5
				F35	set task priority	5	3	3	3	4
				F36	to describe a task	3	5	5	2	3
				F37	submit issue / bug	5	4	3	5	5
				F38	Task dependencies	5	5	4	2	4
			Resoure management	F39	see the availability of each person	1	1	4	2	1
				F40	see availability of my timeline	2	1	2	2	3
				F41	monitor the availability of project's resource	1	1	1	1	1
			Calender	F42	budget management	1	1	1	1	1
				F43	calendar	1	5	5	5	4
				F44	search for events	3	4	5	4	5
				F45	archive the history of meetings	3	5	4	3	5
				F46	Schedule meetings for future	4	4	4	4	4
				F47	Reminders for meeting	3	5	5	5	5
				F48	Sync with other calendars	4	1	5	2	1
			Integration	F49	Integration with file sharing APP	2	5	3	3	4
				F50	Integrate with email	3	4	5	4	4
				F51	Integration with messaging and call APP	1	4	4	3	4
				F52	Integration with reporting APP	3	2	1	1	5
			Data administrative	F53	Integration with developing APP	4	3	4	3	3
				F54	Admin console	2	5	5	5	4
				F55	Import	4	3	5	4	3
				F56	Export	5	3	4	2	4
				F57	Availability of backup	5	2	5	5	4
				F58	Collaboration ( share file )	1	1	3	3	3
				F59	Document management	2	1	3	2	1
			Support	F60	Platform	4	5	5	5	4
				F61	Support	3		5	5	5	5
				F62	Price	5		5	1	5	1
				F63	Tutorial	5		2	3	5	2



Table-A I-37 Collected data from subject ID 37- TM3 team 1 IT

	Role	Features category	features Category	Features	features	Trello-premium	Asana-premium	Monday-standard	Teamwork-deliver	Zoho project-enterprise
Subject ID 36	Team member	FC1	CHAT BOX	F1	private Message	1	3	1	5	5
		FC1		F2	group Messages	1	2	2	5	3
		FC1		F3	voice message	1	1	1	2	5
		FC1		F4	video message	1	1	1	2	1
		FC1		F5	search in messages	1	2	5	3	3
		FC1		F6	attach file in chat	1	5	3	4	5
		FC1		F7	Edit msg	1	2	1	5	1
		FC1		F8	delete msg	1	3	1	5	1
		FC1		F9	feed	4	5	4	4	5
		FC1		F10	member's status	4	4	4	5	5
		FC2	Call	F11	Voice call	1	1	1	1	1
		FC2		F12	Video call	1	1	1	1	1
		FC2		F13	Share screen in video call	1	1	1	1	1
		FC2		F14	Call recording	1	1	1	1	1
		FC3	REPORTS	F15	Planned hours	2	5	2	3	3
		FC3		F16	Actual hours	3	5	3	4	5
		FC3		F17	Task progress	4	5	4	5	5
		FC3		F18	Time tracking	5	5	4	5	5
		FC3		F19	Timeline view	5	4	4	5	5
		FC3		F20	customize (for new fields)	3	4	5	3	5
		FC3		F21	Milestones	3	5	5	5	5
		FC3		F22	Notification for task	3	5	3	5	4
		FC3		F23	work space activity and statics	2	3	3	2	1
		FC3		F24	Automate form/workflow builder	1	5	2	3	5
		FC4	Task	F25	create task	5	5	5	5	4
		FC4		F26	delete task	5	5	5	3	5
		FC4		F27	search for tasks	4	5	5	3	4
		FC4		F28	accept/reject task	2	5	5	3	3
		FC4		F29	Add/edit fields for tasks	5	5	5	3	5
		FC4		F30	add a date of beginning of a task	5	4	4	5	3
		FC4		F31	add a date of finishing the task	4	4	4	4	3
		FC4		F32	set duration for a task	5	4	3	5	4
		FC4		F33	submit a final task / set final status for task	5	5	5	2	4
		FC4		F34	set task status	4	5	5	4	5
		FC4		F35	set task priority	3	5	5	5	5
		FC4		F36	to describe a task	3	5	5	2	3
		FC4		F37	submit issue / bug	5	5	3	5	5
		FC4		F38	Task dependencies	5	5	4	2	4
		FC5	Resource management	F39	see the availability of each person	2	1	4	2	2
		FC5		F40	see availability of my timeline	2	1	2	2	3
		FC5		F41	monitor the availability of project's resource	1	1	2	1	1
		FC5		F42	budget management	1	1	1	1	1
		FC6	Calendar	F43	calendar	1	5	5	5	5
		FC6		F44	search for events	3	4	5	4	5
		FC6		F45	archive the history of meetings	3	5	5	3	5
		FC6		F46	Schedule meetings for future	4	5	4	4	4
		FC6		F47	Reminders for meeting	5	5	5	5	5
		FC6		F48	Sync with other calendars	4	1	5	2	1
		FC7	Integration	F49	Integration with file sharing APP	2	5	3	3	4
		FC7		F50	Integrate with email	3	5	5	4	5
		FC7		F51	Integration with messaging and call APP	1	4	4	3	4
		FC7		F52	Integration with reporting APP	3	2	2	2	5
		FC7	Data administrative	F53	Integration with developing APP	4	3	4	3	3
		FC8		F54	Admin console	2	5	5	5	4
		FC8		F55	Import	5	3	5	4	3
		FC8		F56	Export	5	3	5	2	4
		FC8	Support	F57	Availability of backup	5	2	5	5	4
		FC8		F58	Collaboration ( share file )	1	1	3	3	2
		FC8		F59	Document management	2	1	2	2	1
		FC9		F60	Platform	5	5	5	5	5
		FC9		F61	Support	3	5	5	5	5
		FC9		F62	Price	5	5	1	5	1
		FC9		F63	Tutorial	5	3	3	5	3

## APPENDIX II

### DATA SETS

Table-A II-1 Dataset 1- chi square

Subject ID	Role	Trello	Asana	Monday	Teamwork	Zoho	Best app
1	PM	119	235	195	243	141	Teamwork
2	PM	115	243	191	220	160	Asana
3	PM	194	238	231	221	214	Asana
4	PM	176	214	209	212	223	Asana
5	PM	200	238	226	225	237	Asana
6	PM	206	227	214	235	220	Teamwork
7	PM	199	238	219	237	221	Asana
8	PM	197	238	226	223	234	Asana
9	PM	178	211	205	210	212	Asana
10	PM	185	220	215	216	202	Asana
11	PM	106	239	176	215	170	Asana
12	TM	108	241	184	245	130	Teamwork
13	TM	119	245	193	228	138	Asana
14	TM	108	239	180	220	146	Asana
15	TM	104	236	181	225	150	Asana
16	TM	114	237	187	230	134	Asana
17	TM	101	238	185	225	134	Asana
18	TM	115	237	181	239	117	Teamwork
19	TM	97	234	178	220	139	Asana
20	TM	102	241	185	230	132	Asana
21	TM	101	235	181	222	130	Asana
22	TM	111	235	179	233	115	Asana
23	TM	99	233	178	219	137	Asana
24	TM	109	252	184	234	133	Asana
25	TM	105	233	175	216	137	Asana
26	TM	97	232	173	221	135	Asana
27	TM	184	225	205	202	216	Asana
28	TM	187	225	218	214	235	Asana
29	TM	192	212	208	206	218	Asana
30	TM	194	215	213	223	210	Teamwork
31	TM	199	232	230	232	231	Teamwork
32	TM	192	226	227	225	233	Monday
33	TM	185	220	218	220	215	Teamwork
34	TM	183	223	216	220	219	Asana
35	TM	178	216	210	208	219	Asana
36	TM	183	213	213	214	212	Teamwork
37	TM	188	226	220	220	223	Asana

Table-A II-2 Dataset 2 – for prediction analysis

Subject ID	Weight FC1	Weight FC2	Weight FC3	Weight FC4	Weight FC5	Weight FC6	Weight FC7	Weight FC8	Trello	Asana	Monday	Teamwork	Zoho	Best score	Best app
1	22	2	17	4	7	12	30	4	119	235	195	243	141	243	Teamwork
2	14	8	23	16	13	4	10	6	115	243	191	220	160	243	Asana
3	13	15	17	12	13	13	6	7	194	238	231	221	214	238	Asana
4	19	7	24	13	6	11	11	4	176	214	209	212	223	223	Zoho
5	19	8	20	11	11	12	7	7	200	238	226	225	237	238	Asana
6	16	14	17	14	7	19	5	5	206	227	214	235	220	235	Teamwork
7	16	13	15	21	5	11	10	3	199	238	219	237	221	238	Asana
8	24	9	16	13	6	18	9	4	197	238	226	223	234	238	Asana
9	16	11	19	19	6	11	10	3	178	211	205	210	212	212	Zoho
10	17	14	18	12	7	17	5	5	185	220	215	216	202	220	Asana
11	22	9	17	11	10	14	9	6	106	239	176	215	170	239	Asana

## APPENDIX III

### PROOF OF ETHICAL FORM- ETS EMAIL



Comité d'éthique de la recherche  
École de technologie supérieure

Le 17 septembre 2021

**Titre de l'activité :** Comparing project management software for start-ups  
**Responsable :** Mickaël Gardoni, Professeur au département de génie des systèmes – École de technologie supérieure  
**Étudiante :** Niaz Zafarmirmohamadi, Étudiante à la maîtrise  
**Référence :** H20210903

#### DÉCISION DU COMITÉ D'ÉTHIQUE DE LA RECHERCHE

Monsieur Gardoni,

Vous avez soumis au Comité d'éthique de la recherche (CÉR) de l'ÉTS le formulaire de présentation de l'activité mentionnée en rubrique. Ce formulaire a été évalué le 17 septembre 2021 en comité délégué.

Selon les informations contenues dans le Formulaire de présentation, et considérant l'Article 2.5 de l'*Énoncé de politique des trois Conseils – Éthique de la recherche avec des êtres humains (ÉPTC2)*, le comité a conclu que l'activité présentée vise l'amélioration des processus et qu'elle ne répond pas à la définition de recherche avec des participants telle que définie par l'ÉPTC2. **Par conséquent, une évaluation éthique et un suivi continu de la part du CÉR ne sont pas requis.**

Veuillez noter que cette décision repose sur les informations présentées. Si vous devez apporter des modifications aux objectifs de l'activité, veuillez en informer le CÉR dans les meilleurs délais.

Veuillez également noter qu'indépendamment de cette décision, les principes de conduite responsable en recherche s'appliquent à votre activité. Vous êtes donc tenu de vous y conformer.

Veuillez agréer, Monsieur Gardoni, l'expression de mes sentiments les meilleurs.

Mathias Glaus, Ing., Ph.D.

Président, Comité d'éthique de la recherche  
École de technologie supérieure

cc : Ghyslain Gagnon, Doyen de la recherche  
Erika Olivaux, Coordonnatrice du CÉR

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