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Resolving Conflicting Stakeholders Emotional Goals in the Requirements Engineering: the case study of Facebook Messenger App

Master's Thesis (20 ECTS)

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Tartu 2021

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Abstract:

Requirements engineering (RE) is an integral part of developing a socio-technical system (STS) focusing on end-user satisfaction and technology acceptance. However, finding a conflict-free STS in a given problem domain is challenging because of its complexity and insatiable human needs. This thesis answered the research question on capturing, categorizing, and resolving conflicts in emotional requirements expressed as feel goals for different STS stakeholders in a case study. The goal is to provide a proper understanding of human behavior, motivation, strategies and harmonize their emotional differences. The research method is a mixture of qualitative and quantitative methods by engaging stakeholders in an e-workshop. We worked out a strategy based on existing methodologies to harmonize the different stakeholders' emotional goals and gave an appropriate comprehension of user behavior, desire, strategies, and the option to unify emotional variations. Our result provided a goal model's generic structure of the problem domain that shows how each emotional goal relates to the functional goals and roles created.

Keywords: requirements engineering, emotional requirements, ACH analysis, Quantitative Based Mechanism; e-workshop; socio-technical systems
CERCS: P170 Computer science, numerical analysis, systems, control

Konfliktsete sidusrühmade emotsionaalsete eesmärkide lahendamine nõuete väljatöötamisel: rakenduse Facebook Messenger juhtumianalüüs

Abstraktne:

Nõuete projekteerimine (RE) on sotsiaal-tehnilise süsteemi (STS) väljatöötamise lahutamatu osa, keskendudes lõppkasutajate rahulolule ja tehnoloogia aktsepteerimisele. Konfliktivaba STS-i leidmine antud probleemvaldkonnas on aga keeruline selle kompleksuse ja rahuldamatute inimvajaduste tõttu. Käesolev töö vastas uurimisküsimusele emotsionaalsete nõuete konfliktide defineerimise, kategoriseerimise ja lahendamise kohta, mis on väljendatud erinevate STS-i sihtrühmade emotsionaalsete eesmärkidena. Töö eesmärk on luua arusaam inimeste käitumisest, motivatsioonidest, strateegiatest ja ühtlustada nende emotsionaalsed erinevused. Uurimismeetod on kvalitatiivsete ja kvantitatiivsete meetodite segu, kaasates sihtrühmi läbi virtuaalse töötoa. Töötasime välja olemasolevatel metoodikatel põhineva strateegia, et ühtlustada erinevate sihtrühmade emotsionaalseid eesmärke ning lõime põhjaliku ülevaate

kasutaja käitumisest, soovidest, strateegiatest ja võimalusest ühtlustada emotsionaalseid erinevusi. Töö tulemusena mudeldasime valdkonna üldise struktuuri, mis näitab, kuidas iga emotsionaalne eesmärk on seotud loodud funktsionaalsete eesmärkide ja rollidega.

Märksõnad: nõuete projekteerimine, emotsionaalsed nõuded, ACH analüüs, kvantitatiivne mehhanism; e-töötuba; sotsiaal-tehnilised süsteemid
CERCS: P170 Arvutiteadus, arvuline analüüs, süsteemid, juhtimine

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1. Introduction.

In order to create software in a coherent, compatible, and reliable manner, it is common practice to use the software development life cycles (SDLC) [1]. As described in [2], reaching higher maturity levels of software development processes needs a long-term approach to constantly enhancing procedures. In the process of software development, software engineers play one of the critical roles. Thus, software engineers need to understand the way people interact with the software to create something useful for the end-users. In this context, to fulfill the end-user satisfaction and technological acknowledgment, socio-technical systems (STS) become a notable example of the systems that require those aspects [3-4].

Around the end of the fifties, the Tavistock Institute in London developed the idea of the socio-technical method [5]. To emphasize the mutual interconnection between end-users and software, the idea of the socio-technical system emerged [6]. Moreover, to build such systems, requirements engineering (RE) becomes an integral part of it [1-2]. RE is primarily the process of discovering the intent by defining and recording stakeholders and their needs appropriately for research, communication, and implementation purposes [7].

STS and RE require human participation because both of them are sophisticated and need to be in a symbiotic environment meeting end-user satisfaction [8-9]. Due to nature, people are complex creatures in emotional terms [10]. Thus, it is not easy to detect a conflict-free system based on the STS, which meets their expectations, needs, and desires. To achieve mutual understanding between stakeholders and satisfy all their needs and avoid any conflicts, it is necessary to think of a framework or model that will resolve mutual misunderstanding issues for all parties.

We also need to note that in designing user-centered software, user engagement is another crucial factor. It invokes the user experience nature that highlights the effective forms of interaction and the phenomena related to technology captivation [11]. Nevertheless, it is difficult to identify user engagement drivers; thus, it brings many problems and restrictions while eliciting requirements [12]. It is still unknown what kind of things on an emotional level fulfills users' satisfaction and meets their needs. Sherka et al. [12] developed the Emotional Attachment Framework (EAF) to understand people’s emotional goals to tackle this issue. However, Sherkat et al. [12] based their work on a case study, which may be considered a subject to bias. Using a small fraction of data to derive the given case study results may be considered a restriction point of this research. Here, the analyzed data only focused on homeless people; however, for building a better framework/solution, all the stakeholders should have been taken into account.

Furthermore, the research in [13] described an approach for eliciting and representing emotional requirements for STS using two e-health case studies. The research in [13] tackled the problem of not guaranteeing that individuals will be engaged with the eventual software solution to address their desires, both functionally and emotionally. Thus, the authors in [13] suggested the motivational modeling approach for addressing this problem. With motivational modeling, three objectives: the “do, be, and feel” goals, were derived from different stakeholders during requirements elicitation. The “do” goals described what the system to be designed should do; the “be“ goals described how those designed systems need to be; and the “feel” goals, also known as emotional goals, described what end-users want to feel while using the system. As a result, outcomes derived from requirements elicitation were translated into a motivational goal model. It also shows that accurate elicitation of emotional requirements is crucial for achieving emotionally acceptable software. The motivational model in [13] provides a resource for improved conversation with stakeholders while the design is being developed. However, the different stakeholders can be subject to different emotions that are individually constructed. The possibility for some trickish disagreement might arise. Such trickish disagreement is what we refer to as conflict.

This thesis aims to identify and resolve conflicts in stakeholders' emotional requirements (ER) in a complex and collaborative setting. ER supports the careful examination of ambiguous expressions of stakeholders captured from scenarios and user stories. Therefore, developing an approach to harmonize stakeholders' emotional goals to ensure mutual feelings and satisfaction is ideal for developing emotionally acceptable software. The objective will be to give an appropriate comprehension of user behavior, desire, strategies, and the option to unify emotional variations. Additionally, the thesis seeks to find a way to coordinate all involved stakeholders' needs and desires to develop an acceptable solution for all parties.

We used the Facebook Messenger App as a case study in this thesis. The choice of the case study was motivated by the fact that many different types of users are using messaging apps, and there is the highest probability of finding and mapping emotional concerns. Facebook Messenger App is used to communicate, share images, clips, stickers, audio, and files, and respond to other users' messages and engage with bots. The thesis addressed the main research question: **How to identify and resolve conflicts in emotional requirements that are expressed as feel goals for different stakeholders?** The main research question entails the following sub-questions:

- RQ1: How to capture and categorize the stakeholders' goals for conflict resolution in a given domain?
- RQ2: How to resolve conflicts between the feel goals of stakeholders?

- RQ3: What is the best methodology to resolve conflicting stakeholders' “feel” goals in a given domain?

Chapter 2 presents the study's background, shows other existing approaches, and elaborates on its strengths and weaknesses. Then Chapter 3 describes the methodology and case study approach used in answering the research questions. Chapter 4 presents the study results based on the methodologies used in the case study. Chapter 5 presents the discussion of the results. Lastly, the threats to validity, conclusions and future work are presented in Chapter 6 and Chapter 7 accordingly.

2. Background

2.1. What is RE?

Today, the fast-changing Information Technology (IT) world requires more attention to the development process [14]. Moreover, to carry out this process, a necessary aspect is implementing coherent requirements specifications from the different stakeholders involved [15]. Requirements arising from the stakeholders help envision the whole process from the beginning and set goals to achieve the end result. Also, the determination of problem scope is one of the most important stages in the software development process. In this case, RE helps to interpret the problem scope and connect it with other software development process aspects [15]. As described in [15], RE is the cornerstone of every project; thus, it defines what stakeholders need from the system to be designed.

However, defining problem scope is one of the most challenging aspects of every RE process [16]. Several techniques are needed that can support the RE processes to ensure that requirements are thorough, compatible, consistent, complete, unambiguous, and applicable [17]. Additionally, the most common perception of a requirements engineer is that he or she is in charge of 'eliciting' requirements from customers. This is typically accomplished by the use of interviewing, questionnaires, or observation, in which the user is a relatively passive participant. Alternatively, other methods, such as a method for controlled requirements expression (CORE), enable the requirements engineer to define the "customer authority" and "viewpoint authority" [17]. Remarkably, these techniques focused on avoiding errors in the early stage of the software development process because the later errors are found, the more costly it is to fix them [17, 18]. Besides, requirement-related problems are perceived as the three top-most reasons for a challenging project and the two top-most reasons for system failure [19].

2.2. Key activities in the RE process

Five key activities are parts of the RE process: elicitation, analysis and negotiation, documentation, validation, and management [20]. Elicitation is when the analyst defines the stakeholders' needs, collects information from the stakeholders, and clarifies the customers' and users' expectations [21]. Once the requirements have been collected, analyzing them for completeness, conflicts, errors, overlap should be done. This means the requirements elicitation stage is inevitable towards developing a system, as it is the backbone of the RE process.

Typically, requirements analysis entailed determining which data and functionality a software system must support. Entity-relationship diagrams can be used to represent the data that the system can manage, while data flows can be used to define the functions [22]. Although such approaches are the basis for several modern software engineering activities, requirements analysis must entail more than just analyzing a new system's functions. In fact, the requirements engineer must investigate options and assess their viability and desirability in light of the stakeholders' objectives [22]. Nevertheless, even by using such techniques, defining stakeholders' goals may be difficult and ambiguous at the same time. Being able to meet all expectations of stakeholders is quite a challenging process in RE [23].

2.3. Emotional preconceptions of stakeholders

Some several reasons and factors underlie the issue of meeting all expectations of stakeholders, and one of them is the emotional preconceptions of stakeholders. As evident in [24], emotions play a vital role in daily human life, making it distinct. Emotions themselves can belong to different groups; some of the most common groups are positive and negative emotions [24]. If we consider each group separately, we can say that positive emotions include amusement, satisfaction, pride in success. Negative emotions include such emotions as fear, anger, sadness [25].

From the examples given, emotions are rather a broad concept and can contain different kinds of sentiments. Thus, being able to satisfy all emotions of stakeholders is a challenging task for requirements engineers. As observed in [26], three types of emotions include primary, background, and social emotions. Happiness, sorrow, fear, rage, surprise, and aversion are among the primary emotions. The sense of well-being, calm, discomfort, enjoyment, excitement, and depression are background emotions. Social emotions include humiliation, envy, remorse, and pride.

In several cases, emotions are hard to manage. Particularly in circumstances in which one would not even predict emotions to be a cause, such as the development of software processes [27]. In different research fields such as computer science, information system, and software engineering, various objective and subjective instruments have been used over time to quantify emotions [28]. However, no specific methodology exists to quantify emotion or the magnitude of emotion precisely [29]. On the other hand, people can effortlessly recognize certain emotions in others. For example, emotions expressing joy, happiness, or sadness and anger are easily identifiable.

It is worth noting that in [30], emotions are described as follows:

1. *Personal emotions:* Regardless of the mechanism being examined, these are the emotions that a person feels. Feelings like love, safety, and wholeness are indicators of such emotions. Since emotions are distinct from the system, modelling those personal feelings that are within the software's range is clearly beneficial.
2. *Context-specific emotions:* These are the feelings (or desires) that a person has against a device or piece of technology. Feeling satisfied with the program, irritated by the system, or having the system incorporated into their lives are all examples. These are different feelings about the system that only occurs in response to it.

In the literature, emotions such as rage, panic, excitement, sorrow, and happiness are not correlated with end users' emotional expectations [31, 32]. For example, users' emotional preferences for specific software, such as a photo editing tool or an online education platform, can be described as “feel” expectations, meaning how one or another user wants to feel when using the particular system. Although users' emotional preferences are linked to how users feel or want to feel, they cannot be described as emotions in this thesis's context. Users' emotional preferences contribute specifically to how the end product is viewed by users [28]. Therefore, the emotional preferences of users in this study relate to how users view the end product.

2.4. Difficulties of taking into account user preferences

Software engineers are trained to distinguish functional requirements from non-functional and thus develop systems based on these, engineers find it hard to take into account users’ preferences. The main reason for that is that it is difficult to capture all users' emotional needs [33]. Nevertheless, the value of end-users emotional aspirations regarding technology adoption can neither be overlooked nor undervalued. It is worth noting that a clearer realization of the

accuracy and balance of the concept of requirements will contribute to recognizing stakeholder emotions. However, there is no formal approach or paradigm for software that thoroughly explains how to capture and implement emotional user objectives into the life cycle of software creation. Not meeting stakeholders' goals may become the source of different kinds of conflicts among stakeholders.

It is also known that social conflicts are an innate part of human life [34]. The conflict analysis is a crucial part of developing and applying approaches that diminish the damage and boost the interest of a particular conflict [34]. The social conflict happens when two or more people have adverse objectives, and it involves many contending parties. Conflicts are often differentiated by the nature of the opposers: people, countries, organizations, communities, etc. Opposers also may be differentiated by nature, such as their culture, background, geography, etc. [34].

We should say that *"..a stakeholder's beliefs may not be consistent with the goals of all stakeholders of a system being constructed"* [35]. Thus, it may be a reason for conflict between them. It also should be taken into account that if those conflicts remain unresolved, as a result, they may lead to the failure of a system to be designed. In the RE, determining and sorting out target conflicts has been recognized as crucial [36]. Also, there may be vague and contradictory preliminary specifications supplied by several stakeholders in complex systems [37]. A requirements engineer that translates such specifications into the syntax of goal-oriented modeling language can inaccurately catch these stakeholders' general purpose. In addition, the difference between stakeholders of the same group is another important problem with target modeling [37].

2.5. Methods of resolving disputes between stakeholders

Several methods have been suggested to handle and settle disputes between stakeholders in the literature, and resolving conflicting goals remains an interesting topic for researchers [38, 39]. The management of undefined specifications, ambiguities, and disputes between stakeholders is an essential issue that has to be resolved [40]. At the same time, these problems can be beneficial as they may allow for more elicitation of requirements that, on the other hand, would have been overlooked [40]. The approach developed in Hassine et al. [40] is dependent on a statistical analysis of the empirical evidence obtained for and category of stakeholders from the surveys. In this case, the concept analysis was applied to set goal-model artifacts, which may be the reason for conflicts. For each artifact, a respondent was asked to answer the questions. The data collected from surveys has been statistically analyzed using

t-test [41] and ANOVA [42]. Then, the collected data has been analyzed by adopting the concept analysis method. This strategy, however, is subject to many limitations and risks to validity [40].

With regard to the adoption of different parametric approaches such as t-test, ANOVA, and regression with limited sample sizes and data that would not usually be dispersed, there is some criticism. However, the two approaches used in this thesis and then compared to each other, such as the ACH method [35] and a quantitative method [43], are primarily focused on continuous input from all system stakeholders.

Meanwhile, in [38], Van Lamsweerde et al. suggest systematic techniques and heuristics to distinguish contradictions from numerous stakeholder target specifications. While these methods illustrate vulnerability detection at the goal stage, the ACH method will resolve conflicts by considering viewpoints that are consistent or inconsistent with goals. Antón and Potts [44] also infer objectives from abstract or incomplete criteria and discover more complete requirements from the objectives inferred. Their strategy includes asking structured questions to strengthen criteria, calming initial targets using barriers, and investigating various scenarios. However, the method [43] we used in this thesis offers a more algorithm-based quantitative approach to resolving disputes, allowing us to deal with competing priorities more systematically. Case study in a [45] identifies contradictions between functional and safety criterias. They capture security criteria at both different levels for each stakeholder. ACH is quite similar to the approach in [45]. However, while the method in [45] attempts to recognize disputes at an initial stage of development by progressively documenting perceptions that contributed to the conflict, ACH attempts to resolve the conflict.

A Goal Argumentation Method (GAM) by Jureta et al. [46] recommends integrating claims into the modeling of goals. With GAM, stakeholders pick acceptable criteria and convert such requirements to argument-based target models. The main motive behind all of GAM and ACH is to document stakeholders' decision processes to produce specifications. The method in [47] includes justifications into i* goal modeling. Primarily, justifications involve fulfillment assertions that connect domain expertise to requirements for producing software requirements. However, ACH generates stakeholder opinions and the connection between beliefs and goals to create requirements and objectives similar to the [47] approach.

As seen from all the above research works, identifying conflicting goals and resolving them has been lucrative for many researchers. However, capturing emotional goals, identifying conflicting goals and their further resolution was not done yet extensively. Thus, in this thesis, we mainly focus on capturing emotional goals and resolving the conflicts that arose by using two different methods. After that, we compared the two methods and discussed their pros and cons.

3. Methodology

In this chapter, the methodologies used for answering each research question are described.

3.1 Research Approach

This study employed the case study research approaches in SE [48]. It is focused on qualitative and quantitative approaches [50, 51] by making observations from participants in an e-workshop. Also, for resolving conflicting emotional requirements, we employed two methods, such as “Analysis of Competing Hypotheses” (ACH) and Quantitative Based Method (QBM) [35, 43]. ACH is a formal analytic methodology for eliciting stakeholders' goals and beliefs, which are hypotheses about the system to be designed, to be precise. A belief may be in favor of, against, or neutral when it comes to a goal. Whilst, QBM is a quantitative method for resolving disagreements between stakeholders’ goals.

3.1.1 The Case Study - Facebook Messenger App

Facebook Messenger is an app produced by Facebook, Inc. for communication. Initially, it was founded in 2008 as Facebook Chat [52]. Users can communicate via this platform and send images, videos, stickers, files, and audio. The platform also supports voice and video calls. The app also lets its users use multiple accounts, provides support for end-to-end encryption, and provides users with different games to play. For the study, we considered 36 stakeholders divided into three categories: ordinary Facebook Messenger users, government officials, and advertisers. The necessity of linking the role with the emotional goal allows requirements engineers to identify competing emotional goals for different stakeholders [30], which is why we decided to include individuals from different backgrounds.

3.1.2 e-Workshop

The e-workshop was partially based on guidelines written by Lopez-Lorca, Burrows, and Sterling [53] and went along with the following stages: preparation and set up for the workshop; introducing the activity to the participants of the workshop; populating the lists; closing the activity and capturing the results; constructing motivational models by reviewing elements in the lists, clustering lists contents, establishing the hierarchy, adding in the quality, and

emotional goals, reviewing and clarifying results with stakeholders. In **Section 4**, a detailed description of the plan can be found.

3.1.3 Analysis of Competing Hypotheses

ACH is a popular method for structured analysis. It explains the methodological approach to build a diagnosticity matrix, documenting the relative degree to which the beliefs of stakeholders about the contradictory objectives given are incompatible. Until continuing along to the next form of proof, ACH requires determining a type of proof against each hypothesis.

3.1.4 Quantitative Based Method

This strategy is based on stakeholders' feedback [43]. It employs the weighted method to determine the priorities. The goal of optimum choice is to have more exposure to conflict resolution. The framework described is composed of four phases, and it is shown in **Figure 3.1** [43].

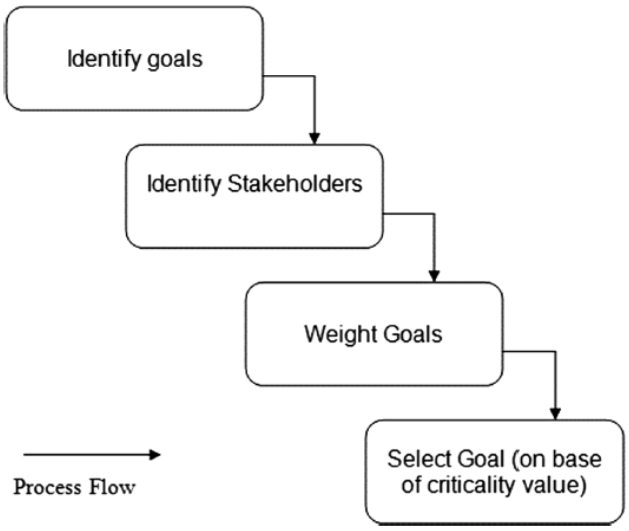

Figure 3.1 Process flow [43]

3.2 Approach to Answering Research Questions

In this section, we describe how each of the research questions was answered.

3.2.1 Approach For RQ1

To answer **RQ1** *(How to capture and categorize the stakeholders' goals for conflict resolution in a given domain?)*, we addressed this study through a qualitative approach in case study research. The case study method provides the opportunity to investigate a complex event and potentially discover new things about it. The case study enables a broader and more great interpretation of the event to be gained [54]. Thus, to answer RQ1, we organized an e-workshop due to the COVID situation to elicit stakeholders' emotional goals.

We created e-workshop questions that would help to answer **RQ1**. The purpose was to capture and categorize the stakeholders' *feel* goals during the e-workshop. For that case, the *do/be/feel* method was exploited during the e-workshop [53]. The outcome of the workshop was described in the "*Results"* chapter of this thesis.

Overall, there were 36 stakeholders with three types of roles: 12 average Facebook Messenger users, 12 government representatives, and 12 advertisers. The reason why we decided to have people with different backgrounds is the importance of connecting the role with the emotional goal, since it enables requirements engineers to capture conflicting emotional goals for different stakeholders [30]. People from different backgrounds tend to have more conflicting points if one's opinion does not support another's belief [30, 55]. Participants of the e-workshop were found through personal contacts. The e-workshop was conducted via Zoom, and all the results during the brainstorming session were captured in Miro. Since it was a bit difficult to gather all 36 people at the same time, we decided to have three (3) different rounds of the e-workshops with 12 people in each round. Two e-workshops were recorded. One workshop was not recorded because one particular participant was not willing to be recorded. A timetable of the case study is presented in **Table 3.2**.

Table 3.2. A timetable of the case study.

Procedure	Timeline	Remarks
Finding the participants	10.12-25.12.2020	36 participants
Conducting workshops	7.01-9.01.2021	The workshop was conducted via Zoom, and results were captured in Miro
Construction of motivational models from the e-workshops, clustering lists contents and establishing the hierarchy	09.01-14.01.2021	
Reviewing and clarifying results with participants	15.01-20.01.2021	The reviewing part was conducted via Zoom

From **10.12.2020** to **25.12.2020**, we decided to conduct workshops for each group of participants. Eventually, we decided to conduct 3 workshops from **7.01.2021** to **9.01.2021**, with 12 representatives of each type of stakeholder overall. The workshops were conducted via Zoom due to the Covid-19. The results were captured in Miro, the virtual board for visual collaboration. In preparing the e-workshop, we decided to have one facilitator (author of this thesis) who guided participants; different colored post-its; and a virtual blackboard.

During the e-workshop, the facilitator described the three categories (do/be/feel) that were put as headings on the blackboard. Next, the brainstorming session began, and the facilitator guided participants to elicit more requirements for the Facebook Messenger app. At the end of the workshop, the participants were informed of the need to be invited again to review the workshops' results and give feedback.

3.2.2 Approach For RQ2

To answer **RQ2** *(How to resolve conflicts between the feel goals of stakeholders?),* we decided to test two different methods and then compare each of them accordingly. The first methodology is called “Analysis of Competing Hypotheses” (ACH) [35], and the second one is “Quantitative Based Method” (QBM) [43]. Both of these methodologies can be implemented to resolve

conflicting stakeholders' "feel" goals. As described in [30], emotional goals can not be considered as software requirements. Thus, they drive new requirements (either functional or non-functional goals). Since the emotional goals are attached to functional goals, we need to resolve goal conflicts among given functional goals. Consequently, if we resolve conflicting functional goals, then stakeholders' "feel" goals will also be resolved.

We used the Analysis of Competing Hypotheses (ACH) to overcome goal conflicts [56]. Here, ACH was used to minimize confirmation bias. This bias is individuals' willingness to pursue proof to support a hypothesis that they keep reluctantly and dismiss evidence that contradicts that hypothesis [57].

All steps that we employed to overcome goal conflicts are mentioned below.

1) Identified conflicting goals. To implement ACH methodology, first of all, we identified conflicting goals in **Section 4.1.3.**
2) Identified significant beliefs. If a belief supports or contradicts one of the opposing goals, then it is important. Here we took into account all logical reasonings from views that endorsed or opposed a contradictory goal. Thus, we contacted all 36 stakeholders via Zoom to identify significant beliefs that they had about each goal.
3) Created a diagnosticity matrix. In our matrix, the columns indicate conflicting goals and beliefs. A matrix cell indicates whether the belief with regard to the objective referring to the cell is consistent (C), strongly consistent (SC), inconsistent (I), strongly inconsistent (SI), or neutral (N). A consistent belief embraces a goal and contradicts a goal with an inconsistent belief.
4) Drew tentative conclusions. As a next step, we found beliefs that are inconsistent with each objective. This is called the *inconsistency score* of the goal. Here, if a belief is inconsistent, then it is counted as -1. Simultaneously, if it is consistent or neutral, it is counted as 0, and double-counted when strongly inconsistent or consistent. The goal with the *lowest* inconsistency score is counted as the most attractive for the system.
5) Analyzed sensitivity and reported conclusions. As the last step, we analyzed all the stakeholders' assumptions and identified if there are optional explanations for every belief.

Then, we implemented QBM and defined all the objectives involved in a conflict at the stage of goal recognition. The stakeholders from different areas of the framework were concerned with these objectives. Then, we listed the conflict-affected stakeholders. To settle the conflict, these stakeholders took part in it. The goals on a scale of 1 to 5 were provided weights. At that value, "1" indicated that it was important to achieve the goal, while the value "5" implied that the goal

was discretionary. We picked the goal that scored the highest value at the end. This indicated that this goal was granted total focus.

Equation **3.1** summarizes the QBM method:

$C(Gi) = (\sum(\text{Weights})/\text{no. of stakeholders}) + S$ **(3.1)**

As indicated in Equation 3.1, C(Gi) is the criticality of goal i, and S is the number of stakeholders.

3.2.3 Approach For RQ3

To answer **RQ3** *(What is the best methodology to resolve conflicting stakeholders' "feel" goals in a given domain?),* we conducted an empirical evaluation and ran a survey among 40 participants from different universities. These participants were students with different backgrounds (Information Technology; Information Management; Computer Science). We decided to do so to be able to compare two different methodologies used by us and see each of their strengths and weaknesses. Each subject signed an informed consent form and was then allowed to participate in the survey. This method of evaluation was also used in [35].

We created two groups of 20 participants, where each group consisted of students from different backgrounds, as we stated above. Then we explained to the participants ACH or QBM to find a solution to the conflict in the "*Blocking ads" scenario*. The start point for all participants was three conflicting goals: avoid ad blockers, block ads while playing games, and filter ads. We also asked our previous workshop participants (stakeholders) to answer all the questions that our participants (students) might have.

Furthermore, we asked our participants (students) to approach stakeholders to incorporate beliefs and create assumptions if needed. We also allowed participants who were going to use the QBM to get in touch with stakeholders for evaluating each of the goals. In the latter case, we should also note that participants were not limited by the number of stakeholders they could potentially reach. In the end, all the participants completed a post-participation survey[1,2] to record their findings, and based on their answers, we made conclusions and examined both methods in **Section 4.3**.

[1] RQ 3 - Quantitative Based Mechanism Survey

[2] RQ 3 - ACH Analysis Survey

Using the metrics mentioned below, we examined the ACH method.

1. *The efficiency of the method.* Efficiency is a crucial factor in the real world. A method's simplicity of use and short study time are two essential factors [35]. We measured efficiency by *time* spent on the analysis and *difficulty* of implementing the method.
2. *Quality of the method.* The consistency of a process is probably the most critical factor [35]. The quality of the ACH method was measured by the number of specific beliefs that were taken into account in the ACH study and the number of groups (combined beliefs). When the number of valid beliefs increases, it boosts credibility [35]. And the number of groups refers to an analyst's ability to blend many values. There may not be a straightforward conviction promoting a goal in certain real-life situations. Even so, it can be possible to connect beliefs in order to achieve an objective. We also take into account assumptions. Assumptions are unavoidable since the beliefs accessible for interpretation are often incomplete and vague [35]. Thus, the number of assumptions made in the ACH analysis is one of the measures we considered.
3. *The method's repeatability.* Frequently, an analysis statement should be addressed in different situations and by various experts [35]. A beneficial aspect of a system is that it produces similar or slightly similar results when implemented by different observers. The more similar results are produced, the better the repeatability of a method.

Then, again, using the metrics mentioned below, we examined the QBM.

1. *The efficiency of the method.* This metric is similar to the one used in ACH analysis.
2. *Quality of the methods.* Here, we also considered the number of stakeholders approving and denying the goals. Since the range of stakeholders who support or oppose a goal affects the goal's approval or rejection [43], we decided to consider this metric.
3. *The method's repeatability.* This metric also refers to the one used in ACH analysis.

3.3 Conflict Identification among Stakeholders

To identify conflicts among stakeholders, we decided to use the conflict identification methodology proposed by Muhammad Suhaib [58]. This method consists of four stages:

- Define initial (parent/root) goal
- Break down parent goal into subgoals

- Ask stakeholders to contribute to the sub-goals
- Identify conflicts

In the first step of defining the initial goal, attention was given to the stakeholders' main needs. The need was the same for every type of stakeholder, which could have been treated as a basic stakeholder requirement. Secondly, subgoals were created to help achieve the main and parent goal. Thirdly, the stakeholders were asked to provide feedback as a contribution to the subgoals. Finally, we identified conflicts by comparing the subgoals.

4. Case study with FB Messenger

In this chapter, the results of the case study will be presented based on the research questions.

4.1 Motivational Goal Model Construction

After conducting the e-workshop, we exploited the results from the do/be/feel method to construct a motivational model. After the e-workshop, four lists were categorized into *do/be/feel* goals and roles. We reviewed each element again to ensure that there was no misunderstanding. All the questions, ambiguous moments, duplicated elements, and assumptions, among others, were noted for further communication with stakeholders. At this stage, rewording elements were also implemented.

At the beginning of the functional goals, the verb *"I want to..."* was added, quality goals were clarified as adjectives, and emotional goals were reworded as *"I want to feel...".* The reason why we decided to start each functional and emotional goal with "I want to...", was the fact that we wanted to maintain consistency [53]. As it is stated in [53], *"Following conventions when naming goals improves clarity"*. The next step was grouping related elements together. For that purpose, we used the *affinity diagram* approach [53]. Elements from each list were captured on four different colored post-its. Each color represented one of the list categories. Then we grouped clusters of related elements. After clustering, we chose a label for each cluster. Next, we built a hierarchical view of functional goals to create the structure of the motivational model. All the functional goals were associated with related roles, quality, and emotional goals. Then, each functional goal was examined once again to form the cluster's hierarchical structure of functionalities.

After that, a top-level (root) functional goal for the motivational model was chosen. To execute this task, the *How/Why Laddering* method was employed. In this method, the parent goal answered why a specific sub-goal was necessary, and the sub-goal answered how the parent goal was achieved. The next step was to join all the above-mentioned parent goals and subgoals into one structure and establish a parent goal for the entire model.

The final step was adding the remaining elements (roles, quality, and emotional goals) to the created hierarchy. Lorca et al. [53] suggested that in order to make the model look simple and easy to understand for non-technical stakeholders, it is better to group as many quality and emotional goals inside a shape as practical. However, the suggestion in [53] is not applicable in this study because such a step may have become a hindrance towards capturing and seeing all the conflicting emotional goals.

The last stage was *reviewing and clarifying* everything with participants. For that case, we asked participants to join Zoom calls again. The model was explained to the participant during the zoom meeting to gather further feedback on the model.

4.1.1 Capturing the Stakeholders Feel Goals

A virtual board[3] that was captured during the e-workshops is shown in **Figure 4.1**. Also, we included roles there since they show which category of stakeholders took part in the e-workshop and what they incorporated during the whole process.

[3] https://miro.com/app/board/o9J_lZHhNLk=/

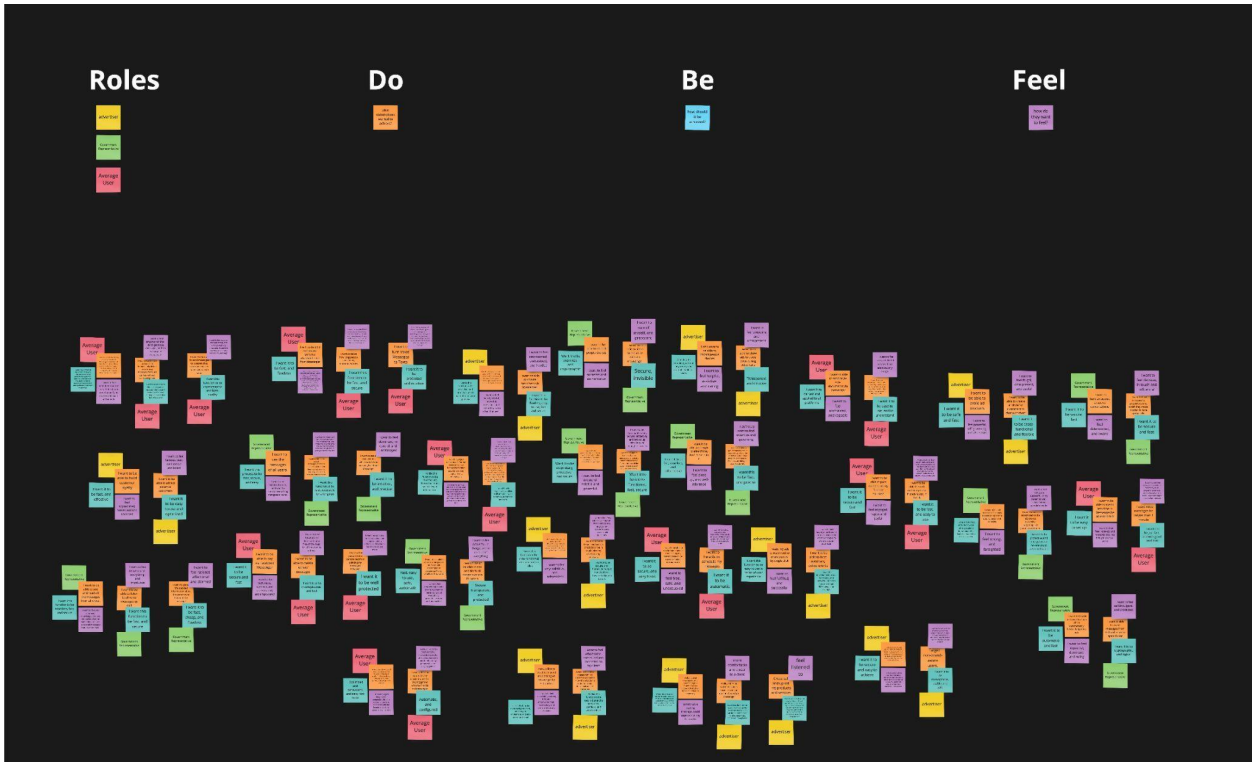

Figure 4.1 Virtual board with ideas from workshops

The questions that we asked during the e-workshops were: (i) what stakeholders wanted to achieve, (ii) how should it be achieved, (iii) how do they want to feel. For that reason, four different colored post-its were used. Each post-it was representing *do/be/feel* goals and *roles* accordingly. The stakeholders wrote down as many functional goals as possible. They added quality and emotional goals for each written functional goal accordingly. The activity finished when stakeholders ran out of ideas, and there was nothing to add from their sides. Below, in **Table 4.2** we represented all roles; and do, be, feel goals from the e-workshops.

Table 4.2 Final *do,be,feel* goals from e-workshops

Roles	*Do goals*	*Be goals*	*Feel goals*
Average users	1. I want to be able to edit my stories on Facebook Messenger. Sometimes it takes time to delete them and recreate them again. So it would be cool if I could just edit them and then reshare them again. 2. I want to have a chance to immediately delete advertising	1. I would say it would be cool if this action was ubiquitous, like being present everywhere at once, so I can edit it not only from Facebook messenger but also from other platforms that relate to Facebook. 2. I want it to be easy to do	1. I want to feel confident that the story that I shared was changed, and no one noticed it at the end. 2. I want to feel empowered that I don't get those messages, and I'm in charge of changing it. 3. I want to feel assured, safe and strong, that nobody reads my messages except me and the person who received my

	messages from 3rd parties without even seeing them 3. I want to be able to send messages to a secret chat, so no one sees or reads whatever I send 4. I want to be able to pay via Facebook Messenger 5. I want to be able to delete others' messages 6. I want other people to be constrained from deleting my messages however 7. I want to be able to scan and translate whatever I need from Messenger 8. I want to select how long people can see my moments/stories 9. I want to turn Voice Messages into Texts 10. I want to get just relevant ads for my needs only, like being able to filter ads before they appear in my messenger. 11. I would say that I wouldn't like to be able to play all kinds of games on the Facebook Messenger platform. I think it would be good if the gaming feature was fully removed from the messenger. In my opinion, it is a waste of time. 12. I want to able to send large size documents via Messenger 13. I want Facebook messenger to be as basic as possible, now it is too overloaded. It's better to have a few functions like calling, messaging and sharing stories. 14. I want to be able to play all kinds of games on the Facebook Messenger platform. Like, be able to integrate all browser games to Messenger with one click 15. I want ads to be automatically blocked while I'm playing games with my friends on Messenger 16. I want to be able to restrict some people from seeing my current location, or any information related to me 17. I want to be able to schedule my messages 18. I want voice messages to be longer than 1 minute 19. I want to be able to spend less time in Messenger, be able to	and transparent, especially being easily understood or seen through (because of a lack of subtlety) 3. I want his function to be cryptographic and high-quality. 4. I want it to be secure and fast 5. I want it to be inconspicuous and fast 6. I want it to be well protected 7. I want it to be fast and flawless 8. I want this function to be fast and secure 9. I want it to be protected and intuitive 10. I'd like this function to be more secure, filtered, so I don't see irrelevant information. 11. I want it to be large-scale, applied to all accounts, wide, common, automatic, and safe 12. I want it to be fast and applied to all platforms 13. I want it to be easy to use and to understand 14. I want it to be optimized, and benevolent, and easy, fast to do 15. Automatic and configured 16. I want it to be secure and easy to do 17. I want it to be automatic 18. I want it to be just fast and in good condition 19. I want it to be easy to set up 20. I want it to be fast and easy to use 21. I want it to be secure and fast	message. 4. I want to feel tech-savvy, carefree, and unrestrained, and empowered 5. I want to feel forceful and dominant and free of the need for affirmation by others. 6. I want my opinions to be accepted and appreciated by others, so they won't be able to delete them 7. I want to feel assured and optimistic that whenever I want I can access this function in messenger and translate everything I need easily. And also, I want to be understood. For example, when I use this function, I want it to translate anything without any errors, thus the opposite side understands me correctly. 8. I want to create the FOMO effect, so people miss my moments and try to check my moments every time in order not to miss them. I want to feel appreciated, cherished, and valued. 9. I want to feel relieved of the burden of writing long text messages and recording voice messages, I also want to feel loved, communal, and appreciated by people who don't like to listen to long audio messages 10. I want to feel more well-informed, but at the same time, not being bombarded with lots of unrelated ads. I have nothing against ads, I just hate when they are irrelevant, so that is why I want to feel relatable and free. 11. I want to feel more realistic, less or noncompetitive at all, to feel present and spend time with friends in a more meaningful way, not just playing some games over messenger. 12. I want to feel unchained and capable 13. I want to feel calm, a little bit isolated from unnecessary things. 14. I want to feel engaged, imaginative, competitive, fictional, and joyful, and also connected with my friends around the same things, interests 15. I want to feel more forceful, involved, respectful, and conscious, so no ads bombard

	lock it 20. I want to be able to reach out to my close friends faster, in 1 click 21. I want to be able to post content on my friends' "stories."		my phone while I'm playing games 16. I want to feel free, safe, and unoccupied 17. I want to feel caring, supportive, and responsible. I want people to realize how much I care about them. Maybe I even want to feel accepted by them 18. I want to feel free again and be able to record my voice properly, so no one gets bothered when i send 5 voice messages in a row for 1 minute 19. I want to feel free, relieved, and more realistic, not being in a virtual world 20. I want to feel that I didn't spend much time in order to find close people in the messenger app, and also I want them to feel special, and I also want to feel special if someone adds me to the close contact list 21. I want to feel engaged, happy and joyful
Government representatives	1. I want to be able to see and read all the messages from all chats. 2. I want to be able to listen to all voice messages as well 3. I want to get all the detailed information about the person who has sent the message 4. I want to see the messages of all users. 5. I want to be able to see all messages/moments and etc., which have been edited and want to see originals before they have been edited. 6. I want to see all transactions which were done by using Facebook Messenger 7. I want to be able to restrict some games on Facebook Messenger, so people can't play whatever they want 8. I would like to be able to see and block all dangerous ads for users 9. I want to be able to impact people choices 10. I want to be able to listen to the voice calls via messenger 11. I want to be able to have a function which automatically blocks dangerous ads 12. I want to be able to make messages from 3rd parties go	1. I want this function to be seamless, fast, and secure 2. I want this function to be fast and secure 3. I want it to be fast, cheap, and flawless 4. I want this process to be fast, secure, and easy 5. I want this function to be fast, accessible for a long run 6. I want it to be intuitive and precise 7. I want it to be fast, easy to use, safe, automatic 8. I want it to be secure, transparent, and protected 9. I want it to be seamless, and cryptographic 10. I want it to be secure, invisible 11. I want it to be automatic and fast 12. I want it to be cryptographic and logical 13. I want it to be protective and encrypted, so no one could avoid or hack it 14. I want it to be fast, and I don't want other people	1. I want to feel well informed, knowledgeable and empowered at the same time, so I can access all messages that I want to read. 2. I want to feel in control of everything and impetuous 3. I want to feel rational, affectional and alarmed 4. I want to feel highly informed and want to control everything that goes around. 5. I want to feel assured and secure and, at the same time, confident that I can control the situation again and have an overview of what has been posted or what was edited or deleted. 6. I want to feel dominant, in control, and undismayed 7. I want to feel assured that no one gets hurt, I want to feel in control of everything, powerful, secure, and unattached 8. I want to feel powerful, in charge, and in control of everything 9. I want to feel supreme and authoritative 10. I want to sure of myself, and prepotent 11. I want to feel impactful, dominant, and ruling 12. I want to feel self-indulgent and protected 13. I want to feel ruling and

	to the spam folder 13. I want to restrict advertisers to be able to do extensive targeting, as Joanna mentioned 14. I want to be able to restrict the Facebook Messenger app for a specific person if it is needed 15. I would like the government to be in charge of all the chatbots, or other automatic functions within messenger, in order to prevent all kinds of fraud. 16. I want to be able to listen to all voice messages and actually convert them to text format, so it would be easier for me to track and see everything 17. I want to be able to see people location if they don't even share it 18. I want to be able to get information about people's behavior, like what they watch, what they are interested in, what they are doing on a daily basis, etc. 19. I want to have access to secret conversations 20. I want to have access to people's rooms, which they create in order to have group calls	to know about this feature, I want it to be a secret 15. I want it to be proprietary, protective, and secure 16. I want it to be cross-functional, fast, secure 17. I want it to be fast, seamless, and collaborative 18. I want this to be fast and precise 19. I want it to be secure, fast 20. I want it to be secure and fast	successful in my career as well since I serve people's needs 14. I want to feel strong and farsighted 15. I want to feel in control, helpful, and powerful 16. I want to feel dominant, smart, secure, protective, and backed up with data and enough resources 17. I want to feel close up and well-informed 18. I definitely want to feel assertive and governing 19. I want to feel determined and aware 20. I want to feel decisive, in touch, and influential
Advertisers	1. I want to be able to build customer loyalty 2. I want to be able to attract potential customers 3. I want to be able to stream geo-localized marketing services at the bottom of chats and online games that are specifically tailored to the users' preferences 4. I want to be able to charge customers via Messenger 5. I also want to be able to impact people choices 6. I want to be able to show ads to users even during video calls 7. I would like to be able to avoid ad blocking on messenger by 3rd parties 8. I want to be able to engage with my customers, to get to know them better in order to create individual ads for each user 9. I want to send messages to all or selected page`s followers by	1. I want it to be fast and effective 2. I want it to be easy to use and optimized 3. I want this function to be assistive and intuitive, also I want it to be very precise 4. I want this function to be flawless, easy to use, fast and secure 5. I want it to be complete, without any errors, and not noticeable for users 6. I want it to be transparent and intuitive 7. I'd like this function to be well protected, and easy to implement, and also cross-functional 8. I'd like this function to be secure but at the same time seamless and very intuitive 9. I want it to connect with my clients faster. Because when you send	1. I want to feel appreciated, communal, and accepted 2. I want to feel famous, very well known and loved 3. I want to feel heard, helpful, powerful, conscious and listened to more often than ever. 4. I want to feel empowered, understood, and heeded 5. I want to feel helpful, assistive, and caring 6. I want to feel presiding and omnipresent 7. I want to feel successful, assured, free, and empowered that I reached my end users without any problems 8. I want to feel wholesome, communal, and connected to my clients 9. I want to feel comfortable that my message would approach all my followers 10. I want to feel more comfortable and closer to a client 11. I want to feel listened to 12. I want to feel fulfilled that i

	one button, actually it can be paid function, as advertising 10. I want to listen to voice messages easier as we can do it in WhatsApp Messenger 11. I want to cross-sell and up-sell my products and services 12. I want to be able to target users on Messenger based on their recent behaviors, such as if they've traveled outside of the country or if they've searched a particular keyword recently, downloaded an App, read an article on the topic. 13. I want to target non-brand-aware users. 14. I don't want to bother my customers with notifications, I want to use the same ads which are evenly tailored to all users so they don't get frustrated 15. I want to be able to sell services via chatbots or be in touch with my clients using chatbots 16. I want my ads to reach out to more people with a single click 17. I want to be able to host webinars, online events 18. I want to be able to avoid ad blockers 19. I want to be able to create a "circle" of customers to chat with them	messages to clients one by one, you can't approach them as fast as you want it to be 10. I want it to be easier to explain to the client by audio messages, but it can be not comfortable for the client if they don't have headphones 11. I want it to be flawless and very intuitive, so I don't spend much time trying to figure out how it works. It would be great if it also shows me what kind of steps I need to take in order to set up a cross-selling function 12. I want it to be secure and easy to achieve 13. I want it to be manageable, usable and safe 14. I want this function to be cross-functional and available in 1 click 15. I want it to be secure and human, so people do not feel that they are talking to robots 16. I want this function to be easy to use in terms of user experience 17. I want this function to be cross-functional and powerful so that it can host more than 500+ people, for example 18. I want it to be safe and fast 19. I want it to be cross-functional and flexible	reached out to enough amount of people, subservient, like prepared to obey my customers unquestioningly and successful in my career 13. I want to feel assured that I reached out to more people than before, and I also want others to be influenced, I myself want to have an influence on them. 14. I want to feel very individual and independent 15. I want to feel free, careless, being sure that chatbots may engage my customers and answer their questions 16. I want to feel fulfilled and successful 17. I want to feel heard, to be listened to, to get connected with more people, to stand out as an advertiser 18. I want to feel powerful, self-governing, and also smart 19. I want to feel frugal, omnipresent, and useful

4.1.2 Categorizing the Stakeholders Feel Goals

To build a motivational goal model and see a clear picture of the goals, the results from e-workshops were reviewed. As a result of this, we looked for any questions, ambiguities, or assumptions that arose from the results and noted them to discuss with stakeholders later on. Since at the beginning of the e-workshops, all participants were asked to put *do/be/feel* goals next to each other, there was no need to review them again and use rewording in this sense. Hence, after reviewing all the post-its with different ideas, we decided to cluster list contents

and see whether any questions or assumptions appear. For the clustering, an affinity diagram was used. We decided to group post-its into clusters of related elements. Thus, the list elements were reviewed, and clusters were formed[4], as is shown in **Figure 4.3.** Below, in **Table 4.4** we represented all roles; and do, be, feel goals from the e-workshops.

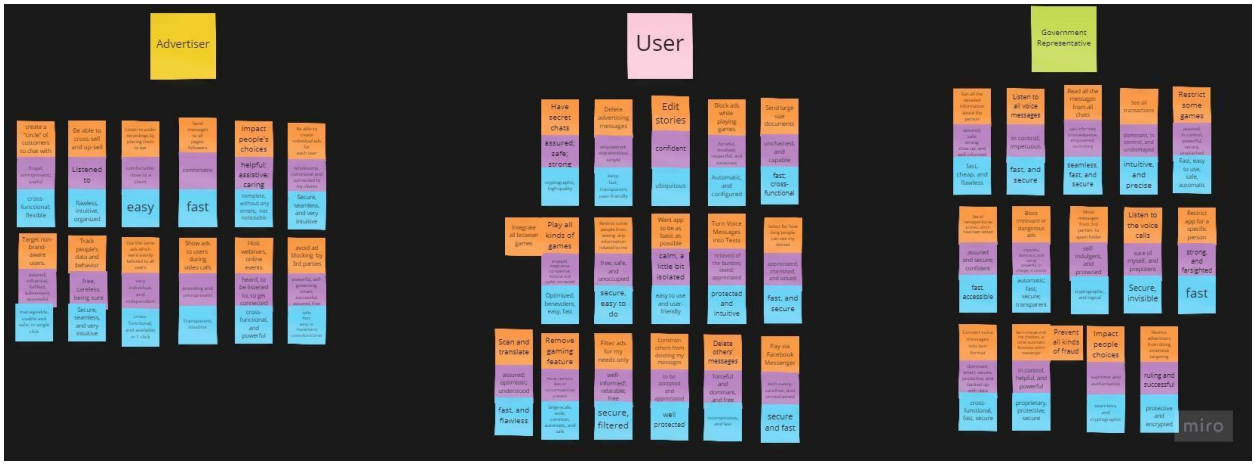

Figure 4.3 Clustering the elements.

Table 4.4 Clustering the elements.

Roles	*Do goals*	*Be goals*	*Feel goals*
Average users	1. Have secret chats 2. Delete advertising messages 3. Edit stories 4. Block ads while playing games 5. Send large size documents 6. Play all kinds of games and Integrate all browser games 7. Restrict some people from seeing any information related to me 8. Want app to be as basic as possible 9. Turn Voice Messages into Texts 10. Select for how long people can see my stories 11. Scan and translate 12. Remove gaming feature 13. Filter ads for my needs only 14. Constrain others from deleting my messages	1. Cryptographic; high-quality 2. Easy; Fast; Transparent; user-friendly 3. Ubiquitous 4. Automatic and configured 5. Fast; cross-functional 6. Optimized; benevolent, easy, fast 7. Secure, easy to do 8. easy to use and user-friendly 9. protected and intuitive 10. fast, and secure 11. fast, and flawless 12. Large-scale; Wide, Common, automatic, and safe	1. Assured; Safe; strong 2. Empowered; Unpretentious; simple 3. Confident 4. forceful, involved, respectful, and conscious 5. unchained, and capable 6. engaged, imaginative, competitive, fictional and joyful; connected 7. free, safe, and unoccupied 8. calm, a little bit isolated 9. relieved of the burden; Loved; appreciated 10. appreciated, cherished, and valued 11. Assured; Optimistic; understood 12. more realistic, less or noncompetitive; present 13. Well-informed'; Relatable; free 14. to be accepted and

[4] https://miro.com/app/board/o9J_lXX9fac=/

	15. Delete others' messages 16. Pay via Facebook Messenger	13. secure, filtered 14. well protected 15. Inconspicuous and fast 16. Secure and fast	appreciated 15. forceful and dominant, and free 16. tech-savvy, carefree, and unrestrained
Government representatives	1. Get all the detailed information about the person 2. Listen to all voice messages 3. Read all the messages from all chats 4. See all transactions 5. Restrict some games 6. See all messages/stories and etc., which have been edited 7. Block irrelevant or dangerous ads 8. Move messages from 3rd parties to spam folder 9. Listen to the voice calls 10. Restrict app for a specific person 11. Convert voice messages into text format 12. Impact people choices 13. Restrict advertisers from doing extensive targeting 14. Be in charge of all the chatbots or other automatic functions and Prevent all kinds of fraud	1. fast, cheap, and flawless 2. fast, and secure 3. seamless, fast, and secure 4. Intuitive and precise 5. Fast, easy to use, safe, automatic 6. fast, accessible 7. Automatic; Fast; Secure; transparent 8. cryptographic, and logical 9. Secure, invisible 10. Fast 11. cross-functional, fast, secure 12. seamless, and cryptographic 13. protective and encrypted 14. Proprietary, Protective, secure	1. Assured; Safe; Strong; close up, and well-informed 2. in control; impetuous 3. well-informed, knowledgeable, empowered; controlling 4. dominant, in control, and undismayed 5. Assured; in control; powerful, secure, unattached 6. assured and secure; confident 7. impactful, dominant, and ruling; powerful, in charge, in control 8. self-indulgent, and protected 9. sure of myself, and prepotent 10. strong, and farsighted 11. dominant, smart, secure, protective, and backed up with data 12. supreme and authoritative 13. ruling and successful 14. in control, helpful, and powerful
Advertisers	1. Create a "circle" of customers to chat with 2. Cross-sell and up-sell 3. Listen to audio recordings 4. Send messages to all pages' followers 5. Impact people's choices 6. Create individual ads 7. Target non-brand-aware users. 8. Track people's data and behavior 9. Use the same ads for all users 10. Show ads to users during video calls 11. Host webinars, online events 12. Avoid ad blocking	1. Cross-functional; flexible 2. flawless,Intuitive, organized 3. Easy 4. Fast 5. Complete, without any errors, not noticeable 6. Secure, seamless, and very intuitive 7. manageable, usable and safe; in a single click 8. Secure, seamless, and very intuitive 9. cross-functional, and available in 1 click 10. Transparent; intuitive 11. Cross-functional and powerful 12. Safe; Fast; easy to implement; cross-functional	1. frugal; omnipresent; useful 2. Listened to 3. Comfortable; close to a client 4. Comfortable 5. Helpful; Assistive; caring 6. wholesome, communal and connected to my clients 7. Assured; Influential; fulfilled, Subservient; successful 8. free, careless, being sure 9. very individual and independent 10. presiding and omnipresent 11. heard, to be listened to, to get connected 12. powerful, self-governing, smart; successful, assured, free

As **Table 4.4** reflects, the clustering of the elements made it possible for the *do/be/feel* goals to be more readable, short, and to the point. In particular, we removed superfluous words. For example, the "*be"* goal *"I want to connect with my clients faster. Because when you send messages to clients one by one, you can't approach them as fast as you want it to be"* was shortened to the *"be"* goal - *"fast."* Next, as an example, a functional goal, *"Ability to listen to voice messages easier as we can do it in WhatsApp Messenger,"* was converted to *"Listen to audio recordings by placing them to ear." Also, we* divided some goals into two goals; for example, the goal *"Play all kinds of games on the Facebook Messenger platform and integrate all browser games to Messenger with one click"* was divided into *"Play all kinds of games"* and *"Integrate all browser games."*

Next, the goal *"Be in charge of all the chatbots, or other automatic functions within messenger, in order to prevent all kinds of fraud"* was divided into "*Be in charge of all the chatbots, or other automatic functions*" and "*Prevent all kinds of fraud*". Once the clustering was done, we chose a label for each cluster. Preferably, it was appointed as the mark for a particular functional goal in each cluster. Otherwise, a new functional goal should be created which covers all cluster elements. As we can see, in a given **Table 4.4,** after clustering, a particular functional goal that occurs in each cluster and can be appointed as the root or main goal for all other goals was not found, we decided to create a new one and name it as an *"I am in touch"* functional goal. This means that for all different types of users of the Facebook Messenger app, being in touch with others is the main goal.

The next step was establishing the hierarchy. This activity helped us to establish the structure of the motivational model. Here, the top-level functional goal was created in the clustering part of the elements: the *"I am in touch"* functional goal. In order to determine other subgoals, the *How/Why Laddering* method [53] was used. Using this method, we determined each subgoal for the root functional goal. However, all clusters can be located under the root functional goal when each hierarchy unit refers to a specific feature of the structure. **Figures 4.4.1 - 4.4.4** show the different parts of the hierarchical structure of the Facebook Messenger goal model. Since it was difficult to include a whole diagram in this thesis, the URL[5] to the diagram shows the whole picture.

[5] Link to the hierarchical structure

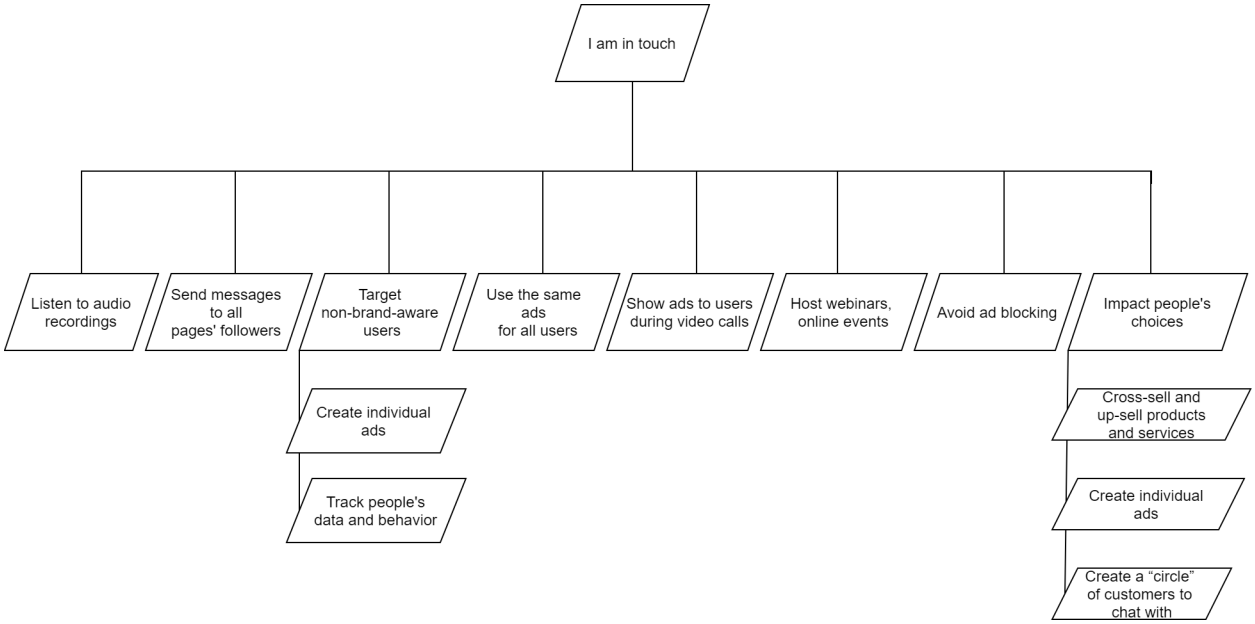

Figure 4.4.1. 1st part of the hierarchical structure of the Facebook Messenger Goal Model

In this paragraph, the hierarchical structure of the Facebook Messenger app will be described. First of all, the "I am in touch" functional goal was chosen as a root goal. However, the author noted this goal and it was going to be discussed with the stakeholders later. In **Figure 4.4.1,** the functional goal *"Target non-brand-aware users"* was decided to be used as a parent goal for the *"Create individual ads"* subgoal since it clearly answers the question *"Why is there a need to create individual ads?",* where the answer will be *"in order to target non-brand-aware users."* The same rule was applied to *"Impact people's choices"; "Cross-sell and up-sell products and services"; "Create individual ads";* and *"Create a circle of customers to chat with"* functional goals.

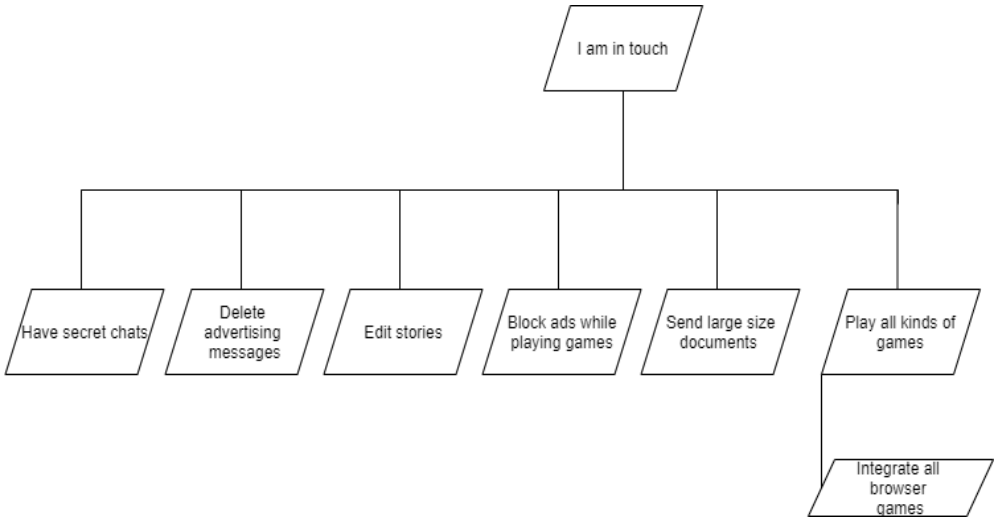

Figure 4.4.2. 2nd part of the hierarchical structure of the Facebook Messenger Goal Model

Next, in **Figure 4.4.2,** the functional goal *"Play all kinds of games"* was used as a parent goal for the *"Integrate all browser games"* subgoal because it answers the question *"Why is there a need to integrate all browser games?",* where the answer can be *"in order to play all kinds of games".*

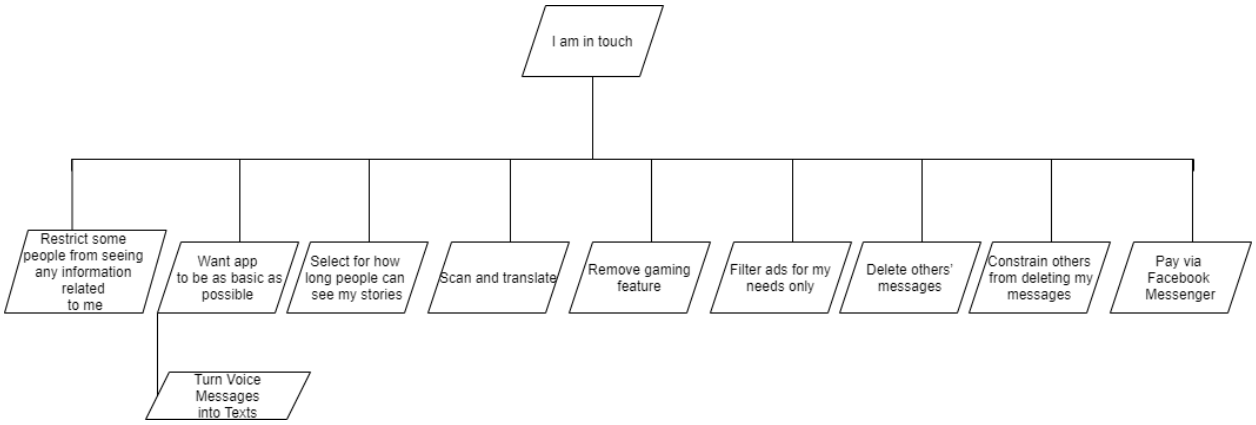

Figure 4.4.3. 3rd part of the hierarchical structure of the Facebook Messenger Goal Model

As **Figure 4.4.3** shows, the functional goal *"Want app to be as basic as possible"* was the only one considered as a parent goal, where the subgoal is *"Turn voice messages into texts"*, since the latter one clearly answers the question "How make an app as basic as possible? ". On the other hand, **Figure 4.4.4** shows that a functional goal *"Impact people's choices"* appears to be a

parent goal for such subgoals as *“Listen to all voice messages”; “Read all the messages from all chats”; “See all transactions”; “See all messages/stories which have been edited”; “Listen to the voice calls”; “Get all the detailed information about the person”*. In this case, a parent goal answers the question “Why is a specific subgoal necessary?” At the same time, subgoals answer the question “How can a parent goal be achieved?”.

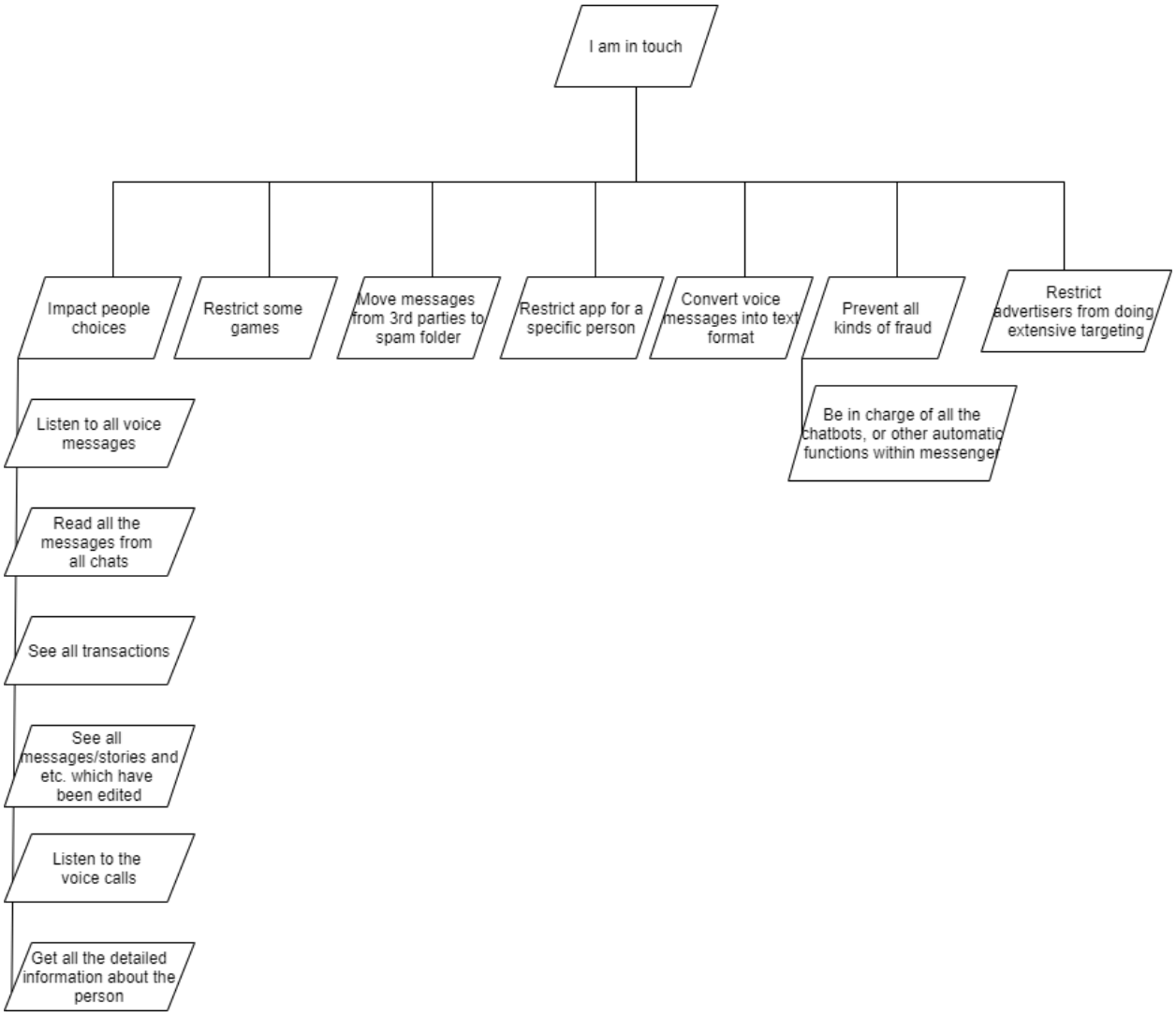

Figure 4.4.4. 4th part of the hierarchical structure of the Facebook Messenger Goal Model

After establishing the hierarchical structure of the goal model, the next stage involves adding roles, quality, and emotional goals. First, the roles were connected to the corresponding functional goals, and each role connected to the root goal is connected accordingly to its subgoal. Next, the quality goals were added to each functional goal. Since some quality goals were repeated during the workshops, we decided not to overload the goal model with a huge

amount of quality goals. Thus, we added the emotional goals that are important while achieving the functional goals. Lastly, the emotional goals were added to the goal model. Here, each emotional goal was related to a particular functional goal and role. Worthy of mentioning, the notational style in Lopez-Lorca et al. [59] was used to build a goal model.

After building the goal model, all participants were contacted again via Zoom to answer all the questions that arose during modeling for clarification. Also, since the *"I am in touch'' functional* goal was added by the author of this thesis to the model, we also decided to ensure it with participants and ask for their feedback and capture emotional goals for this activity. After considering all e-workshop attendees' comments, we made some minor alterations, such as adding additional quality goals for some functional goals and rephrasing two functional goals. Since the size of the goal model was large, the link[6] to the whole model is included in this thesis. **Figures 4.4.5-4.4.8** below show the different parts of the created motivational goal model. The figures below depict all functional goals incorporated during the e-workshop and related emotional and non-functional goals with attached roles accordingly.

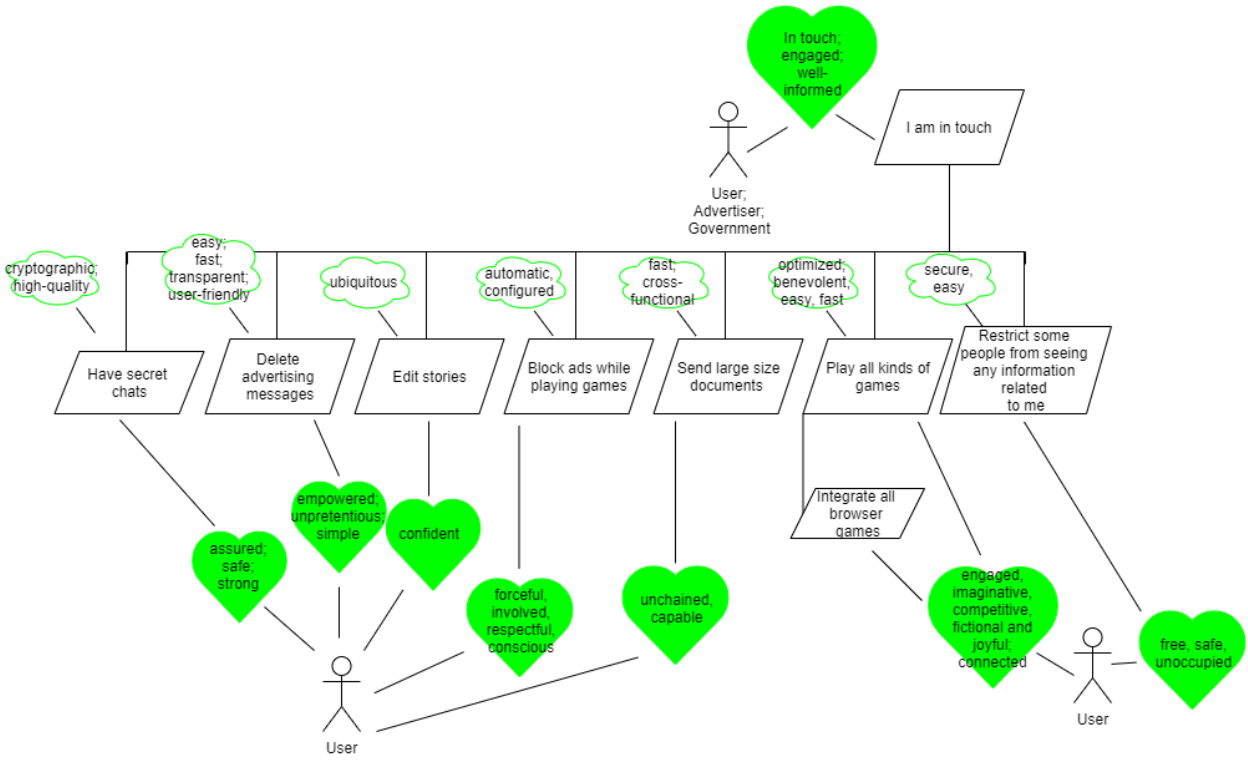

Figure 4.4.5. Motivational Goal Model

[6] Link to the final goal model

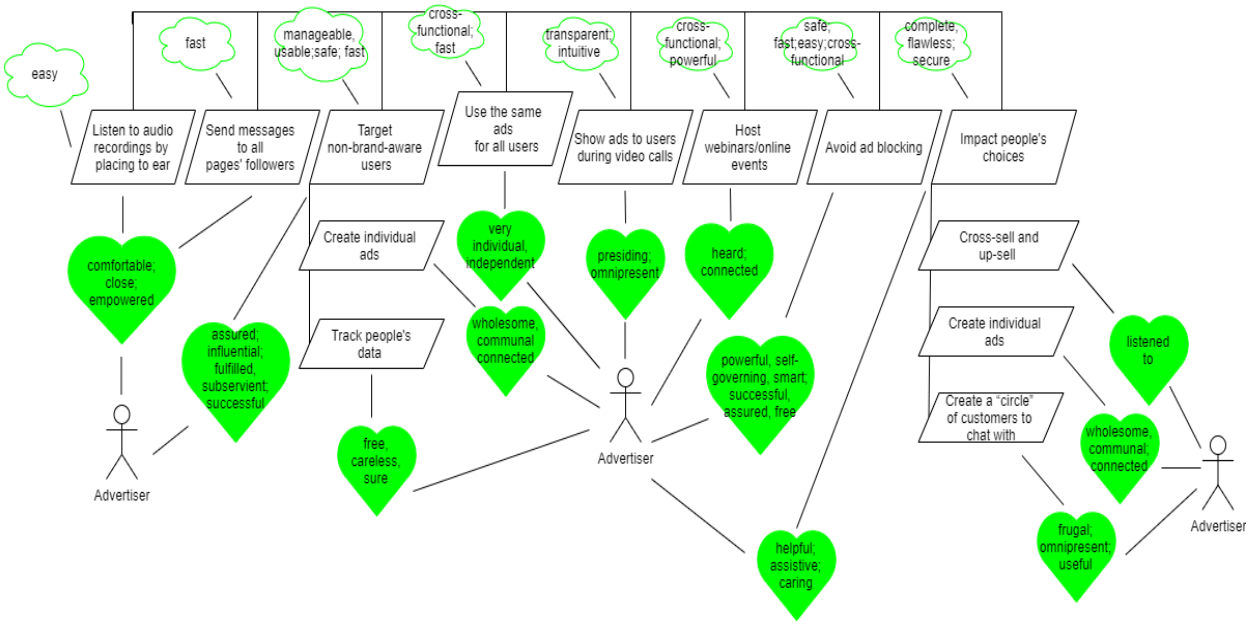

Figure 4.4.6. Motivational Goal Model

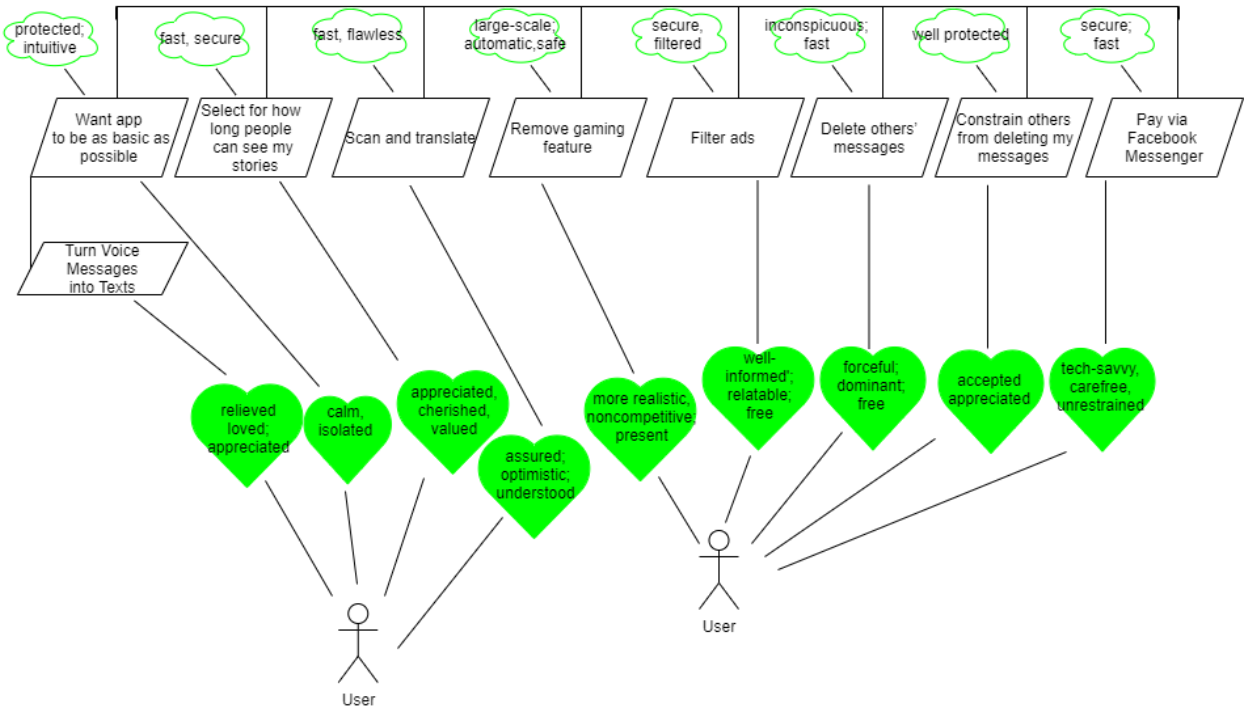

Figure 4.4.7. Motivational Goal Model

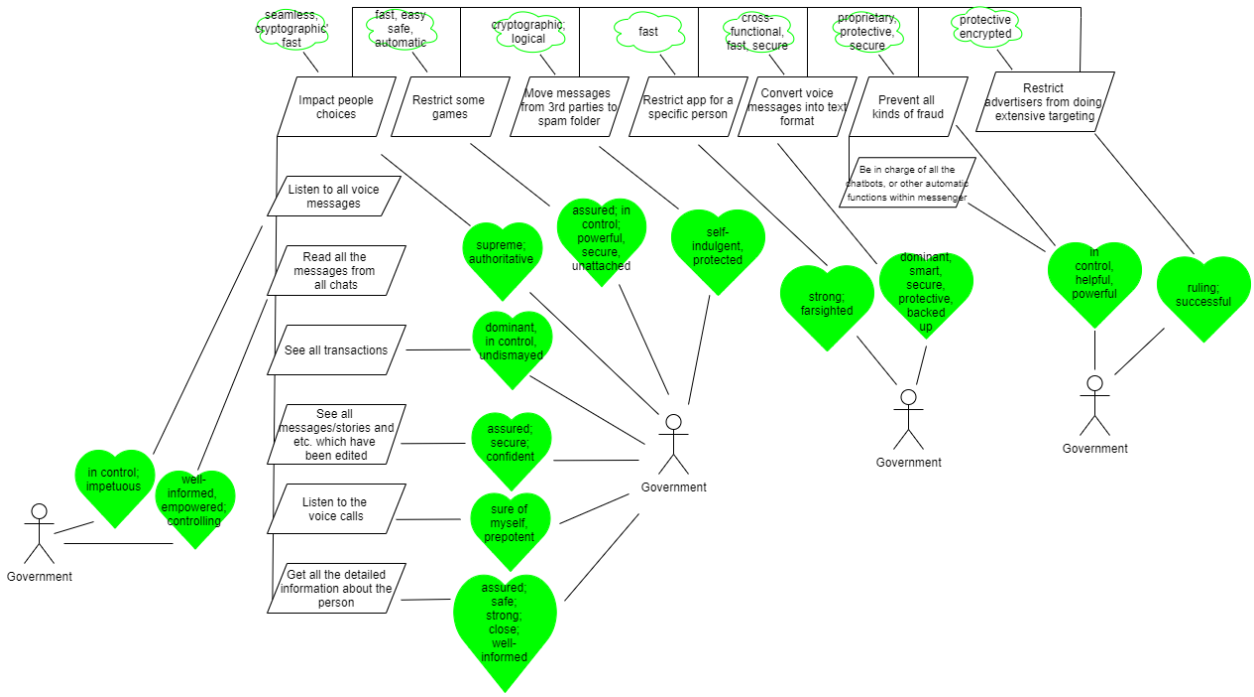

Figure 4.4.8. Motivational Goal Model

4.1.3 Identified Conflicts

To identify conflicts among stakeholders, we decided to look through each emotional goal within the goal model and determine them. Thus, we created **Table 4.5**, to better depict all the identified conflicts and all the reasonings behind them. We decided to start with the first emotional goal in our goal model and discuss it until the last emotional goal which was depicted on our goal model. At the same time, we decided to compare functional goals related to those emotional goals because more than often, the same emotional goals may be related to conflicting *"do"* goals.

The first functional goal is to *"Listen to audio recordings by placing to ear,"* and related to its emotional goals such as feeling "comfortable; close; empowered," does not contradict emotional goals within the goal model. So, we decided to check the next functional goal, which is to *"Send messages to all pages' followers,"* with emotional goals such as feeling *"comfortable; close; empowered."* We found that these emotional goals contradict the user's emotional goals such as feeling *"empowered; unpretentious; simple,"* related to the functional goal *"Delete advertising messages."* In this case, both types of users want to feel the same way. However, it is impossible because, in order to get the same emotions, both functional goals will contradict each other. Thus, it will be hard to meet all stakeholders' needs in the end. Hence, these "*do/feel"* goals at the same time were marked as conflicting ones and are going to be addressed in the next sub chapters.

The next "*do"* goal is to *"Target non-brand-aware users"* with its *"feel"* goals such as *"assured; influential; fulfilled; subservient; successful"* contradicts the *"feel"* goals such as *"ruling; successful"* which are related to the functional goal to *"Restrict advertisers from doing extensive targeting"* of a government representative. In both cases, both representatives want to feel successful. However, if we investigate, we notice that even if these emotions have the same meaning, they are still accepted differently by both representatives in terms of functional goals. For example, the words *"influential; subservient"* in advertiser's case means "*impactful, without any pressure*" (this aspect was particularly discussed with the advertiser during the model review in order to be sure). However, feeling *"ruling"*, means the same as the word *"forceful"*, thus, these two emotions contradict each other.

The next emotional goals are: feeling *“wholesome; communal; connected.”* These emotional goals opposed a functional goal which is to *“Use the same ads for all users”* that has attached emotional goals such as *“very individual, independent.”* These emotional goals have different purposes, as feeling wholesome contradicts feeling very individual and dependent.

Additionally, the emotional goals such as feeling *“free, careless, sure”* with its *“do”* goal to *“Track people's data,”* contradicts emotional goals to feel *“in control, helpful, powerful”* of a government representative which is at the same time connected to the functional goals *“Prevent all kinds of fraud”* and *“Be in charge of all the chatbots, or other automatic functions within messenger”*. Here, the feeling of freedom and being careless contradicts the feeling of controlling and being helpful. When these *“do”* goals were discussed with both representatives *(advertisers; government)*, we noted that advertisers want to have everything beforehand and deliver better campaigns by using some chatbots and other automation tools within Messenger. However, government representatives want to be powerful and prevent third-party chatbots that may breach some rules.

Next, the feeling of *“heard and connected”* for the functional goal *“Host webinars/online events”* contradicts emotional goals such as feeling *“calm, isolated”* of functional goal *“Want app to be as basic as possible”*. Because being connected and at the same time feeling isolated does not support each other. The following *“feel”* goals such as feeling *“powerful, self-governing, smart; successful, assured, free”* which are connected to the functional goal *“Avoid ad blocking”* do not support emotional goals like feeling *“forceful, involved, respectful, conscious,”* which are related to *“Block ads while playing games”* do goal, and emotional goals *“well-informed'; relatable; free”* which are connected to the goal *“Filter ads”*. Here, advertisers want to feel powerful. However, users want to be respected and do not want to be bombarded with ads, or, at least, have a right to filter all irrelevant ads, and get the ads related to their real needs.

The next feel goals *“helpful; assistive; caring”* with the functional goal *“Impact people's choices”* contradict emotional goals of a government representative, such as feeling *“supreme; authoritative,”* which are also related to *“Impact people's choices”* functional goal. Here, advertisers want to impact people’s lives in a way to help them make a choice when they consider buying something. However, a government representative wants to rule people’s lives and play an authoritarian role. The subsequent emotional goals such as *“frugal; omnipresent; useful”* that are connected to *“Create a “circle” of customers to chat with”* functional goal, oppose emotional goals such as *“self-indulgent, protected”* which are related to *“Move messages from 3rd parties to spam folder”* functional goal. Being omnipresent means being

everywhere, but feeling protected can not be achieved. If an opposite side wants to intervene, these two emotions contradict.

Furthermore, feeling *"assured; safe; strong"* while *"Having secret chats"* does not support such feelings as *"well-informed, empowered; controlling"* and *"in control; impetuous,"* which are related to such do goals as *"Listen to all voice messages"* and *"Read all the messages from all chats"* of a government representative because a user can not feel safe if s/he is under control all the time. Feeling *"confident"* while *editing stories* also opposes the feeling of *"assured; secure; confident"* of a government representative who wants to *"See all messages/stories, etc. which have been edited."* Even if two feelings, such as being confident, are applied for both parties, during the reviewing part of the model, we noted that users want to feel confident when they are assured that nobody sees their edited stories. However, being confident for a government representative does not support it.

Feeling *"engaged, imaginative, competitive, fictional and joyful; connected"* for a user while *playing all kinds of games* and *integrating all browser games* contradicts feelings of *"more realistic, non-competitive; present"* and *"assured; in control; powerful, secure, unattached."* One type of user wants to feel present while using the Messenger app for basic needs. Another type of user wants to feel connected, engaged, which contradicts a feeling of being more realistic and present. Being *"free, safe, unoccupied"* also opposes the feeling of *"assured; safe; strong; close; well-informed."* In this case, being free for a user means that s/he is not under control. However, a government representative wants to be well-informed, which does not support the first emotional goal of a user.

Again, the feelings *"forceful; dominant; free"* which are related to the *"Delete others' messages"* functional goal does not support the feeling of being *"accepted; appreciated,"* where a functional goal is to *"Constrain others from deleting my messages."* Because, here, a user wants to be appreciated and accepted by others. However, it may not happen if the same user wants to feel dominant while deleting others' messages.

Table 4.5. Identified Conflicts

Roles	Conflicting Emotions	Functional Goals
1. Advertiser 2. User	1. Comfortable; close; empowered 2. Empowered; unpretentious; simple	1. Send messages to all pages' followers 2. Delete advertising messages

1. Advertiser 2. Government	1. Free, careless, sure 2. In control, helpful, powerful	1. Track people's data 2. Prevent all kinds of fraud and Be in charge of all the chatbots, or other automatic functions within the messenger
1. Advertiser 2. Advertiser	1. Wholesome, communal; connected 2. Very individual, independent	1. Create individual ads 2. Use the same ads for all users
1. Advertiser 2. Government	1. Assured; influential; fulfilled, subservient; successful 2. Ruling; successful	1. Target non-brand-aware users 2. Restrict advertisers from doing extensive targeting
1. Advertiser 2. User	1. Heard; connected 2. Calm, isolated	1. Host webinars/online events 2. Want app to be as basic as possible
1. Advertiser 2. User 3. User	1. Powerful, self-governing, smart; successful, assured, free 2. Forceful, involved, respectful, conscious 3. Well-informed'; relatable; free	1. Avoid ad blocking 2. Block ads while playing games 3. Filter ads
1. Advertiser 2. Government	1. Helpful; assistive; caring 2. Supreme; authoritative	1. Impact people's choices 2. Impact people's choices
1. Advertiser 2. Government	1. Frugal; omnipresent; useful 2. Self-indulgent, protected	1. Create a “circle” of customers to chat with 2. Move messages from 3rd parties to spam

		folder
1. User 2. Government 3. Government	1. Assured; safe; strong 2. In control; impetuous 3. Well-informed, empowered; controlling	1. Have secret chats 2. Listen to all voice messages 3. Read all the messages from all chats
1. User 2. Government	1. Confident 2. Assured; secure; confident	1. Edit stories 2. See all messages/stories and etc., which have been edited
1. User 2. User 3. Government	1. Engaged, imaginative, competitive, fictional and joyful; connected 2. More realistic, non-competitive; present 3. Assured; in control; powerful, secure, unattached	1. Play all kinds of games and Integrate all browser games 2. Remove gaming feature 3. Restrict some games
1. User 2. Government	1. Free, safe, unoccupied 2. Assured; safe; strong; close; well-informed	1. Restrict some people from seeing any information related to me 2. Get all the detailed information about the person
1. User 2. User	1. Forceful; dominant; free 2. Accepted; appreciated	1. Delete others' messages 2. Constrain others from deleting my messages

4.2 Conflict resolution of *feel* goals

This section covered all the steps that were followed to answer **RQ2** "*How to resolve conflicts between the feel goals of stakeholders?*"

4.2.1 Weighting the goals

Earlier, we identified the goals and stakeholders that were conflicting in **Section 4.1.3**. Thus, in this Section, we will refer to the identified conflicts table, which was presented in **Section 4.1.3**.

After conflict identification, we asked all stakeholders to give weights to each goal. To do that, we contacted each stakeholder via Zoom. We asked them to give weights to each goal on a scale from "1" to "5", where the value "1" meant that it was necessary to achieve the goal, but the value "5" meant that the goal was optional. **Table 4.6** below shows the weights given by each stakeholder to the goals.

Table 4.6 Values assigned by stakeholders to goals

Stakeholders	Goals	Weights
S1: Advertiser **S2:** User	**G1:** Send messages to all pages' followers **G2:** Delete advertising messages	G1. **S1:** 2; **S2:** 4 G2. **S1:** 5; **S2:** 3
S1: Advertiser **S2:** Government	**G3:** Track people's data **G4**: Prevent all kinds of fraud and Be in charge of all the chatbots, or other automatic functions within the messenger	G3. **S1:** 1; **S2:** 1 G4. **S1:** 5; **S2:** 3
S1: Advertiser **S2:** Advertiser	**G5:** Create individual ads **G6:** Use the same ads for all users	G5. **S1:** 3; **S2:** 3 G6. **S1:** 5; **S2:** 2
S1: Advertiser **S2:** Government	**G7:** Target non-brand-aware users **G8:** Restrict advertisers from doing extensive targeting	G7. **S1:** 1; **S2:** 5 G8. **S1:** 5; **S2:** 2
S1: Advertiser **S2:** User	**G9:** Host webinars/online events **G10:** Want the app to be as basic as possible	G9. **S1:** 1; **S2:** 2 G10. **S1:** 1; **S2:** 1
S1: Advertiser **S2:** User **S3:** User	**G11:** Avoid ad blockers **G12:** Block ads while playing games **G13:** Filter ads	G11. **S1:** 1; **S2:** 5; **S3:** 5 G12. **S1:** 5; **S2:** 2; **S3:** 3 G13. **S1:** 4; **S2:** 1; **S3:** 4
S1: Advertiser	**G14:** Impact people's choices	G14. **S1:** 1; **S2:** 3

S2: Government	**G15:** Impact people's choices	G15. **S1:** 4; **S2:** 1
S1: Advertiser **S2:** Government	**G16:** Create a “circle” of customers to chat with **G17:** Move messages from 3rd parties to spam folder	G16. **S1:** 1; **S2:** 3 G17. **S1:** 4; **S2:** 1
S1: User **S2:** Government **S3:** Government	**G18:** Have secret chats **G19:** Listen to all voice messages **G20:** Read all the messages from all chats	G18. **S1:** 1; **S2:** 5; **S3:** 5 G19. **S1:** 3; **S2:** 1; **S3:** 1 G20. **S1:** 5; **S2:** 1; **S3:** 1
S1: User **S2:** Government	**G21:** Edit stories **G22:** See all messages/stories and etc. which have been edited	G21. **S1:** 1; **S2:** 5 G22. **S1:** 3; **S2:** 1
S1: User **S2:** User **S3:** Government	**G23:** Play all kinds of games and Integrate all browser games **G24:** Remove gaming feature **G25:** Restrict some games	G23. **S1:** 1; **S2:** 3; **S3:** 4 G24. **S1:** 5; **S2:** 1; **S3:** 3 G25. **S1:** 5; **S2:** 1; **S3:** 1
S1: User **S2:** Government	**G26:** Restrict some people from seeing any information related to me **G27:** Get all the detailed information about the person	G26. **S1:** 1; **S2:** 3 G27. **S1:** 1; **S2:** 5
S1: User **S2:** User	**G28:** Delete others’ messages **G29:** Constrain others from deleting my messages	G28. **S1:** 1; **S2:** 3 G29. **S1:** 5; **S2:** 1

4.2.2 Selecting Goals

We used equation (3.1) from QBM methodology to determine that a specific goal is accepted or rejected, using the weights given by stakeholders in **Table 4.6**. Below we added **Table 4.7** with all the calculations for each goal. We should also note that the "S" element is pointless and can be dismissed if the number of stakeholders in all the opposing objectives is the same. Thus, we ignored it in the calculations below.

Table 4.7 Calculating the criticality values

Goals	**C(G) = (∑(Weights)/no. of stakeholders) + S**

G1: Send messages to all pages' followers **G2:** Delete advertising messages	*C(G1)* = 4+2/2 = 3 *C(G2)* = 5+3/2 = 4 Thus, *C(G2) > C(G1)*
G3: Track people's data **G4**: Prevent all kinds of fraud and Be in charge of all the chatbots, or other automatic functions within the messenger	*C(G3)* = 1+1/2 = 1 *C(G4)* = 5+3/2 = 4 Thus, *C(G4) > C(G3)*
G5: Create individual ads **G6:** Use the same ads for all users	*C(G5)* = 3+3/2 = 3 *C(G6)* = 5+2/2 = 3.5 Thus, *C(G6) > C(G5)*
G7: Target non-brand-aware users **G8:** Restrict advertisers from doing extensive targeting	*C(G7)* = 1+5/2 = 3 *C(G8)* = 5+2/2 = 3.5 Thus, *C(G8) > C(G7)*
G9: Host webinars/online events **G10:** Want the app to be as basic as possible	*C(G9)* = 1+2/2 = 1.5 *C(G10)* = 1+1/2 = 1 Thus, *C(G9) > C(G10)*
G11: Avoid ad blockers **G12:** Block ads while playing games **G13:** Filter ads	*C(G11)* = 1+5+5/3 = 3.6 *C(G12)* = 5+2+3/3 = 3.3 *C(G13)* = 4+1+4/3 = 3 Thus, *C(G11) > C(G12) > C(G13)*
G14: Impact people's choices **G15:** Impact people's choices	*C(G14)* = 1+3/2 = 2 *C(G15)* = 4+1/2 = 2.5 Thus, *C(G15) > C(G14)*
G16: Create a “circle” of customers to chat with **G17:** Move messages from 3rd parties to spam folder	*C(G16)* = 1+3/2 = 2 *C(G17)* = 4+1/2 = 2.5 Thus, *C(G17) > C(G16)*
G18: Have secret chats **G19:** Listen to all voice messages **G20:** Read all the messages from all chats	*C(G18)* = 1+5+5/3 = 3.6 *C(G19)* = 3+1+1/3 = 1.6 *C(G20)* = 5+1+1/3 = 2.3 Thus, *C(G18) > C(G20) > C(G19)*
G21: Edit stories **G22:** See all messages/stories and etc. which have been edited	*C(G21)* = 1+5/2 = 3 *C(G22)* = 3+1/2 = 4 Thus, *C(G22) > C(G21)*
G23: Play all kinds of games and Integrate all	*C(G23)* = 1+3+4/3 = 2.6

browser games **G24:** Remove gaming feature **G25:** Restrict some games	*C(G24)* = 5+1+3/3 = 3 *C(G25)* = 5+1+1/3 = 2.3 Thus, *C(G24) > C(G23) > C(G25)*
G26: Restrict some people from seeing any information related to me **G27:** Get all the detailed information about the person	*C(G26)* = 1+3/2 = 2 *C(G27)* = 1+5/2 = 3 Thus, *C(G27) > C(G26)*
G28: Delete others' messages **G29:** Constrain others from deleting my messages	*C(G28)* = 1+3/2 = 2 *C(G29)* = 5+1/2 = 3 Thus, *C(G29) > C(G28)*

After calculating the criticality values, we decided *G2, G4, G6, G8, G9, G11, G15, G17, G18, G22, G24, G27, G29* will be given priority because the criticality values of these goals were greater than others.

As a next step, we created a diagnosticity matrix (Section 3.2.2) like the one shown in **Table 4.8** to indicate conflicting goals and beliefs that we elicited from stakeholders.

Table 4.8 ACH diagnosticity matrix

Beliefs G1:G2	**G1:** Send messages to all pages' followers	**G2:** Delete advertising messages
People get frustrated when they receive messages from 3rd parties	I	C
Some people may need information about products from 3rd parties and are willing to receive them	C	I
If the company page gets hacked, then spam messages can be sent out to followers, which eventually will ruin the company's branding	I	N
Inconsistency Score:	-2	-1

Beliefs G3:G4	**G3:** Track people's data	**G4**: Prevent all kinds of fraud and Be in charge of all the chatbots, or other automatic functions within the messenger
Tracking people's data allows hackers to get information about a specific person and use it in a bad way.	I	C
Tracking data can help crime activity get solved.	C	N
When the government is in charge of some functions within Messenger, it is less likely for hackers to get information about a specific person.	N	C
Inconsistency Score:	-1	0
Beliefs G5:G6	**G5:** Create individual ads	**G6:** Use the same ads for all users
Individual ads catch people's attention since they are evenly tailored for specific types of users	C	I
Creating different types of ads takes much more time, and sometimes results can not be successful	I	C
Having a lot of features to create ads within an app brings more frustration to the advertiser since they might get lost in settings	N	N
Individual ads help better track users' behavior and see whether they work or need	C	I

to be changed		
Inconsistency Score:	-1	-2
Beliefs G7:G8	**G7:** Target non-brand-aware users	**G8:** Restrict advertisers from doing extensive targeting
Targeting non-brand aware users can increase company's reach and visibility	C	I
Targeting non-brand aware users may lead to their frustration if they are not interested in the company's services	I	C
Some advertisers may use targeting methods as sending out spam messages and advertising inappropriate products	I	C
Advertisers use Messenger in order to reach out to more people, otherwise they will not use it	C	N
Inconsistency Score:	-2	-1
Beliefs G9:G10	**G9:** Host webinars/online events	**G10:** Want the app to be as basic as possible
Webinars/online events may help to increase the company's visibility	C	N
Various topics are discussed at webinars that can teach many things to users. So the pastime will become more interesting and useful for users.	C	N
Facebook already makes it		

possible to launch webinars on the site, and there is no need to do this in the messenger.	I	C
Webinars on Messenger will help to attract new clients for the company easier and faster.	C	N
Inconsistency Score:	-1	0
Beliefs G14:G15	**G14:** Impact people's choices	**G15:** Impact people's choices
People prefer freedom, so if they notice that government tries to rule over their lives, they will delete Messenger	N	I
Government tries to prevent users from malicious attacks by third parties by impacting users' choices	N	C
Inconsistency Score:	0	-1
Beliefs G16:G17	**G16:** Create a “circle” of customers to chat with	**G17:** Move messages from 3rd parties to spam folder
Messages from unknown 3rd parties frustrate users	I	C
Users can get in touch with companies by themselves if they need any information, no need to chat with them	I	N
Messenger already has a feature of moving messages from 3rd parties to the “other messages” folder, so there is a high likelihood that a very small amount of users will receive messages	N	N

Inconsistency Score:	-2	0
Beliefs G21:G22	**G21:** Edit stories	**G22:** See all messages/stories and etc. which have been edited
People are willing to post more stories if they can later edit them, so there will be no need to delete and upload new version again	C	N
In order to be able to track users' actions, it is better to see all their edited stories/messages before they were edited.	N	C
When users edit stories, they do not want others to see the previous ones. Users prefer privacy over anything else.	C	I
Inconsistency Score:	0	-1
Beliefs G26:G27	**G26:** Restrict some people from seeing any information related to me	**G27:** Get all the detailed information about the person
Seeing all the detailed information about the user is necessary if crime activity happens, it will help to solve such cases much faster	I	C
Users may churn from the platform if the platform does not support their privacy	C	N
Another chat service, Telegram, refused to share data with the government and the number of users of the system increased many times over.	C	N

Inconsistency Score:	-1	0
Beliefs G28:G29	**G28:** Delete others' messages	**G29:** Constrain others from deleting my messages
Deleting others' messages may lead to users' frustration and churn since they lose their rights to speak	I	C
People may misuse such function	I	C
Inconsistency Score:	-2	0

Beliefs G11:G12:G13	**G11:** Avoid ad blockers	**G12:** Block ads while playing games	**G13:** Filter ads
Users get frustrated when they receive ads while playing games	I	C	N
Ads help educate the consumers	C	I	N
With the help of advertisements, a consumer gets the best possible options	C	I	C
Inconsistency Score:	-1	-2	0
Beliefs G18:G19:G20	**G18:** Have secret chats	**G19:** Listen to all voice messages	**G20:** Read all the messages from all chats
Users want to keep messages safe from the hacker attacks	C	I	I
Secret chatting function does not support cloud backup functionality	N	I	I

Messages in secret chats can't be forwarded.	C	I	I
Inconsistency Score:	0	-3	-3
Beliefs G23:G24:G25	**G23:** Play all kinds of games and Integrate all browser games	**G24:** Remove gaming feature	**G25:** Restrict some games
More games may drive more users to the platform	C	I	I
Gaming addiction negatively affects eyesight and also results in Insomnia, so people may start avoiding it	I	C	C
If some users do not want to play games, they may avoid it. However, it does not mean that such a feature should be fully removed from Messenger.	C	I	I
Inconsistency Score:	-1	-2	-2

We calculated inconsistency scores and concluded that the goals with the least inconsistency scores are the most desirable by the system's stakeholders. Thereby, we decided that *G2, G4, G5, G8, G10, G13, G14, G17, G18, G21, G23, G27, G29* are the most preferable by the stakeholders. The findings were discussed with the stakeholders, where they all agree that the desired goals can be considered as additional features to improve the FB messenger app. Worthy of mention is that *G6, G9, G15, G22, G24* were excluded from the list of goals that should be considered as goals of the system because the inconsistent scores of these goals were not the smallest.

4.3 Analysis of the methodologies

This section is going to cover all the steps that were followed in order to answer **RQ3** "*What is the best methodology to resolve conflicting stakeholders' "feel" goals in a given domain?*". To answer this question, we explained all the steps in Section **3.2.3**.

4.3.1 Efficiency

First of all, we analyzed the efficiency of the ACH method. As we see from the pie chart below (**Figure 4.9**), 70% of the respondents who implemented the ACH method spent 3-4 hours conducting an analysis. This includes getting in touch with stakeholders, scheduling calls with them and incorporating beliefs during meetings. On the other hand, 30% of participants spent 5 and even more hours repeating all the above steps. This means that the ACH method mostly takes 3-4 hours to conduct. However, time spent using the QBM took less than 1 hour (50%) or at most 2 hours (45%) (**Figure 4.10**). We expected such results since ACH and QBM methods vary and require different time frames to be completed.

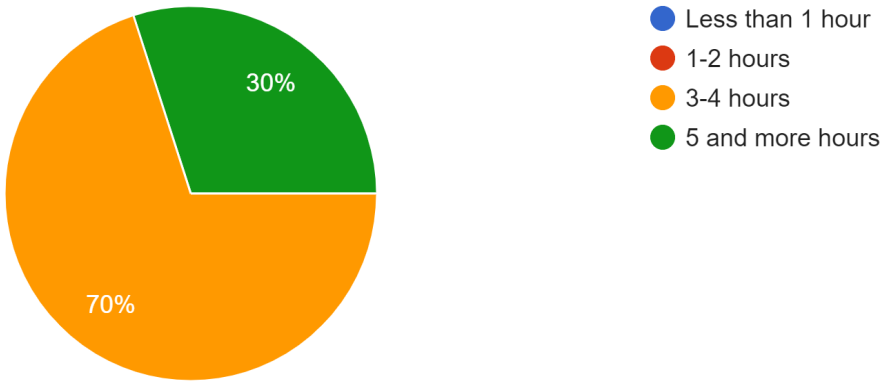

Figure 4.9: Time spent for analysis (ACH)

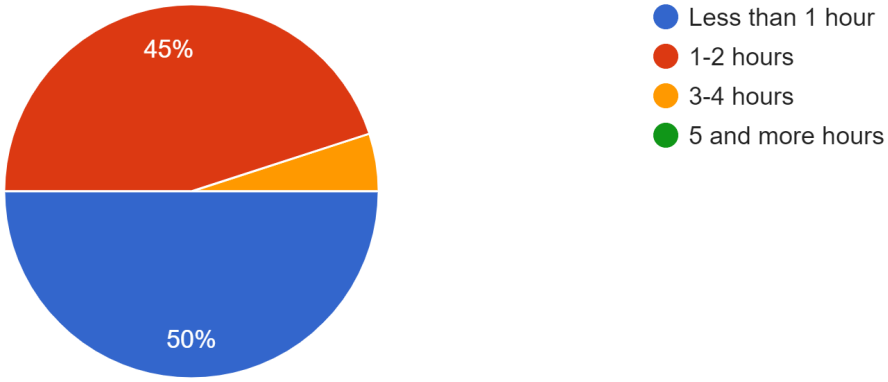

Figure 4.10: Time spent for analysis (QBM)

In terms of efficiency, we also analyzed the difficulty of both applied methods. As we see in the pie chart below **(Figure 4.11**), most of the participants think that the ACH method is either difficult to apply or it is neither difficult nor easy to implement at the same time. However, a very small fraction of participants are inclined towards "very difficult" and "easy" options. We think that the reason for participants choosing such options as "neutral" and "difficult" depends on their subjective beliefs in terms of difficulty. People perceive the term of difficulty differently, but it does not change the fact that the ACH method is perceived as a more difficult method rather than the QBM. As we can see from the pie chart below **(Figure 4.12)**, the majority (60%) think that the QBM is "very easy" to apply. None of the participants thinks that this method is either difficult or very difficult to apply.

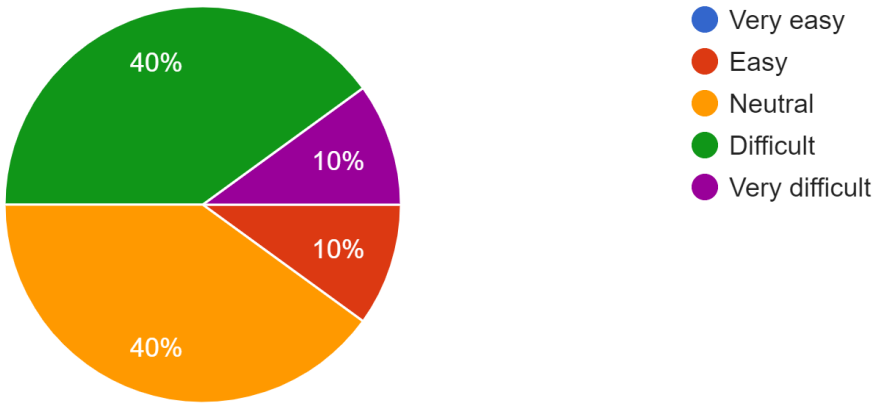

Figure 4.11: Difficulty of the analysis (ACH)

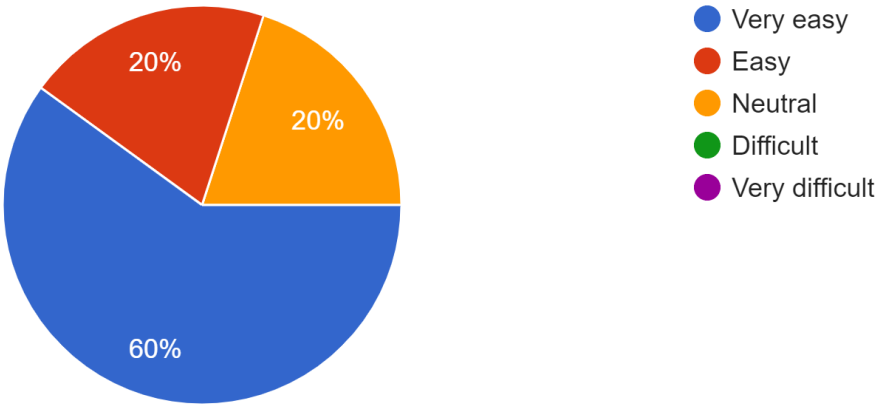

Figure 4.12: Difficulty of the analysis (QBM)

4.3.2 Quality

As shown in (**Figure 4.13**), the number of relevant beliefs that were incorporated in the ACH analysis by the participants was mostly less than 10 (55%). Even if some participants incorporated more than 10 relevant beliefs during the analysis, it is still sufficiently less. As we stated in **Section 3.2.3**, when the number of valid beliefs increases, it boosts the credibility and quality of the analysis. However, in this case, most participants have incorporated less than 10 beliefs, which may have led to the poor quality of the analysis. On the other hand, we also analyzed the number of combined beliefs by participants in the ACH analysis (**Figure 4.14**). Here, most of the participants united beliefs into four (4) groups. The more beliefs are combined, the more the analyst's mental burden is theoretically minimized. However, as we can see, the number of groups is not significant. Therefore, this can also affect the quality of the analysis.

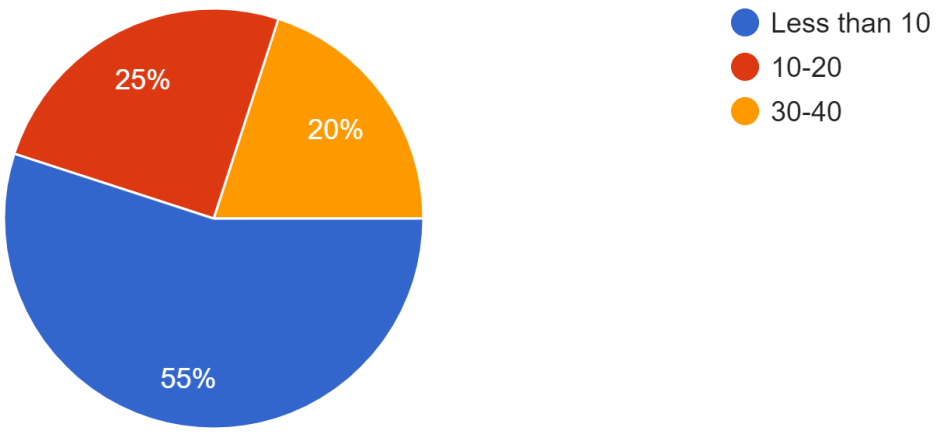

Figure 4.13: The number of relevant beliefs incorporated in the ACH analysis

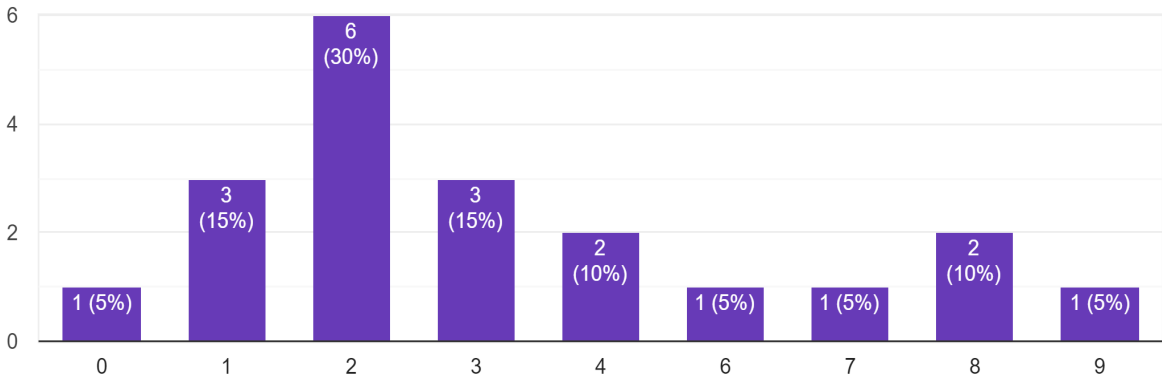

Figure 4.14: The number of groups (combined beliefs) in the ACH analysis.

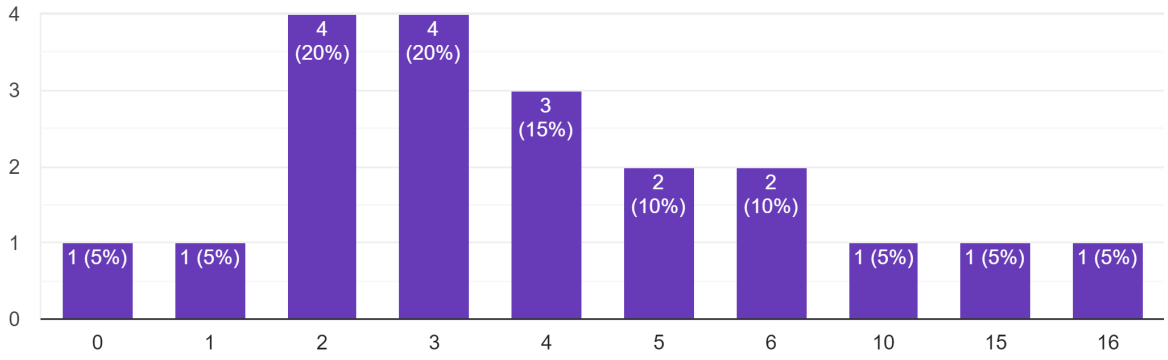

Figure 4.15: The number of assumptions made in the ACH analysis.

We also analyzed the number of assumptions (**Figure 4.15**) made by our participants. The assumptions made by the analyst determine the quality of the analysis. Assumptions are unavoidable since the beliefs available for review are often insufficient and vague. As **Figure 4.15** shows, most participants made 4 assumptions approximately, and only some of the participants constructed 5-6 assumptions during the analysis. The majority of participants incorporated less than 10 beliefs, and if we assume that approximately 4 assumptions were also made during analysis, we can say that the quality of analysis, in this case, was good.

On the other hand, when we analyzed the quality of the QBM, we considered the number of stakeholders approving and denying the goals. As **Figure 4.16** shows, approximately 3 participants reported that they approve the “Avoid ad blockers” goal as the most desirable one. Although this number is not big, it played a crucial role in defining the "Avoid ad blockers" goal as the most desirable one. On the other hand, when we analyzed **Figure 4.17**, we saw that nearly 4 stakeholders voted against the "Avoid ad blockers" goal.

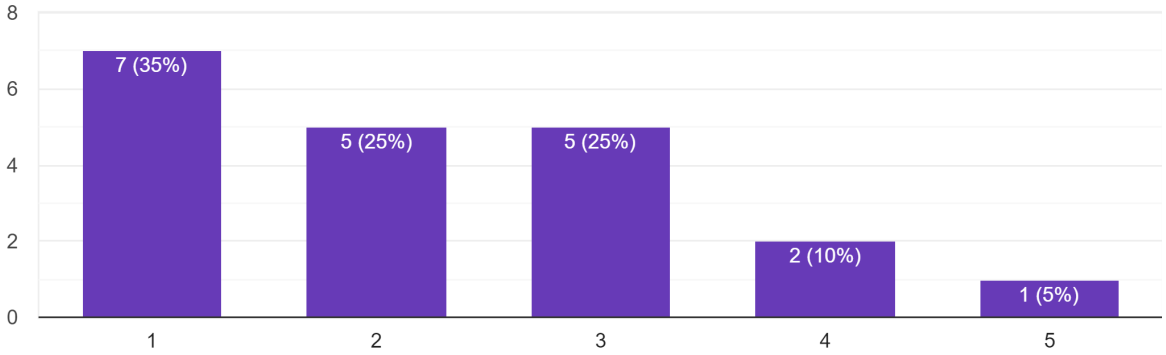

Figure 4.16: The number of stakeholders approving the "Avoid ad blockers" goal.

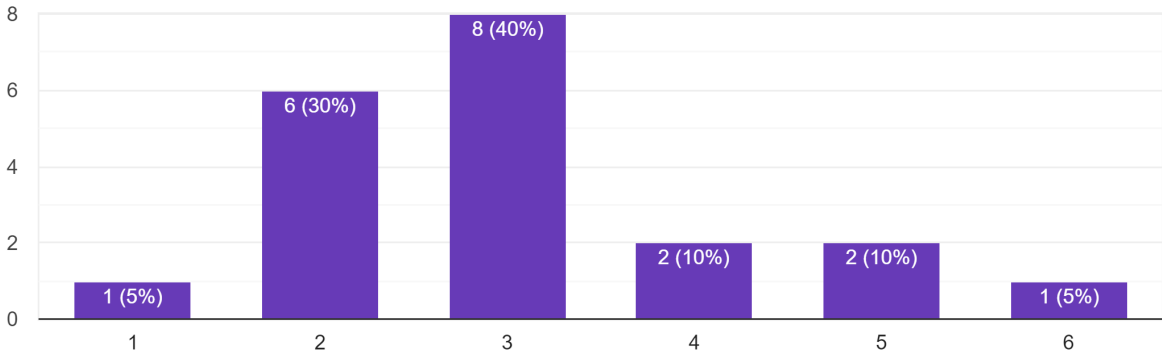

Figure 4.17: The number of stakeholders denying "Avoid ad blockers" goal.

Next, when we analyzed the “Block ads while playing games” goal, we realized that the number of stakeholders denying that goal was a lot higher (≈4) than the number of stakeholders approving it (≈2) as shown in **Figures 4.18** and **4.19** accordingly. Therefore, as a result, the "Block ads while playing games" goal was the least desirable goal in the end.

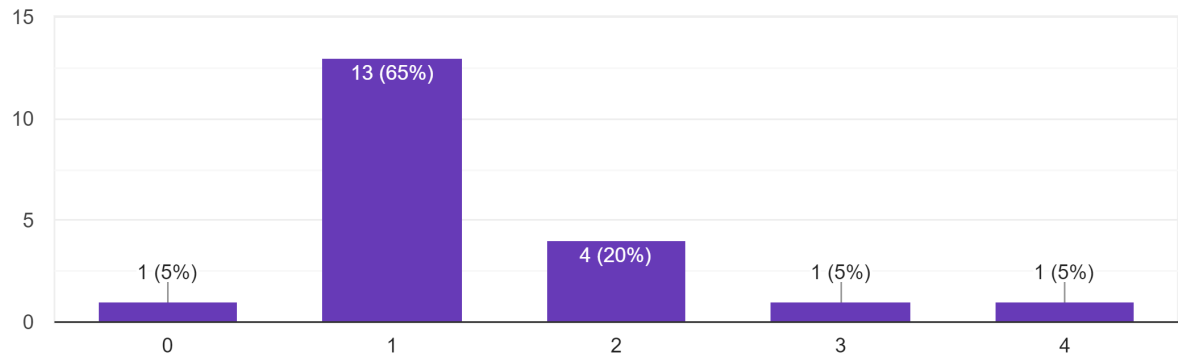

Figure 4.18: The number of stakeholders approving the "Block ads while playing games" goal.

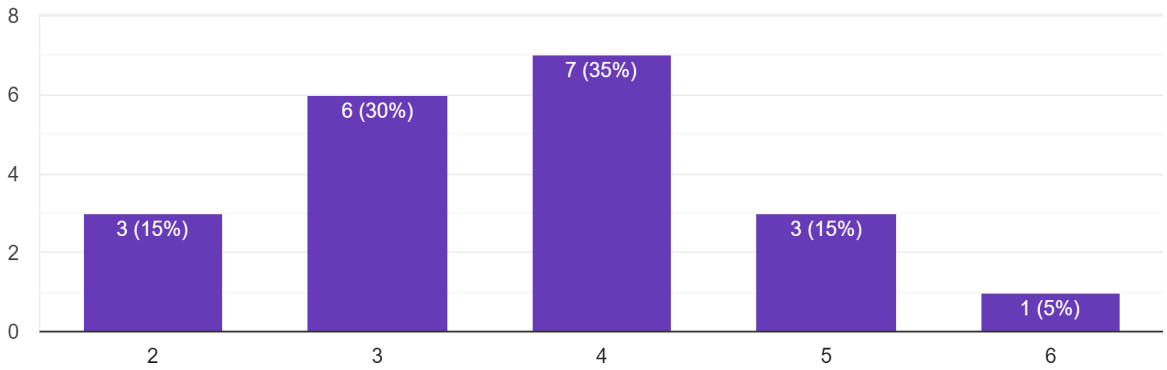

Figure 4.19: The number of stakeholders denying the "Block ads while playing games" goal.

In the end, when we analyzed the number of stakeholders approving the "Filter ads" goal, we also noticed that a very small fraction of stakeholders approved it (≈2) in most of the cases (**Figures 4.20 and 4.21**). However, the number of stakeholders denying the "Filter ads" goal was relatively high (≈4) in comparison to those who approved it. Thus, as we can see at the end, the "Filter ads" goal was one of the least desirable goals after the “Block ads while playing games” goal.

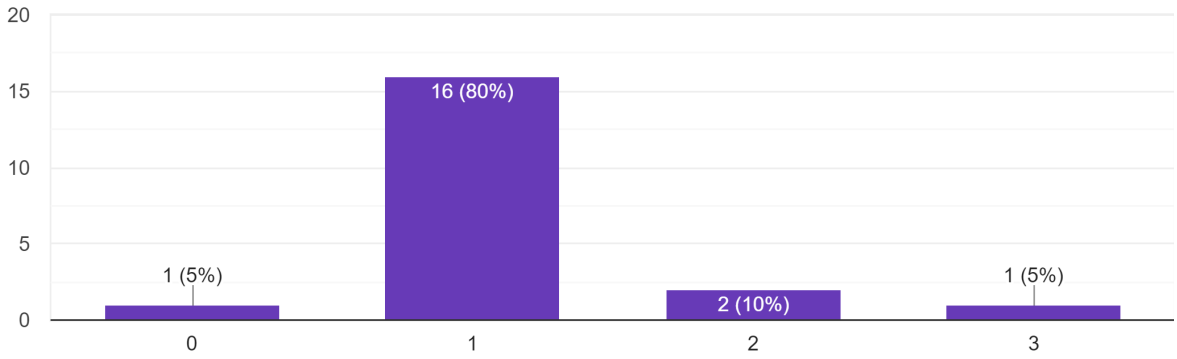

Figure 4.20: The number of stakeholders approving the "Filter ads" goal.

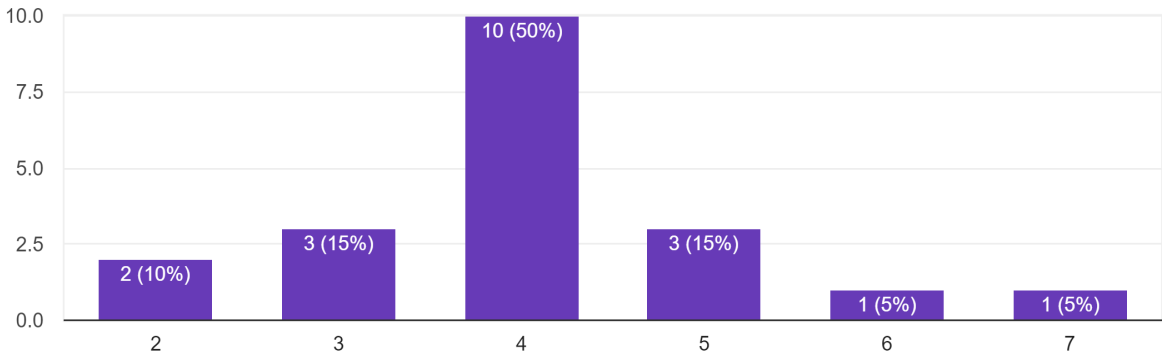

Figure 4.21: The number of stakeholders denying the "Filter ads" goal.

4.3.3 Repeatability

As we stated in **Section 3.2.3**, a beneficial aspect of a system is that it produces similar or slightly similar results when implemented by different observers. The higher the repeatability, the better the results. In **Figure 4.22,** we observe that 10 participants concluded that filtering ads are most desirable. On the other hand, 9 participants concluded that avoiding ad blockers was most desirable. However, as we see from **Figure 4.23,** 13 participants concluded that avoiding ad blockers was most desirable. Only 7 participants concluded altogether that blocking ads and filtering them was most desirable**.** Thus, there is low repeatability among the participants who used ACH than those who implemented QBM about the most desirable goal.

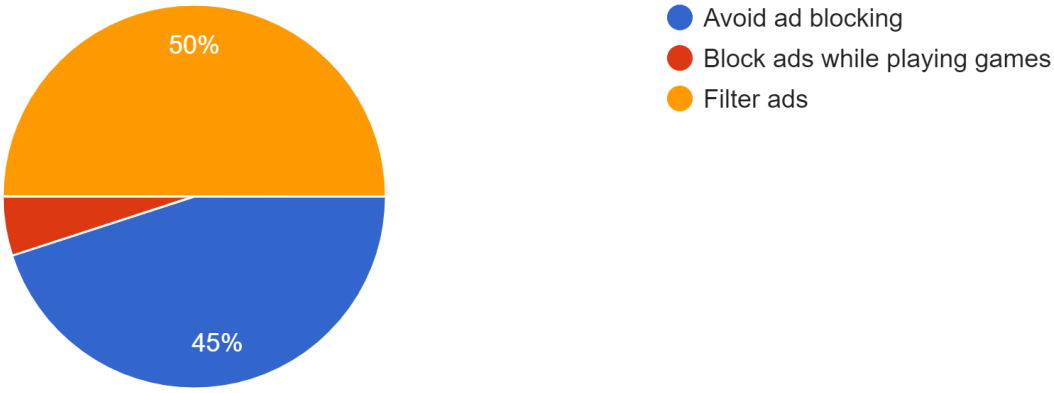

Figure 4.22: A goal that should be achieved based on ACH analysis

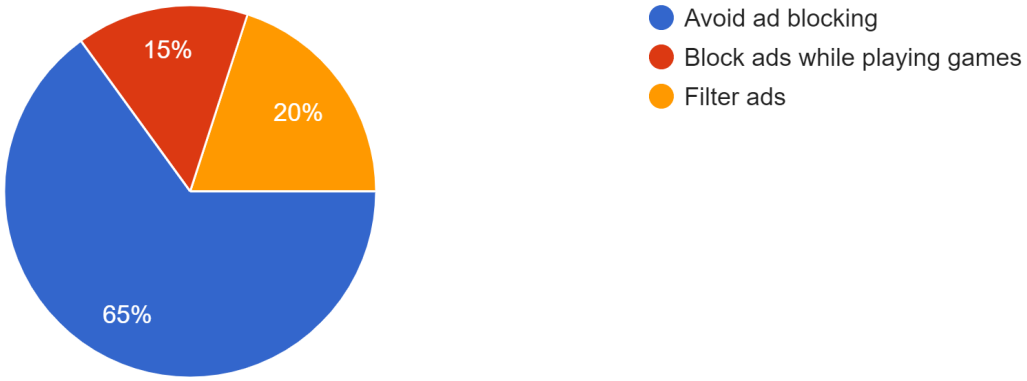

Figure 4.23: A goal that should be achieved based on QBM

5. Discussion

The discussion reflects the findings and implications of the study.

5.1 Capturing and categorizing the stakeholders feel goals

For tackling the first research question, we decided to conduct a workshop to capture and categorize the stakeholders' feel goals for conflict resolution in a given domain. The main focus of this e-workshop was capturing and conveying different stakeholders' requirements efficiently in a simplified way. In every other case, whether educational or commercial, this was always a tough process, as requirements can be quite vague, arbitrary, and hard to understand [60]. Lightweight models that facilitate cooperation among stakeholders are clearly required [53].

The conducted e-workshop focused explicitly on agile development processes. As a result, we developed flexible models to assist communication among stakeholders and those associated with the case study. Worth noting that motivational modeling [53, 61] perfectly evoked and reflected emotional requirements [62]. Motivational models created a layered framework of the system's objectives [63]. The motivational model represented the roles of all stakeholders, the system's functional and non-functional goals, and emotional goals that depicted how users want to feel while engaging with the system. Thus, three kinds of goals emerged from previously mentioned objectives - *do, be, and feel goals*.

This qualitative approach helped to see a bigger picture of the given domain and system to be. Because of its simplicity, all the emotional goals were captured easily and discussed with stakeholders without any problems. This approach also helped to elicit requirements very quickly and then organize them in a more readable way. Since the focus was on categorizing all the emotional goals of the Facebook Messenger App and constructing a motivational goal model, we created **Table 4.5** with all the captured conflicts. Here, we can state that different types of conflicts occurred among stakeholders. Most importantly, all emotional goals were connected with functional goals, and to solve emotional conflicts, we focused on functional goals that are related to those emotional goals.

5.2 Resolving conflicts between the feel goals of stakeholders

The two methodologies used took the same amount of time and effort. Despite the fact that RQ1 was much more cumbersome and time-consuming than RQ2, our main goal was to find

such methodologies that look alike at some point but at the same time have different approaches. Our goal was to constantly contact stakeholders since the human factor played the most crucial role during this research. We also chose these methodologies to show stakeholders the importance of the motive behind each goal.

We see that the results are not very different from each other. We only removed a few goals from the total number of goals. However, the methodologies we used proved that the use of versatile approaches increases the chance that the chosen goals will equally appeal to all stakeholders. It is also worth noting that being constantly in touch with stakeholders was positively assessed by them. In the end, each of the stakeholders came to a common conclusion, which is the best option for everyone and at the same time resolved the conflicts between them that arose during the workshop. Remarkably, the ACH methodology works best if all stakeholders are involved in the discussion. For example, when making a call via Zoom, it is best to make sure that each stakeholder is involved and hear each other's arguments and bring counter-arguments or agree with existing ones.

5.3 Decision on the Best Methodology for Resolving Conflicts

By answering RQ3, we wanted to see which methodology works best and analyze the advantages and disadvantages of each of them. We decided to take university students as our participants. One of the criteria for us was that all the university students we considered as our participants were enrolled in IT-related programs and were somehow familiar with the RE process. As a result, we received a post-survey from all 40 participants and analyzed each methodology based on that.

First of all, we can start with the efficiency of each method. We see that most time was spent on ACH analysis rather than on the QBM. It is also very easy to notice how the results are very different. In the case of the ACH analysis, the participants spent mostly 3-4 hours analyzing the scenario given to them. However, in the case of the QBM, most of the participants spent 1-2 hours or less in the range for the entire analysis. Thus, this means that ACH analysis takes more time than the QBM. When both methods were used for analysis, time did not matter since it was easy for us to contact the stakeholders and conduct the analysis. However, it was not easy for the participants since, to implement the ACH analysis in practice, they had to carefully and for a long time be in touch with stakeholders to obtain beliefs from them. On analyzing the difficulty of the method, most participants noted that the QBM was very easy to implement,

rather than ACH analysis, and this statement also supports our assumption in terms of time. Thus, in terms of efficiency, the QBM was the most desirable.

Then, we analyzed the quality of both methods. Here, the number of beliefs incorporated in the ACH analysis was not quite high. However, we know that when the number of valid beliefs increases, it boosts credibility and quality [35]. In the case of ACH analysis, the number of beliefs was not high, which may have led to the poor quality of the analysis. On the other hand, the number of groups (combined beliefs) in the ACH analysis was also quite low, however, as we stated in **Section 4.3.2**, the more beliefs are combined, the more the analyst's mental burden is theoretically minimized. Thus, in this case, it also may have led to the poor quality of the analysis.

We also checked the number of assumptions made in the ACH analysis. Because as we stated in **Section 4.3.2**, the quality of the analysis is also determined by the number of assumptions made by the analyst. And as we saw in **Section 4.3.2**, the majority of participants made 4 assumptions at most, and if we also consider that the majority of participants incorporated less than 10 beliefs, and if we assume that approximately 4 assumptions were exactly made during analysis when participants incorporated less than 10 beliefs, we can say that the quality of analysis, in this case, is not poor.

To assess the quality of the QBM, we took into consideration the number of stakeholders approving and denying the goals. As discussed in **Section 3.2.3**, since the range of stakeholders who support or oppose a goal affects the goal's approval or rejection [43], we decided to consider this metric. In the case of the “Avoid ad blockers” goal, an adequate number of stakeholders voted against it, and the majority of the stakeholders voted in favor of avoiding ad blockers.

Furthermore, goals such as “Block ads while playing games” and “Filter ads” received many votes from stakeholders, denying their importance. Thus, the latter goals were noted as the least desirable ones, while ''Avoid ad blockers'' was chosen as the most desirable goal. However, this means that the number of stakeholders who support or oppose a goal does not significantly affect the goal's approval or rejection. Because in the case of this analysis, it might have happened that even some stakeholders voted against the “Avoid ad blockers” goal’s execution, although the ones who voted in favor of it provided weights that were quite high, and it made the “Avoid ad blockers” goal as the most desirable.

The last criteria that we focused on were the repeatability of the methods. In this case, we know that a beneficial aspect of a system is that it produces similar or slightly similar results

when implemented by different observers. The more similar results are produced, the better the repeatability of a method [35]. However, in the case of ACH analysis, such goals as “Avoid ad blockers” and “Filter ads” were both the most desirable ones, as there was no repeatability here. However, in the case of the QBM, the most desirable goal was the “Avoid ad blockers” goal, and we can see that this goal has been repeated over and over again because it has the highest percentage.

As a result, we can say that both methods have their advantages and disadvantages, and choosing one method out of two is a very subjective approach in this case. That is why we advise considering all aspects of both methodologies and apply each of them in different real-life scenarios.

6. Threats To Validity

The methods used in this thesis to resolve conflicting stakeholders' emotional goals in the RE have two kinds of threats to validity.

First of all, when we look at the user personas of the Facebook Messenger App, it is highly possible to see more than 10 user personas defined by them, and within this research, we had only focused on a few groups of people. We have merged the user personas to mitigate this threat and selected the three main ones: government, app users, and marketing specialists. According to Facebook, these were the chief user personas, and thus we decided to invite the exact user groups.

Secondly, the subject group who analyzed methodologies can also be considered a subject to bias because we considered only university students. However, other seasoned professionals could potentially have assessed these two methodologies differently. To mitigate this threat, we selected students with different seniority level backgrounds. For instance, some students did not have any prior job experience at all. There were also students with at least one year of industry experience. This helped us to collect different types of feedback.

7. Conclusion and Future Work

The research work reported in this thesis has focused on capturing and categorizing the stakeholders' feel goals for conflict resolution in a given domain and methodologies to resolve conflicts between the feel goals of stakeholders. The approaches used by us consist of conducting an e-workshop and using ACH and QBM methodologies. The e-workshop was focused in part on Lopez-Lorca, Burrows, and Sterling's guidelines [53]. The weighted method was used to decide the priorities in the QBM method, and the structured analysis method was used in the ACH method, allowing an analyst to determine the form of proof against each hypothesis. Thereby, we can conclude that both methodologies (ACH and QBM) have benefits and drawbacks and that preferring one method over the other is a subjective decision. Thus, we recommend understanding all elements of both methodologies and implement them in different domains.

Further, it will be helpful to explore human psychology to understand each stakeholder's motivations. Since emotions are a complex system in themselves, studying them also requires hard and long work. Each individual perceives everything that happens around him differently. Accepting this fact and acting on it is an important aspect of learning.

On the other hand, the methods used by us in this thesis can be applied in various domains. This can help us identify gaps of employed methods and, thus, work on their improvement.

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