



# “Live Work”

## Peer-to-peer fair exchange of services

**Master thesis**

Faculty of Science, University of Bern

Handed in by  
Jamal Zakaria

2020

Prof. Dr. Edy Portmann,

Supervisors: Moreno Colombo, Jhonny Pincay

Department of Informatics | University of Fribourg, Switzerland

August, 2020



UNIVERSITÉ DE FRIBOURG  
UNIVERSITÄT FREIBURG

*u*<sup>b</sup>

<sup>b</sup>  
UNIVERSITÄT  
BERN

unine

UNIVERSITÉ DE  
NEUCHÂTEL

# Abstract

This master thesis evaluates several inquiries relevant to the development of an application named “Live Work”. Live Work is an application that enables the exchange of services within a local economy by assisting buyers and sellers with locating each other, coordinating the exchange of services, and processing the transaction. The key research question is whether a practical and user-friendly rating system can be designed that is flexible to varying numbers and types of user rating inputs while maintaining fairness. Additionally, other factors in the design of the application are examined, such as the possibility of incorporating cashless transactions as a mode of exchange.

The research effort accomplishes the design of an improved multi-step rating system based on one mandatory user rating and two optional ratings. A fuzzy logic control model is designed that aggregates these multi-step ratings into a final rating. The design is then assessed for fairness using a multi-step process, including validating that the ratings produced are objectively consistent across different numbers of optional user rating inputs and that the rating produced by the fuzzy controller model reflects similar outcomes to ratings produced when all user ratings are provided. Additionally, subjective measures of the rating systems are analyzed across multiple dimensions via a study of positive and negative comments that study participants provided regarding the rating methods. On the basis of the selected evaluation criteria, this rating system is determined to be superior to the conventional rating system in its fairness and accuracy and is determined to be suitable for use in the “Live Work” application.

# Acknowledgments

I would like to express my gratitude to professor Dr. Edy Portmann, as well as my supervisors Mr. Moreno Colombo and Mr. Jhonny Pincay for their useful remarks and extensive support throughout the entire learning process of this master thesis.

Furthermore, I would like to thank everyone who participated in the questionnaires and controlled experiments to help me evaluate and design the product.

I would like to thank my loved ones, who have supported me throughout the entire process, both by keeping me harmonious and supporting me putting pieces together. I will be grateful forever for you.

# Contents

<b>Abstract</b>	<b>iii</b>
<b>Acknowledgments</b>	<b>iv</b>
<b>1 Introduction</b>	<b>1</b>
1.1 Motivation of the Research . . . . .	2
1.2 Potential Benefits . . . . .	2
1.3 Problem Statement . . . . .	3
1.4 Scope of the Thesis . . . . .	3
1.5 Research's Aim and Objectives . . . . .	4
1.6 Research Methods . . . . .	5
1.7 Outline of the Thesis . . . . .	5
<b>2 Literature Review</b>	<b>7</b>
2.1 Rating System . . . . .	7
2.1.1 Rating System Models . . . . .	7
2.2 The Rating Criteria . . . . .	9
2.3 The Rating Scales . . . . .	10
2.4 The Rating Methods . . . . .	12
2.5 An Examination of the Present Rating Systems . . . . .	13
2.6 The Principles of Fuzzy Logic and Fuzzy Rules . . . . .	15
2.7 Settlement Systems . . . . .	16

2.7.1	Historical Background . . . . .	16
2.7.2	Barter System . . . . .	16
2.7.3	Currency System vs Barter System . . . . .	17
2.7.4	Purpose of Currency System Instead of Barter System . . . . .	17
2.7.5	Types of Money and Their Role In Transactions . . . . .	18
2.7.6	Modes of Transactions of Money . . . . .	18
<b>3</b>	<b>Exploratory Study</b>	<b>19</b>
3.1	Data Collection . . . . .	19
3.2	Questionnaires and Interviews . . . . .	19
3.2.1	Rating Systems Questionnaire . . . . .	19
3.2.2	Settlement Methods Questionnaire . . . . .	20
3.2.3	Settlement Methods Interview . . . . .	21
3.3	Rating System Evaluation Criteria . . . . .	21
<b>4</b>	<b>Fair Rating and Service Exchange Systems</b>	<b>23</b>
4.1	Fuzzy Logic Modeling . . . . .	23
4.1.1	Fuzzy Logic Operator and Rules . . . . .	25
4.1.2	The Fuzzy Controller Rules . . . . .	26
4.2	Aggregation of Total Ratings . . . . .	28
4.3	Classification Methods . . . . .	29
4.4	The Mechanisms of Moneyless Transaction . . . . .	30
4.4.1	The Proposed Novel Settlement Method . . . . .	31
<b>5</b>	<b>Design and Prototyping</b>	<b>32</b>
5.1	Persona and Scenario . . . . .	32
5.1.1	The Client Persona . . . . .	32

5.1.2	The Service Provider Persona . . . . .	33
5.1.3	The Scenario . . . . .	33
5.2	UX and UI Wireframe Prototype . . . . .	34
5.3	Design and Specification . . . . .	35
5.4	Rating Methods . . . . .	37
<b>6</b>	<b>Evaluation and Results</b>	<b>40</b>
6.1	The Scenarios . . . . .	41
6.2	The Value of Three Rating Methods . . . . .	42
6.3	The Correlation Between The three Rating Techniques . . . . .	44
6.4	The Selection of the Appropriate Final Rating Technique . . . . .	45
6.5	Assessment of The Validity of the Fuzzy Controller Model . . . . .	48
6.6	Overall Rating Method Conclusions . . . . .	49
<b>7</b>	<b>Discussion</b>	<b>50</b>
7.1	Lessons Learned . . . . .	50
7.2	Further Research Topics Areas . . . . .	51
<b>8</b>	<b>Conclusions</b>	<b>53</b>
<b>Bibliography</b>		<b>53</b>
<b>Appendices</b>		<b>56</b>
1	Appendix A: Questionnaires . . . . .	56
2	Appendix B: Interview . . . . .	61

# List of Figures

2.1	Graphic Rating Model . . . . .	8
2.2	Numerical Rating Model . . . . .	8
2.3	Binary Rating Model . . . . .	8
2.4	Descriptive Rating Model . . . . .	9
2.5	Comparative Rating Model . . . . .	9
2.6	SWOT analysis of the modern rating systems . . . . .	13
4.1	Fuzzy logic mechanism . . . . .	25
4.2	Triangular Norms of Degree of Rating . . . . .	26
5.1	Application Home Page . . . . .	35
5.2	User profile . . . . .	36
5.3	Requesting a service . . . . .	37
5.4	Accepting the Completed Job . . . . .	38
5.5	Efficiency Level Ratio . . . . .	38
5.6	Review form . . . . .	39
5.7	Community Classification . . . . .	39
6.1	The correlation between 1st and 2nd rating . . . . .	44
6.2	The correlation between 1st and 3rd rating . . . . .	45
6.3	Final rating methods disparity . . . . .	46
6.4	Method 1, Average computation method. . . . .	47

6.5	Method 2, Fuzzy logic controller and weighting method. . . . .	47
6.6	Actual Final Rating Provided (Fuzzy VS Weighted Methods ) . . . . .	49
1	Questionnaire description . . . . .	59
2	First Question . . . . .	59
3	Second Question . . . . .	60
4	Third Question . . . . .	60
5	Fourth Question . . . . .	60

# List of Tables

4.1	Semantic rating symbols and characterizations. . . . .	23
4.2	Linguistic Variable and Degree of Rating for Each Variable. . . . .	24
4.3	Fuzzy logic controller rules, based on the linguistics variables. . . . .	28
4.4	Aggregation of Total Ratings 1. . . . .	29
4.5	Aggregation of Total Ratings 2. . . . .	29

## CHAPTER 1

# Introduction

The rise of the internet has connected us to a complex global marketplace where data, services, and products can be exchanged with unprecedented efficiency. The ability to exchange documents and information instantly has made our life much easier and more comfortable. Furthermore, as time has passed, an increasing majority of the population has become accustomed to performing personal business online and has even come to rely on it as the first means to search for products and services. But there remain areas within the marketplace where this digital revolution has not yet covered all aspects of our daily life. For instance, to repair a broken water tap in one's house could take a few days, as it requires addressing issues such as locating an available plumbing company, and obtaining an available appointment that meets the customer's personal schedule. For those who work a normal work-week, this could turn into a major hassle.

Based on this trend, the researcher has developed the idea of designing and developing a smart-phone application that uses Geo-location services to derive the user location to assign the nearest matching service provider to the user. When an arrangement between the two parties has been established, they can conduct a transaction, and then the service company can provide the service to the user as fast as possible. The goal of this arrangement is to match customers with service providers capable of providing on-demand service, rather than scheduled appointments which may be less convenient or difficult to arrange.

The idea is to gather a large database of various professionals, all over Switzerland, where the users can search and select the nearest and most convenient service provider and demand the company to perform a task based on a brief explanation of the problem. If the service supplier completes the service and both parties are satisfied, the service-requester user must provide a code that allows the execution of the monetary transaction.

The wide availability of service providers necessary to logically make this application successful relies on buyer's ability to rely on a robust rating and review system that is trusted, since traditional means of determining the qualification of a service provider such as brick and mortar location, customer testimonials, and TV advertisements may be unavailable to individual contractors and small businesses who are ready and available to perform services on demand.

Since the rating and review systems can be easily manipulated and fabricated by multiple methods [1], there is a need for an impartial rating system that can be fair to every user regardless of their marketing influence. This research will seek to understand and design a method for establishing trust within an appropriate rating system.

Finally, the author will seek to understand whether such a system could become fluid enough to enable the exchange of services without the need to rely on fiat currency as an intermediary.

The benefits of this type of barter system are discussed, with the goal being to enable low-income individuals capable of providing invaluable services to perform direct trades without the need of relying on a separate currency.

## 1.1 Motivation of the Research

The main motivation of this research work is to develop and implement a practical project that can empower small companies and individual contractors who have the efficiency and essential qualifications to perform valuable services but cannot compete with large established companies who dominate marketing channels to monopolize the marketplace while providing lower cost, but inferior services. Giving direct access to the local job market to small companies and individual contractors can result in a strengthening of the small communities' marketplaces and unearth hidden talents and unique skills [2].

The first challenge involves the need to identify a means for all people to have the ability to participate in the marketplace. Hesitation to participate in monetary transactions can arise from security concerns or the inability to pay. This research seeks to identify a means to have participants in the same community identify certain skills that can be exchanged via a barter system, rather than relying on monetary transactions solely. This concept is expected to improve the community feeling on the application, as well as within the physical community, and will allow people who can not afford to reward the service to still benefit from their work.

The second challenge to be overcome is in establishing trust in the service providers listed on the application. This relies on a rating system being trusted and immune to manipulation that is pervasive in most existing online rating systems. This research will identify potential rating systems, and select an appropriate design that overcomes these issues.

## 1.2 Potential Benefits

In recent years, mobile applications that create marketplaces for valuable services have had great success, particularly within markets that have many potential buyers and sellers. Ridesharing apps such as Uber and Lyft,<sup>1</sup> and food delivery apps such as Uber Eats and Door Dash have disrupted industries and made way for sellers to make a living or supplement their income without the need for a conventional job. This disruption comes down to the mobile applications reducing the barrier of individuals locating prospective customers without the need for large marketing budgets.

Similar benefits could be realized in a much higher mix of services if certain challenges can be overcome. If unique services that are invaluable, but not necessarily high enough in demand to

---

<sup>1</sup>Uber is an American multinational ride-hailing company offering services that include peer-to-peer ridesharing, ride service hauling, food delivery (Uber Eats), Uber.com. And Lyft is an American ridesharing company based in San Francisco, California. It develops and operates the Lyft mobile app, offering car rides, scooters, a bicycle-sharing system, and a food delivery service

warrant their own selling platform can be bought and sold in a common trusted marketplace, then larger numbers of people can be expected to benefit from their unique talents, skills, and trades.

Furthermore, this can be expected to have economic benefits, even above those offered by existing gig-economy applications. Serving as a taxi driver, or delivering food is in demand and valuable to buyers, but is inherently a commodity. In practice, this does not often afford a high standard of living to sellers because competition ensures prices stay low. In a marketplace with a significantly higher mix of services offered, differentiation between offerings should enable both buyers and sellers to extract extra value, as buyers can get services that would otherwise be difficult to find and sellers can sell at a fair price without excessive competition driving prices to less than a living wage.

### 1.3 Problem Statement

All around the world, consumers rely on traditional businesses for a variety of services. In many cases, small businesses and individual independent contractors are best suited to meet the needs of customers within their local communities but are unable to stay financially viable, nonetheless. The reasons for these failures come from multiple causes such as:

- Smaller businesses may have limited or no marketing budgets to attract customers.
- Larger businesses and chains are able to leverage economies of scale to lower prices below those that small companies can compete with, and limited information on the quality of services is available to customers to justify the higher cost.
- Larger businesses may engage in anti-competitive behaviors when small competitors emerge, such as locking down available vendors, driving prices down temporarily, or spreading misinformation.

Generally, a trusted marketplace that allows small businesses to connect directly with buyers and demonstrate service quality through a trusted rating method should solve several of these issues by reducing the need for marketing budgets, and providing a trusted means to discriminate a service based on quality and personal service.

### 1.4 Scope of the Thesis

The primary focus of this project is to design an efficient equitable rating system for services and clients. The study aimed to serve the general population and does not focus on special demographics or ages. The study consists of an investigation of the existing rating systems along with their models and scales and proposes innovative fair rating techniques based on a fuzzy logic controller. The application will be using fuzzy logic rules to estimate an approximate rating scale for each user based on the following criteria:

- 1) Acceptance of the service
- 2) Efficiency measurement
- 3) 24 hours later review

However, some limitations were noted, which influence the main outcomes. Due to the global pandemic of COVID 19, the author was unable to achieve several interviews that could have grant more data. As for the questionnaires, the rating systems were posted online in order to gather the maximum volume of data.

Along this path, the author examines an ethical method of a settlement system that expresses an exchange of various services or items. The study took a duration of six-month continuance work and it was based completely in Switzerland. Accompanied by a controlled experiment and A/B test on two groups of people with different backgrounds and ages. The author will conclude with a discussion of future work and different aspects that could have been reciprocated for optimal results.

## **1.5 Research's Aim and Objectives**

The main motivation of this research work is to develop and implement a practical project that can empower small companies and individual contractors who have the efficiency and essential qualifications to perform valuable services but cannot compete with large established companies who dominate marketing channels to monopolize the marketplace while providing lower cost, but inferior services. Giving direct access to the local job market to small companies and individual contractors can result in a strengthening of the small communities' marketplaces and unearth hidden talents and unique skills.

The project's first challenge is the need to identify a means for all people to have the ability to participate in the marketplace. Hesitation to participate in monetary transactions can arise from security concerns or the inability to pay. This research seeks to identify a means to have participants in the same community identify certain skills that can be exchanged via a barter system, rather than relying on monetary transactions solely. This concept is expected to improve the community feeling on the application, as well as within the physical community. It will also allow people who can not afford to pay for services to still benefit from their work.

The second challenge to be overcome is in establishing trust in the service providers on the application. This relies on a rating system being trusted and immune to manipulation that is pervasive in most existing online rating systems. This research will identify potential rating systems, and select an appropriate design that overcomes these issues. This forms the basis of the main research question, in which the proposed rating system will be evaluated. This includes an examination of whether a multi-tiered system consisting of several different ratings adds additional valuable information to the final rating, an assessment of whether a fuzzy logic control algorithm that aggregates these multiple ratings is more favorable than other methods such as simple averaging, and a study of user satisfaction with the proposed process to determine whether multiple ratings are overly burdensome to potential users. Identifying a rating system which adds additional

information, aggregates it in the best way possible, and remains user friendly is the ultimate goal, as it would be a valuable addition to a variety of software applications where buyers and sellers conduct transactions.

This research seeks to answer two primary research questions:

- **What represents the persuasive design for a transparent and verified adequate rating system that encourages consumers to perform a rating?**  
The author will collect information about the most irritating elements of rating systems that prevent users from performing a rating on a service that they hire.
- **How to define a rating controller that can ensure fairness and transparency for all users?**  
The author will examine this problem using Matlab Fuzzy logic, and determine whether a controller based on fuzzy logic can be designed.
- **What is the most convenient method for people to accept the exchange of services instead of monetary transactions?**  
The author will examine this problem in light of empirical studies and interviews to determine whether a system can be designed which will be viable to buyers and sellers.

## 1.6 Research Methods

To answer the different research questions and fulfill the study objectives, different quantitative and qualitative research methods will be used as follows:

- 1) **Literature analysis:** Collecting primary data through paper, articles, and books related to the topic.
- 2) **Desk Reviews:** Collecting secondary data to articulate new findings, through online questionnaires, interviews, focus group sessions, and observation.
- 3) **Evaluation studies:** Collecting results and findings through a controlled experiment with different individuals of different backgrounds and ages.

## 1.7 Outline of the Thesis

The major value of this research is divided into the following: Chapter two will review the literature on related research that points out the problem and addresses the knowledge gap, thus discussing the aim and objectives of the outcomes of the thesis. This chapter also includes the determination of the research methods and explanation of the overall methodology followed by an examination of the present rating system and its diversity and effectiveness, alongside an examination of a new settlement schema that can be an alternative to monetary transactions.

Chapter three describes the methods of collecting data and analyzing the outcomes and includes details on questionnaires, and interviews that were conducted to improve the examination process. Chapter Four will examine the collected information, and a fuzzy logic model will be generated in order to achieve the best impartial rating for users. Finally, this chapter discusses a proposed novel settlement method that can be an alternative to monetary transactions.

Chapter five will demonstrate the process of designing and creating a user interface wireframe prototype of the product and will explain the terminology and structure of each prototype. It will also include considerations for the design of the proposed rating system for evaluation.

Chapter six will evaluate each rating system prototype individually and highlight all alterations made between each. This will include an evaluation of the prototypes via controlled experiment sessions of diverse groups of participants, with different ages and backgrounds. Results will be tabulated and analyzed such that conclusions can be drawn regarding the suitability of the proposed rating system for use in a practical application.

Chapter seven will cover a discussion of the research results, including lessons learned during the course of the study and potential areas to conduct further research in the future. A critical outlook will conclude the thesis in chapter eight.

## CHAPTER 2

# Literature Review

Prior to undertaking this research, a review of the existing literature and related work were completed. This will serve as the starting point of the research, enabling a view of the current state of the art so that it can be further refined and expanded upon for the project at hand.

## 2.1 Rating System

Living in a complex multifaceted society requires different rating systems to evaluate the quality of our services and products, depending on the specific nature of the transaction, product or service, and user base. Different rating systems are useful for different purposes. In general, most of the rating systems studies focused on analyzing individual systems, rather than comparisons between different systems and the impact and influence of these differences on users.

In a comparative review of five sustainable rating systems, Nguyen and Altan [3] discussed a comparison between five sustainable rating systems, BREEAM, LEED, CASBEE, GREEN STAR, and HK-BEAM. In their system criteria and features, they provided a systematic and valuable reference source for various rating criteria such as popularity, influence, availability, and accuracy. But the study did not clarify the correlation between systems and users in the legibility and fairness aspects.

In the design of review systems, Gutta and Neumann [4] focused on the direct impact of online rating on the economic consequences to sellers. Furthermore, they analyzed the structure and various elements underpinning the review systems, and how these impact reviewer behavior. They indicated the three themes that influence the reviewers as the design features, environments, and types of devices.

Today different rating systems are ubiquitous all over the globe with platforms regularly switching back and forth between them in an attempt to enhance the user experience and provide better products.

### 2.1.1 Rating System Models

In general, rating systems are divided into different models and scales [7], addressing correlation and similarity of rating behavior between users and platforms, presented by the following figures:

### 1) Graphic Rating Model

A representation of multiple graphic options where the user can select a particular option of the scale to perform a rating. This method is illustrated in Figure 2.1.



Figure 2.1: Graphic Rating Model

### 2) Numerical Rating Model

A representation of a set of numbers either from zero to five or zero to ten where each number corresponds to a characteristic which symbolizes the actual rating. This method is illustrated in Figure 2.2.



Figure 2.2: Numerical Rating Model

### 3) Binary Rating Model

A basic representation of binary choices that demonstrate a thumbs up, thumbs down, or like, dislike options to rate a certain product. This method is illustrated in Figure 2.3.



Figure 2.3: Binary Rating Model

#### 4) Descriptive Rating Model

A representation of clear stages of a rating system where users have a description of each rating point that leads to consistent and standardized rating. This method is illustrated in Figure 2.4.

	Excellent	Good	Average	Poor
Knowledge of product	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Training style/delivery	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Pace of the course	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Helpfulness	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

Figure 2.4: Descriptive Rating Model

#### 5) Comparative Rating Model

This system requires the user to answer a particular question in terms of comparison. It is used to measure a survey respondent's preferences in terms of popular external benchmarks. This method is illustrated in Figure 2.5.

How do you feel about today's course topic?

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly Agree
Today's topic was relevant to the overall course.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>
The instructor explained the topic clearly.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>
I feel confident that I can complete the homework assignment related to today's topic.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>

Figure 2.5: Comparative Rating Model

## 2.2 The Rating Criteria

Most rating systems include some possible rating criteria, but are not comprehensive, or alternatively are ambiguous about the specific aspect of the service being evaluated. Some focus

on popularity and influence, such as the platform Netflix <sup>1</sup>, relying on the user's voting system through their actions like viewing a video or purchasing a product. Others rely on user ratings of their satisfaction with an order overall, such as Google and Facebook.

Generally, these rating systems all miss an opportunity to get more refined data about various aspects of the products and services being rated. As an example, the Google stars system and the associated text review allows users to give a rating from 1 to 5 stars with a descriptive review text that explains the experience with a certain service. It is left up to the reader of the review to try to determine whether the rating is associated with the quality of the product service, customer service experience, efficiency of scheduling a service provider or shipping a product. The systems have no means to extract this information from users, and so ratings tend to be ambiguous.

All of these systems are optional and non-mandatory. According to Bonelli [8] only 70% of customers leave a review when they are asked to, and this percentage drops to 28% when they are not asked.

The necessity of a technique to persuade people to perform a rating on the services they have received is becoming a priority for many reasons. Current ratings systems have some flaws, such as being prone to manipulation or appearing untrustworthy for small service providers who only have a few reviews. It is vital for the success of small businesses and individuals that rating systems are transparent and contain only genuine reviews from real customers who actually encountered the service provider. This is the only way that a small, efficient business within the same community can distinguish its service offerings based on better quality, efficiency, or personal customer service in order to compete with larger businesses that cannot be easily matched on price.

## 2.3 The Rating Scales

Rating scales are widely used to rate different products and services offered around the globe. The rating process is similar to that of a research survey, but the participants are asked to rank abstract concepts related to the services or products. Commonly rated abstract concepts include likeliness to purchase, satisfaction, and likelihood to recommend others [9]. Ratings are used by potential customers to assess the products or services. Similarly, these ratings are used by service providers to determine the necessary improvements in the product or services. Different platforms such as Google, Facebook, and Yelp, are using different rating scales for the final rating of products [10] Some of these rating scales are briefly discussed below:

### 1) Linear Numeric Scale

Some rating platforms use the linear numeric scale for the final rating of the products. This includes the rating of abstract concepts such as the experience of use, likelihood to use again, the recommendation to other customers. The scores are generally from 1-10 with 1 being

---

<sup>1</sup>Netflix is an American technology and media services provider and production company. The company's primary business is its subscription-based streaming service which offers online streaming of a library of films and television series.

the least and 10 being the highest rating. The final rating of the product is obtained after analyzing the linear numeric scores of all the questions [10]. A common instantiation of the Linear Numeric scale is the star-based rating scale used on many platforms such as Google, Yelp, and Amazon, which requires a rating from 1 star to 5 stars. This rating scale is useful in its simplicity and is among the easiest to understand for consumers.

## 2) Likert Scale

The Likert scale is a classical measuring scale that is used in questionnaires to measure participant scored in a standardized way. During the rating of a product or service, a participant is asked whether he or she agrees with certain statements or not [9]. After recording the responses to these questions, a statistical technique is used to convert the customer responses into numbers used for the ranking of the products. This method is useful because it is standardized and can be utilized to obtain scoring on a variety of product or service attributes. It is a more reliable indicator than other methods because it relies less on the survey participant's interpretation of what the ratings mean.

## 3) Frequency Scale

The frequency scale is used to measure the frequency of certain behaviors of a consumer. Generally, this consists of listings of behaviors relevant to the product or service, with survey respondents tasked with answering whether they always, usually, sometimes, occasionally, or never partake in these behaviors. Various implementations may utilize slightly different frequency markers, numbering usually from 3 to 7 choices. This informs product or service design and marketing decisions. This rating system is not generally used by rating websites but is more commonly used by paid surveys conducted by manufacturers or service providers. This helps these product and service providers to understand the customer and design their products, services, and marketing approaches according to their preference [10].

## 4) Forced Ranking Scale

The forced ranking system requires survey participants to rank a listing of products, services, priorities, or other considerations in comparison to one another. This ranking scale can be used to provide more detailed information about what is important to customers since it requires customers to make clear decisions about what is most and least important to them. In this ranking scale, the customer typically goes through a series of questions with multiple answers that must be ranked in order of importance according to their own perception [11]. Empirically, this has been shown to improve the reliability of the final ratings.

## 5) Paired Comparison Scale

The paired comparison scale represents a variant of the forced ranking system in which only two options are presented for ranking, and the respondent must select which is their preference. For example, this paired comparison scale may ask whether a customer prefers the quality or cost of the product [9]. This helps the service provider or manufacturer to better design their products and services to satisfy the customer's priorities, similar to a forced ranking system.

Many variations on these rating methods, and others, exist and are in use by well-known plat-

forms such as Google, Facebook, Yelp, and Trip Advisor. Although there are many other options in the rating scale methods, none solve the problem of avoiding manipulation and providing 100% authentic ratings that can be trusted by customers [11].

Thus, there is a need for a new rating system that eliminates the flaws in the current rating systems.

## 2.4 The Rating Methods

Rating methods in most rating schemes are homogeneous. It's all too easy for user-experience designers to overlook the many purposes of rating systems. To understand the rating systems and carefully design an alternative system, it is important to understand exactly what rating procedures there are.

- **Rating systems based on algorithmic personalization, where the system personalizes the user experience based on real behavior:** This system is used carefully in some complex platforms with advanced algorithmic personalization to enrich the client experience. As long as the potential user submits a rating, the system becomes more precise to personalize his or her experience. This would include, for instance, Pandora Radio, which selects future songs based on an algorithmic analysis of which songs were previously “liked” or “disliked”.
- **Rating systems based on the aggregation of decision-making:** These systems are designed to help users to make a decision by aggregating multiple ratings over time to enable future decision making. An example of this rating system is Netflix, which analyzes videos that have been watched by the user and aggregates this data to determine similar movies and TV shows which the user may enjoy viewing.
- **Rating systems based on identifying value, where the system uses continuous feedback from users to improve the quality of merchandise or services:** These systems provide users with the possibility of highlighting the best aspects of a product or service. This feedback can then be leveraged by the product or service provider to further enhance and improve the product or service.

To explore internal and external environments affecting rating methods, we present the SWOT Analysis of Figure 2.6 including strengths, weaknesses, opportunities, and threats.

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>There are a number of current rating systems that can be used by the rating platforms. These are designed to remove the complexities of prior rating systems and provide ease to the rating platforms in calculating the final ratings of the system [11].</li> <li>The existing rating systems have been extensively researched, and are well understood. The literature provides strong baselines for the appropriate use of the rating systems, potential shortfalls, and benchmarks that can be used to analyze and cross-compare rating results.</li> </ul>	<ul style="list-style-type: none"> <li>The current rating systems don't adequately address the problem of customer bias and false rating scores given by certain customers. This affects the final ratings of the product or service, impacting the business of service providing company [9].</li> <li>Existing rating systems oftentimes do not sufficiently differentiate various factors that go into ratings, such as product quality, efficiency/timeliness, customer service, etc. This provides incomplete information to customers making a purchasing system.</li> </ul>
Opportunities	Threats
<ul style="list-style-type: none"> <li>The current ranking systems can improve their performance by using Artificial Intelligence techniques to provide authenticity of ratings [11]. This will reduce the need for further rating systems and improve the results.</li> </ul>	<ul style="list-style-type: none"> <li>Many new ranking systems are being introduced and refined. Any authentic rating system solving the concerns of the customer can be detrimental to the existence of current rating systems [9].</li> </ul>

Figure 2.6: SWOT analysis of the modern rating systems

From this perspective, the bias of many rating systems could be improved by utilizing multiple factors currently absent, which can intensify data aggregation of each platform. Improvement opportunities include using machine learning algorithms that can eliminate noise, fake inputs, fake users, and marketing manipulations.

o

## 2.5 An Examination of the Present Rating Systems

The most well-known rating systems such as Google, Facebook, and Yelp ratings, contain confidential and unavailable algorithms publicly [9]. These rating systems impact the purchasing decisions of the customers and prospective customers of the products and services being offered on the platform.

These online ratings are also very important in driving site traffic, making them vital for businesses to even reach customers, much less to close the sale. Ratings are vital to many businesses surviving. From rating the product to driving the customers to the brand's website, these online review systems are a large factor in the success of businesses.

Many users believe that existing rating systems use the honest feedback of the customers to rate the product or service, but it involves much more than a customer's feedback to rate the product. The most well-known rating systems such as Google and Facebook have been shown to help large chains to dominate and spread their various brands to increase presence [9]. Below is an analysis

of some well-known rating systems, illustrating the need for a new trusted review method that can provide consumers with unbiased and accurate information.

### **Google Rating System:**

While Google's rating system is proprietary and therefore confidential and not available for direct inspection, certain aspects of it can be discerned from available data. Google ratings are calculated from users' ratings and many other signals to reflect the quality of the service or a product. [10].

Due to the complexity of these rankings, with many factors included, certain actions have been determined to allow manipulation. In fact, there are many marketing companies that can boost your Google review for a modest price when compared to the outsized impact that a positive set of reviews can have on future sales for a business.

This fact is that in addition to user reviews, Google also uses some key review website ratings to calculate its ratings [12]. These reviews are shortlisted by Google's algorithm according to the site's ratings and a number of site visits. Similarly, the Google algorithm analyzes the online platform of a particular service or product to calculate the final ranking [10].

Things such as Search Engine Optimized (SEO) content and optimization of listing including the information, attractive visuals, and map placing play an important role in the final service ranking. While this incentivizes companies to manage their online presence and provide clear, well organized, and visually appealing descriptions of their product or service offering, these actions may not actually enhance the end product or service offering. Google is in the business of providing an enjoyable web experience that connects you with the information you are looking for quickly and efficiently. This is not fully consistent with the goal of providing you with the best value product or service provider in all cases. Furthermore, investing in search engine optimization, flashy graphics, and driving traffic to a website may be outside the means of very small companies and especially individual contractors who are nevertheless perfectly adequate providers of a variety of valuable services.

### **Facebook Rating System**

The Facebook rating algorithm is also proprietary and confidential, but previous research has determined that this rating system also reviews the customer ratings and filters through the comments about the product [11].

Facebook can also be dependent on external rating sites, such as Google for its rating system. The similarity in the rating stars of various products depicts that these platforms are using each other's information to rate the product or services. This means that Facebook is subject to the same types of manipulations that Google's system risks. Most rating systems are somehow dependent on other platforms rankings in one way or another. The rating of the product by the Google or Facebook review system is not total self-work and uses many other sources that can be misleading [11]. Customer ratings can be false based on brand biases that can lead to false ratings of the products or services. This is another flaw of already established rating systems.

Among the well-known rating systems, a common thread appears in that many are interconnected with each other. This means that many systems inherit the vulnerabilities of other systems.

To some extent, the diversification of factors and the proprietary nature of how ratings are ultimately determined provides protection against manipulation. Unfortunately in practice, businesses will do all that they can to manipulate rating systems to drive sales to their business. The complexity of these proprietary algorithms only serves to drive business to larger businesses which can systematically analyze what impacts their ratings and execute coordinated campaigns to manipulate ratings, which is far out of the reach of small businesses, that are often held back by one or two bad ratings that do not fairly characterize the quality of the product or service being offered.

## 2.6 The Principles of Fuzzy Logic and Fuzzy Rules

Fuzzy logic is an approach to computing based on “degrees of truth” rather than the usual “true or false” (1 or 0) Boolean logic on which the modern computer is based, [21]. It is widely utilized in automatic applications process control and monitoring. It is valuable when calculating outputs from situations in which inputs are well understood but not necessarily precise or well-measured. Allowing degrees of truth within the input enables the level of uncertainty in the inputs to be accounted for throughout the calculation, similar to a way in which a human would make decisions accounting for the uncertainty of various information sources.

Every fuzzy set is determined by the membership function which matches a notion of characteristic function in standard logic. The number of any fuzzy sets can be defined into variables, for example, the sets “Big, Small, Medium”, or “Low, High” where each notion being defined by a membership function. Membership functions represent the distribution of possible true values possible, given the provided input category. Key selection decisions that must be made in determining membership functions include the decision of how many members to include, and what shape distribution to use for the purpose of the membership function. For instance, in using a rating system as inputs, the number of members might be selected as two, as in a thumbs-up versus thumbs down rating system, or may include 5, as in a 1-5 star rating system. Furthermore, the shape of the membership function must be determined. For instance, a triangular shape is very common, which may account for the notion that an input of 4 stars is most likely to represent a true 4.00 rating by the user, but may extend anywhere between 3 and 5, with the probability distribution taking the shape of a point centered around the 4. Other optional designs could be a normal curve shape or trapezoidal shape. Generally, selecting the number of members is more important to the outcome than the specific shape.

The fuzzy logic operators are set to compose logic combinations between the fuzzy notions and to perform computations on degrees of truth, similar to the normal logic operators can be established. Every Fuzzy logic method has some rules, basically it is to implement a human method of argumentation. These rules calculate an output distribution from the given input distributions represented by the membership function. This probabilistically represents what the final output should be.<sup>15</sup>

At the end of execution, the output of the fuzzy set is defined, but cannot be directly applied to provide the operator with specific data, and therefore a process that moves from the “fuzzy world” to the “real world” is required and it is known as defuzzification. Several methods exist to convert

this probability distribution of values into a single output value. Most commonly, the method of calculating the centroid of the fuzzy set is used, as it generally provides the center point of the distribution, accounting for the relative weighting, shape, and skewness of the fuzzy set.

The advantage of these fuzzy controller models is that they can use imprecisely measured or qualitative inputs to calculate outputs with consideration given to the levels of uncertainty of the input information. Such systems are a good choice for use in user ratings for several reasons. For one, user ratings are generally noisy, since they reflect many diverse factors of the service being rated, but also include consideration for the difficulty of the rater and precision of the rating system's measurement. Additionally, it is desirable to be able to deduce overall ratings taking into account the uncertainty of ratings because it allows users to keep relatively simple rating systems not requiring multiple measurements with many precise inputs, while also conveying information about the likely intended ratings taking into account the imprecise nature of the individual measurements.

## 2.7 Settlement Systems

### 2.7.1 Historical Background

Currency systems arose before 5000 B.C. when historical records indicate that metal objects were utilized to facilitate trade between buyers and sellers [12]. In 700 BC, Lydians became the first in the western world to produce coins. The metal was used because it was available, easy to work with, and could be recycled. Soon, countries began to mint their own series of currencies with specific values. Historical reasons for currency systems include that currency enables any buyer to conduct trade with any seller without the need to directly match demanded products and services of the buyer with those products and services supplied by the seller.

### 2.7.2 Barter System

The barter system is the oldest form of economic transaction throughout history. Under this system, an individual who possessed any added value, such as a harvested crop or quantity of cattle, could exchange it directly for something perceived as having a similar or greater value or benefits, such as a clay pot or tool.

This method is excellent in its simplicity, but the ability to carry out foreign exchange transactions is limited to that which depends on a coincidence of desires [13]. For example, a farmer must find someone who not only wants the grains he produced but can also offer something in return that the farmer wants. This shortfall is what consistently gave rise to the creation of currencies in virtually every society throughout history.

### 2.7.3 Currency System vs Barter System

The main difference between barter and currency systems is that a currency system uses a combined paper or currency form as an exchange system, rather than directly trading goods and services through an exchange. Both systems have advantages and disadvantages, although monetary systems are more widely used in modern economies. Generally, the reasons for this are historical in nature, as markets for goods and services have historically been less accessible to individual buyers, and so directly brokering an exchange of goods and services is typically not as easy as using currency as a store of value that can be exchanged later.

### 2.7.4 Purpose of Currency System Instead of Barter System

Bartering systems have been used in the local community throughout history, but advances in technology and transportation make it possible for modern society to barter globally. Bartering has its restrictions, which led to the formation of currency systems. In ancient civilizations, agreed common goods, such as animal skins or salt, set out as a currency that individuals could exchange in return for goods and services [13].

Toward finding an improved moneyless settlement system, McClain and Mears [5] in Free to Those Who Can Afford It, investigated the free stuff transactions in three ideal-typical interfaces: those of the specialist, the promoter of the culture industry, and the urban poor. They articulated the importance that products are affordable to consumers, whether in the case of a professional's free-spending of income or in the case of poor people purchasing necessities. In a number of societies, free stuff can remain an important medium of exchange and frequently serves to provide substantial situational resources seamlessly to recipients. However, the poor are often left out of valuable exchange networks and thus face a considerable cost of retrieval for free stuff.

In Barter Online Network, Tran Ngoc [6], explained the barter system limitations and the problems of the monetary economy. She articulates that the most convenient method to tackle online barter is by implementing mobile application projects that conducted such operations by users or small businesses. She focused on three problems of a barter system: The problem of coincidence of needs, the problem of non-feasibility of multilateral barter, and the problem of inefficient shopping experiences. The factor of setting a value for services that can be swapped with items was not covered in her research.

These currency systems arose because of the difficulty in arranging for direct trades of goods and services on a large scale. Currency makes it easy for buyers and sellers to execute transactions without needing the perfect coincidence of supply and demand. Technology may enable more fluid access to markets that can solve this problem and eliminate the need for currency in service transactions.

## 2.7.5 Types of Money and Their Role In Transactions

The four most important types of money are commodity money, fiat money, fiduciary money, and commercial bank money. Commodity money depends on commodities of substantial value that act as a medium of exchange, preservation of values and accounting units, for example, gold coins and beads. Fiat money, on the other hand, derives its value from a government order, its intrinsic value being significantly less than its appearing value. Therefore, the value of fiat money derives from the relationship between supply and demand [14]. For example, currencies and notes issued by governments with no direct commodity backing represent fiat money. Meanwhile, fiduciary money depends on its value, on the belief that it will generally be accepted as a medium of exchange. The issuer of the trust money promises to exchange it again for a commodity if required by the holder. Examples of this include checks, invoices, and drafts. Finally, commercial bank money can be described as claims against financial institutions that can be used to buy goods or services.

## 2.7.6 Modes of Transactions of Money

- Direct method: In this method, the buyer and seller exchange traditional banknotes for each commodity or service.
- Cheques and Demand Drafts: In this method, a cheque is deposited in the recipient's bank, and the money is received through a payment processed by a clearing office. The demand draft is signed by a banker to ensure that there are enough funds for a successful transaction.
- Debit and Credit Cards: Debit and credit cards can be used to make online purchases and over a store's counter.
- UPI Applications: A virtual payment address helps buyers and sellers to send or receive money without accessing any bank-related information through applications related to our mobile numbers and bank accounts.
- Mobile Wallets: Mobile wallets allow costs to be charged to your mobile wallet, which can be used wherever it's accepted. This adds an additional level of security protection because the wallet is not linked directly to the buyer's bank account.
- ECS: ECS is a convenient method of making wholesale payments, e.g., service bills, wages. ECS can be used for debit and credit services.
- QR Codes: QR codes are an addendum of mobile wallet payment services. Buyers and sellers simply scan the merchant service code to complete a transaction. This will require a smart device with a camera and a scan function.
- Net Banking: Net banking is a substitute for debit or credit cards. The user must log in to the net bank account to approve a payment.
- Gift Cards or Vouchers: Gift cards are a practical way to spend money and are a great idea, as the recipient can decide what they would like to buy with the card. One benefit of gift cards is that there is no link back to the recipient's bank account, and so the risk of loss is low.

## CHAPTER 3

# Exploratory Study

All stages in this research follow a quantitative and qualitative approach. The research in chapter two was based on literature review and related work to determine prior work that can serve as the basis for a deeper understanding of the topics at hand.

The researcher in chapter three will focus on data collection. Two methods were used to collect data for later analysis: questionnaires, and interviews.

The analysis of the collected data will form the basis and the methods for implementing the project. Specifically, based on these data, a fuzzy logic controller will be proposed to generate a fair rating system. The data collected and analyzed through these various methods will boost the design of the application to maximize its ability to overcome the problems that have been discussed within, and will additionally evaluate the success of the application in achieving its goals.

## 3.1 Data Collection

In order to progress the research into the issues discussed, two methods were utilized. Questionnaires were conducted to establish the optimal rating systems and to analyze potential moneyless settlement systems. Additionally, a structured interview was conducted with a service provider to collect more data.

## 3.2 Questionnaires and Interviews

### 3.2.1 Rating Systems Questionnaire

In order to understand the general impression of consumers toward various rating systems, a questionnaire was conducted on 41 people. The questions were structured to determine the most important elements for people in performing ratings of businesses. The first section was a frequency scale system that evaluated the typical behaviors of consumers when performing ratings.

The most surprising finding was that the number of people that perform an actual review after every service was only 2.4% according to the survey. This was contrary to the literature review, which indicated that this number would be much higher. In contrast with this, 63% of respondents

said they rarely perform a review. When analyzing this subset of respondents individually, we note those same people chose the rapidity of the process as the most important factor in whether they perform a review, with other factors such as flexibility of choices, variety of choices, and authenticity being less important.

The next portion of the questionnaire sought to understand the issues with existing rating systems that prevent users from leaving ratings on services they receive.

In general, users focused on three major things as barriers to leaving ratings. The first was the need to sign up to perform a review. The second most pervasive issue was the timing and slowness of submitting the review.

Finally, the third issue was that previous experiences leaving reviews had not resulted in the respondent getting a response from the establishment or service about the review. The first two items essentially point to friction in providing a review as the primary consideration. Any difficulty in leaving a review, from needing to fill out a web form to encountering a loading screen is likely to result in the user abandoning the review. The third issue gets at the value from the customer's perspective in investing their time into providing feedback. If no response is ever received to negative feedback, then a customer may simply not bother.

The final section of the questionnaire posed questions about potential improvements to existing rating systems. In the improvement section, people tended to mention performing reviews quickly many times, which concludes that one-click ratings like thumbs up and down would be a game-changer for many businesses. This is consistent with the previous finding that reducing the friction associated with providing rating is of utmost importance. In order to receive a descriptive text, many survey responses remarked that they would like an incentive to put the effort into type out a review. Again, this is consistent with the previous finding that consumers are looking for a value proposition to put effort into a rating. This could take the form of a direct incentive for an honest rating or alternatively could involve the business rectifying any issues with a negative review. One interesting bit of feedback was that setting a method to contact the manager or owner of the business directly once you have been established as a regular reviewer would be invaluable. This could increase the probability of receiving a response from the manager and getting any problem with the service solved.

The questionnaires are captured in full detail in Appendix A.

### **3.2.2 Settlement Methods Questionnaire**

This questionnaire was about the method of exchange using items or skills as a settlement method instead of monetary transactions. This questionnaire was issued to potential business owners, who deal with customers and transactions on a daily basis, towards obtaining the optimal results. Yet only twelve contributors answered the questionnaire. Most of them state that they use cash and credit cards as a settlement for their business. Priorities preferred in the survey include the security and rapidity options over simplicity and flexibility of use. Key findings of the survey are as follows:

Over 90% of respondents state that they like the idea of service exchange based on a certain scale of measurement that can be adjusted to the value of each service. Those who like the idea proposed to give services like “French lessons, gadgets, some unused goods, gardening, and other competencies.”

The complete questionnaire can be found in Appendix B.

### **3.2.3 Settlement Methods Interview**

Due to the situation with the general pandemic of COVID 19, the author was not able to host one on one interview with service providers, but was able to secure one online interview with a service provider:

The discussion mainly was about the exchange settlement method, and the interviewee welcomed the concept very much and showed an interest in using it and spreading it around if a platform for such exchange existed. The interviewee highlighted a significant point that was mentioned earlier in one of the questionnaires. The idea seems promising but only if we set a value or a scale of measurement that establishes the relevance between the two parties. For instance, a highly coveted and marketable skill such as performing electrical work should command more in-kind compensation than a more common skill set such as providing transportation or dog-walking.

The complete Interview can be found in Appendix C.

## **3.3 Rating System Evaluation Criteria**

The evaluation of the rating system will be conducted using both objective measures and subjective measures. The objective measures utilized will seek to establish that the rating system is acceptable in providing accurate and fair measurements given the available data. The subjective measures seek to establish whether actual users believe that the rating system is superior to existing alternative systems.

For the objective rating criteria of the rating system, the designed system must pass several checks. First, the individual rating inputs from the customers will be analyzed to ensure they are not redundant. This is demonstrated by reviewing the correlation between these individual ratings. If ratings are highly correlated with each other, as measured by the  $R^2$  value, then the ratings are redundant and do not provide significant additional information. The first rating will be compared against the second and third ratings collected to ensure that  $R^2$  values are no higher than 0.8. If correlations exceed this benchmark, then the ratings will be considered to add too little new information to the rating and will be removed from the system as redundant.

The second check will validate that the rules applied to the ratings do not create any systematic biases or inconsistencies. This is readily established by plotting the weighted model and the fuzzy logic controller model outputs against the simple average rating outputs. To pass the evaluation criteria, this plot should show a correlation coefficient and should have no significant obvious bias

between the ratings calculated using a weighted method or rating calculated using the fuzzy logic controller method.

Finally, the fuzzy logic control model needs to be validated to ensure it is not introducing systematic bias by estimating the rating from only 2 user inputs. This will be accomplished by establishing reasonable ranges for final rating calculations based on user input. For each observed individual user rating observed, all occurrences of that specific numerical rating will be collected in a set. The fuzzy logic controller outputs will then be compared against the other methods. All points are expected to fall within this range or be clear outliers that can readily be explained away due to unique circumstances.

Upon clearing these objective criteria, the rating system will be considered valid, and a subjective analysis will be conducted to determine if the rating system is desirable. This will be studied via analysis of user comments. User comments will be collected for ratings computed using the weighted method versus the average method versus the fuzzy logic controller method and similarly, will be collected for ratings computed using a simple average as a benchmark. Comments will then be tagged as either positive in nature or negative in nature and will be allocated to categories relevant to the merits of the rating system. These categories include Fairness, Understandability, Benefits to Employee, Sensitivity to Inputs, Accuracy, and Uniqueness.

The subjective analysis will then compare the merits of these methods to establish the relative strengths and weaknesses of each. If, on the whole, one rating system receives more positive feedback than the other, then it will be considered subjectively superior. If there is a combination of attributes from each method that is better than the other, while the opposite is true for other attributes, then this will be discussed to determine if reasonable rationale can be established for the use of one system over the other in certain design cases.

## CHAPTER 4

# Fair Rating and Service Exchange Systems

## 4.1 Fuzzy Logic Modeling

The researcher identified a practical need for a method that can compute a percentage user rating that preserves fairness within the proposed rating system. A fuzzy logic controller model was investigated to fulfill this need.

The main objective of the proposed model is to compute a fair rating grade for each service based on three conditions, the first rating, which is compulsory, the second rating which is the efficiency rating, and the third rating which takes place after performing the service. Fuzzy logic controllers process user-defined rules and dominate the target control system. They can be reformed easily to progress or boost system performance. By defining suitable rules, new beams can be easily generated into the system.

The semantic rating symbols of the proposed model are explained briefly in the following subsections:

- **The approval rating (compulsory ) AR:** The first data input of the fuzzy controller, which requires the user to rate the business by accepting the service task. This rating is compulsory.
- **The level of the labor efficiency ER:** The second data inputs which basically demonstrate the level of the labor efficiency performing the requisite work by moving a scroll from 0 to 100. This rating is optional.
- **The subsequent rating with descriptive text LR:** The third data inputs, where the system will send a push notification to the client after twenty-four hours of completing the business transaction, requesting that they perform a simple stars review and compose free text comments that adequately explain the experience to help other clients to help them to choose the right service provider. This rating is optional.

Table 4.1: Semantic rating symbols and characterizations.

Semantic Rating Symbols	Characterizations	Notation
Approval Rating	First compulsory rating	AR
Efficiency Rating	Second optional rating	ER
Subsequent Rating	24 hours later rating with text	LR
Final Rating	Final rating after defuzzification	FR

By incorporating some popular concepts of rating attributes from rating scales and models, we specify five simple characterizations of the service in the rating process. These characterizations, which are referred to as linguistics variables are composed to cover a rating measurement from “very bad” to “perfect” in a non-numerical form. According to the definition of Zadeh [20], a linguistic variable is a variable whose values are words or sentences instead of numbers, and where these words are defined on the full domain from [0, 1]. The five variables are distributed to cover the rating scale from a very bad to a perfect experience, as shown in Table 4.2.

Table 4.2: Linguistic Variable and Degree of Rating for Each Variable.

Linguistics Variable and Degree of Rating		
Rating Symbol	Variable	Assigned ratio out of 100
Very Bad	V	0 - 20
Bad	B	20 - 40
Average	A	40 - 60
Good	G	60 - 80
Perfect	P	80 - 100

The selection of these five categories is arbitrary in nature but serves an important purpose. Translation of a numerical rating to a linguistic variable allows users of the rating to determine the context for ratings which are separate from their perception of the difficulty of the rater’s grading process. In some ratings, a 50, for instance, maybe perceived as an average rating which is achieved by most businesses. Other raters, however, may perceive this is a significant failure, invoking an understanding learned in grade school that half credit is totally unacceptable. Translation of numerical ratings to linguistic variables helps the rating system to calibrate user expectations about how to interpret numbers. Similarly, it helps users who are performing ratings to understand how to rate services in a way that will be commonly understood with the users of those ratings.

Furthermore, these linguistic variables provide a future means to calibrate the system based on actual user behaviors. Once such a system is live, data collection efforts can be completed on actual rating data to determine if users who gave certain numerical ratings feel that the linguistic variable is reflective of the actual user experience. If this type of investigation ultimately determines, for instance, that a “Perfect” experience nearly always has a rating between 80-100, or that users who provided a rating of 40 felt that the service provided was “Very Bad”, then the scale can be altered after the fact to calibrate to these actual user experiences without manipulating raw user data. This adds significant flexibility and utility to the system.

#### 4.1.1 Fuzzy Logic Operator and Rules

Fuzzy logic is the method of computing based on the approximate value more than the binary values of (1 or 0) Boolean logic. For our model, we consider X to be a classical set of all inputs, which is the universe set, whose generic elements are denoted x.

$$\mu_A(x) = (\alpha_1, \alpha_2, \alpha_3)$$

Most of the rules are applied to users who receive more than one rating per service. In the event that the customer receives just one rating, the final ranking will be determined on the basis of the compulsory rating. Considering that the second and third rating techniques are non-compulsory, the user final rating will be computed using the logic controller once the user received a second rating technique. Afterward, the score will be computed and updated with the third rating if it occurs. Figure 4.1 describes this concept.

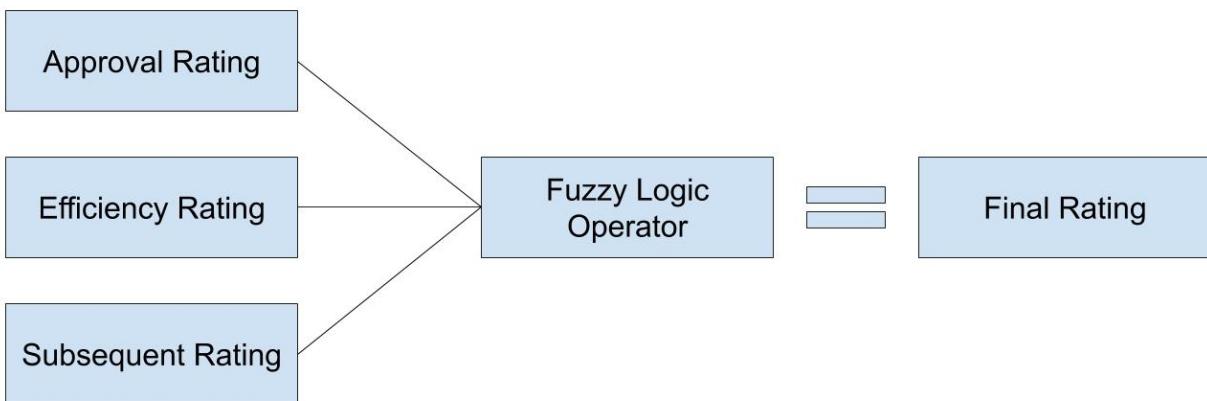


Figure 4.1: Fuzzy logic mechanism

The philosophy behind this procedure implies the purpose of this research which is to grant an equitable evaluation for each user from other authentic users. This method safeguards the equitable nature of ratings by offering numerous rating methods and a sufficient period for customers to evaluate the service they received. It is worth emphasizing that this approach leads to a significant number of potential fuzzy logic rules and, in consequence, the use of the fuzzy logic operator applied with numerous rules, is able to solve the problem of fairness between clients and services.

The fuzzy rules for this model are based on a conditional statement of T-norms which are operations that generalize the logical combination and logical division of fuzzy logic. They can be also limited to a measurable subset of the set interval.

Figure 4.2 demonstrates an example of a triangular norms degree of rating.

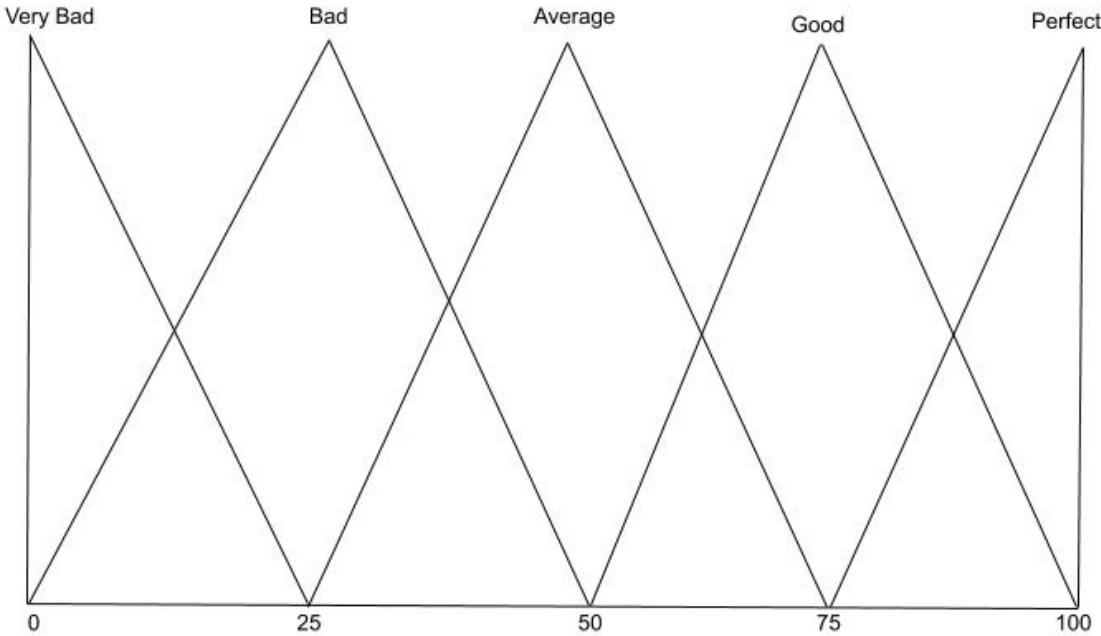


Figure 4.2: Triangular Norms of Degree of Rating

#### 4.1.2 The Fuzzy Controller Rules

The fuzzy rules indicators and structures compose the total rating of the user evaluation, these rules are designed based on the model conditions “IF, THEN” Followed by a fuzzy logic operator and the values set for defuzzification and computing to words. In this model, fuzzy rules are used to calculate the most equitable rating degree for each user. The rules are divided into two stages. The first stage determines the primary rating in case the client decides to rate only using two methods and does not later complete the third rating. Once the third rating is performed, the second stage occurs in which the results of this new rating are submitted to a new rule to finalize the final rating.

The first stage focuses on both the acceptance rating input and the second rating, which could be either of the non-compulsory rating options available. These rules are commutative meaning that if the client only performs the subsequent rating technique which is available only after 24 hours, it will be counted as the second rating method, and so the total rating should be the same as if the user had completed any of the non-compulsory ratings first.

Several other considerations must be considered in defining the fuzzy controller rules. The threshold for the rating is a score of 20, as opposed to zero. This serves as proof that the service was completed and accepted, but the user felt the job was done in a very bad way, such that it was only marginally accepted and deserves the lowest rating possible. The rules using common sense to provide a reasonable final rating when two ratings are provided can be found in Table 4.3.

In the case were the three available rating methods are used by the user, we assume that the third rating is the most significant since it is performed 24 hours after the services have been accepted. This means that the client and the server are not likely in direct contact anymore. This means that the client is more likely to write his or her truthful opinion.

Considerations here include that service providers have been known to intimidate buyers by directly overseeing them providing a rating at the close of performing a service, or even by offering on-the-spot monetary incentives for a 5-star review. Both of these tactics mean that the instantly available service rating may be subject to manipulation and should be weighted less in the final model. Since creating meaningful rules for any possible combination of three linguistic variables with five possible values would result in a too complex set of rules, and considering the latter consideration, the author proposes, as a solution to ensure higher importance of the third rating (the rating 24 hours after the job was performed), to compute the final rating as a weighted average of the three provided ratings. We decide to set a weight of 30% for each of the first two ratings, and 40% for the final rating. This accounts for the more equitable, trusted, third rating being more important without making this rating weighted so high as to make the other ratings inconsequential. The following pseudocode summarizes the proposed process to aggregate the ratings provided by a single person in one single final rating:

```

IF number_of_ratings == 1:
    Return rating1
ELSE IF number_of_ratings == 2:
    Return fuzzy_controller(rating1, rating2)
ELSE:
    Return 0.3 * rating1 + 0.3 * rating2 + 0.4 * rating3

```

As an example of this calculation, a user who inputs three ratings of Good, 70, and 4 Stars, where "Good" will be interpreted as "80" and 4 stars as "80" and it would be calculated as follows. The initial "If" statement would be bypassed since the number of ratings is not 1. The "Else If" statement would be further bypassed, as the number of ratings is not 2, and so the fuzzy controller would not be used in this case. The final "Else" statement would be entered, calculating the rating as:  $0.3 * 80 + 0.3 * 70 + 0.4 * 80 = 77$ .

Implementing the model simulation was done using the Matlab fuzzy-logic toolbox, by adding the Inputs into a numerical value and submitting it to the fuzzy controller implication methods, to aggregate all outputs for defuzzification and generate a final rating.

Assessing these rules against the above considerations provides confirmation that the model is valid. The lowest rating achieved is 20, which is the stated goal. Additionally, in the case of each row within the table, the reader will note that the reciprocal of any given rating is not shown. For instance, even though (B, A) is shown, (A, B) is not shown. This is because the ratings are commutative, so the final rating associated with either of these inputs is the same.

Finally, it can be observed by inspection that the ratings produced by the model are reasonable. For instance, in all cases where Rating 1 and Rating 2 are the same, the final rating is also that same, as an example (B, B) yields a B final rating. Similarly, where the average rating is obvious, the appropriate average rating is given. As an example (B, G) yields a rating of A.

Table 4.3: Fuzzy logic controller rules, based on the linguistics variables.

<b>Fuzzy Controller Rules</b>			
<i>First Stage</i>			
<b>Rule#</b>	<b>Rating 1</b>	<b>Rating 2</b>	<b>1st.FR</b>
1	V	V	V
2	V	B	B
3	V	A	B
4	V	G	A
5	V	P	A
6	B	B	B
7	B	A	A
8	B	G	A
9	B	P	G
10	A	A	A
11	A	G	G
12	A	P	G
13	G	G	G
14	G	P	P
15	P	P	P

## 4.2 Aggregation of Total Ratings

Based on the final rating value, the final rating will describe a value between 20 and 100. A method must be established to aggregate this value with other values from other customers. Since it is presumed that no individual customer rating is of any more importance than any other customer rating, a simple average is sufficient to aggregate these ratings together to provide the total rating of the service provider. An example of this aggregation is given in Table 4.4.

The fuzzy logic controller model ensures that the data being aggregated represents a fair evaluation of the service provided, based on several rating criteria. Additionally, the method allows for other inputs from raters, such as text inputs. This allows future raters to review the aggregated total rating as a method of quick screening, and then to dive into the details of initial ratings. This provides reviewers with knowledge of how involved the seller is in the community, how efficient the service was, and what experience they can expect.

The aggregation of multiple ratings based on the fair fuzzy controller model provides the opportunity for the service provider to receive a fair and impartial evaluation not driven by individual instances of poor performance. In the example above the user, despite having an average and bad

Table 4.4: Aggregation of Total Ratings 1.

Clients	Individual Rating	Closing Evaluation
Client 1	G 70	
Client 2	A 60	
Client 3	B 40	
Client 4	G 75	
Total Rating	245 / 4	61.25 = G

review maintains a “Good” rating due to the high good rating in his final rating. This can be tied not just to any ratings of “Good” “Good” “Average” and “Bad”, but instead to the specific numerical values behind those ratings. For example, in Table 4.5, a user with the same linguistic variable assigned ratings is actually rated average because the numbers behind those linguistic variables, as determined by the fuzzy logic controller are less favorable. The rating can even be constructed which translates the same linguistic variables to an overall bad rating if the “Good” ratings are very marginally good, and the “Average” and “Bad” ratings are very close to the bottom of their ranges. This demonstrates that the aggregation model is preserving the detailed feedback provided during the multi-phase rating evaluation by individual raters, and using this as context to determine the overall aggregated rating for the service provider.

Table 4.5: Aggregation of Total Ratings 2.

Clients	Individual Rating	Closing Evaluation
Client 1	G 61	
Client 2	A 45	
Client 3	B 25	
Client 4	G 62	
Total Rating	193 / 4	48.25 = A

### 4.3 Classification Methods

Recent signs of progress in our understanding of the development of technical and technological systems emanated from the theoretical conceptualization, the active relationship between the ideas of innovation gathering and networking. The idea of community or local organization of related activities is hardly new. It was indeed raised by Alfred Marshall at the origin of the industrial district [15] where he indicated the needs of the manufacturers to be close to the resources on which they depend. Localization is particularly related to physical conditions (such as climate, soil, mines, quarries, access to land, or water). The same idea was subsequently developed by other scholars such as Dawkins [16].

The absence of a precise definition of clusters together with problems in classifying the location of activities has led many economists to develop two elements of clustering definitions. To begin with, clusters are established by connected activities. Second, clusters are geographically neighboring groups of interlinked people and organizations.

For the sake of this research, we will focus on clustering geographical communities of inter-linked individuals and organizations based on their postal code. For the targeted services to be connected on the app, geographic proximity is likely to correlate to a large extent with buyers and sellers matching in the provision of services. Due to this, the postal code is the optimal proxy for determining whether buyers and sellers are a likely match.

Furthermore, tying buyers and sellers to each other geographically by postal code adds consistency to one of the goals of this research, which is to support our communities and our surroundings including small local services and businesses within these communities.

## **4.4 The Mechanisms of Moneyless Transaction**

While many systems that provide for online payments have been developed in recent years, utilizing the typical procedure to settle payment by either cash or credit cards, online payments remains a controversial matter due to numerous reasons. In particular, certain consumers have concerns with current payment schemes, including availability, accessibility, and above all security.

Security is likely the most common concern among those who are hesitant to use online payment systems. Introducing money into a transaction increases the risk of theft and fraud. Many methods of payment could leave payers who are not savvy enough to protect themselves as victims of identity theft or other scams. Furthermore, recent cybersecurity attacks [17] have proven effective in breaching the security protocols of even the most trusted institutions, calling into question whether payment methods truly are safe. A large segment of the population is still at the novice level in terms of using the internet for daily life, and this same population is the most viable target for nefarious individuals looking to commit fraud. Nonetheless, these individuals still could benefit from the ability to quickly and easily connect with service providers.

Accessibility also proves problematic in certain payment schemes. Credit cards add another level of difficulty to bookkeeping and accepting credit cards may be an extra monthly expense in most cases. Additionally, credit cards pose risk to the service provider, including risks like charge-backs and fraud. Settlement via smartphones seeks to enhance certain aspects of these transactions but still does not solve the accessibility problem. Many people do not have smartphones or can not manage to use a mobile payment system.

Finally, availability is a hassle. Many of the problems within our society can be tied to the least economically advantaged people not having the means to pay for even the most essential of products and services. This leads to bad outcomes, such as crime, increased welfare expenses, and poverty. In some cases, these individuals may not be capable of holding down a conventional job that allows for regular income, but they nonetheless have skills that could be valuable to the right

buyer.

This provides an opportunity, where transactions utilizing conventional currency have failed. For example, a retired couple may want to paint their house, but cannot afford it. A suitably designed system could help them to get the service completed by offering a few hours of their unique skills as an exchange. French lessons could be an example.

Such a vision requires the ability to exchange products and services between two or more parties without involving the utilization of monetary transactions. It must provide for an efficient means for personal and natural resources to be efficiently allocated and utilized to satisfy the wants of society without involving waste. Furthermore, this service must be an effective way for companies and individuals that appreciate a mutual benefit in exchanging goods and services.

#### **4.4.1 The Proposed Novel Settlement Method**

With the scale of business markets getting larger and larger, market participants, small businesses, and independent laborers show an interest in the modern ethical and communal innovative method, that minimizes the indulgence of our consumption and grants us the possibility to exchange our unused items for a service that we require or even to use our skills to obtain items that we desire but can not afford.

The feedback from the questionnaire and interview focused on establishing a scale of measurement to equalize the exchange and make it as fair as possible. This is one of the functions that currencies typically provide in monetary transactions. To solve this problem, the researcher proposes the idea of creating a points system that can replace monetary settlement and can be a substitute in communities between users when some people can not afford a certain service.

This points-based system will be homogenous and will match a more conventional monetary system also implemented within the application. The implementation will focus on a novel method that encourages participation within the local community by encouraging buyers to hire services from within the same community.

To accomplish this, we propose a new scheme where the business owner and independent labors offer a certain time or a package of services to their community, where they perform the job for certain points values, each service provider can assign a certain total of his business time to his community citizens, indicating a simple number of points that he can exchange for other services or items from the same community or any other community.

The proposed new settlement technique will be applied in the “Live Work” smartphone application as an option of settlement besides cash.

## CHAPTER 5

# Design and Prototyping

Creating an effective design requires developing a stable foundation. The design should leverage proven information architecture and patterns, intelligent interaction, and navigation systems, along with Peer-to-peer self-organizing algorithms that facilitate direct communications between users.

Additionally UX and UI design must carefully incorporate best practices to create a visual representation of a straightforward to understand and easy to use wireframe prototype. This will ensure smooth adoption by members of a community looking to participate in the transactions that the application means to facilitate.

This wireframe design must be completed during the conceptual level of the mobile app development process. The layout must ensure real user concerns and desires are incorporated, considering people's normal habits, and meeting user needs for security, privacy, and transparency.

## 5.1 Persona and Scenario

Thomaz and Filgueiras [19] defined a persona to be a combination of realistic representative sets of information which can include various details for each persona to achieve an accurate characterization. In this project, the author defined two types of personas, client, and service provider.

These personas are utilized to craft user interfaces that uniquely meet the information and input requirements for each type of user role. For the sake of this study, each persona is described with multiple assumptions, to be used in analyzing potential vignettes for the use of the platform.

### 5.1.1 The Client Persona

- Background: The client represents a user that can be male or female, from any age over 18 years or older. The client could be any profession, but for the sake of this research, we will assume he is male and a lawyer. We also assume that the client resides in Switzerland. Based on his occupation, the client holds a great understanding of Swiss law and based on his country of residence, most of his clients are Swiss citizens. He does not have much experience in household jobs. For the purpose of this project, we assume that the client is married, and shares domestic responsibilities with his wife, who maintains a full-time job as well.

- Goals: Keep his family healthy, fix anything in his house quickly, enjoy the quiet weekend with his family.
- Challenges: Time management constraints (working five days a week and 10 hours a day). The wife is also working, during daily business hours. Difficulty finding time to take care of issues with the house means that the client must trade-off between leisure time and getting issues around the house resolved.
- How this project will benefit the client: Provide a repair service at any time of the day, with less complexity and with an adopted time frame.

### **5.1.2 The Service Provider Persona**

- Background: The service provider represents a user who can be male or female, of any age over 18 years old. For the sake of this project, we make several assumptions about the service provider, including that he is male, lives in Switzerland, and is a plumber certified by the state as well trained in his profession. Generally, he performs work within his community plus two other communities nearby. The provider accepts cash and an exchange of services in exchange for the provision of plumbing services.
- Goals: Earn more money, exchange services with others from the same community, build a recurring customer base based on a high rating of services provided.
- Challenges: Prefer to work within his own community and near his home, spends time quoting work for potential customers who decide they are unable to afford the services and have very limited ability to advertise and grow the customer base, instead of relying mostly on word of mouth.
- How this project will benefit them: Job opportunities, getting to meet his community, a wide swap of services, access to customers who would not otherwise find him.

### **5.1.3 The Scenario**

The scenario is a brief story or vignette that demonstrates how and why the personas would use the application to perform a specific task in a certain context. Numerous scenarios could be written using our defined personas. For our purposes, the following example was presented.

The Client gets home and finds out that there is a problem with the hot water in his house. He opens the “Live Work” application and searches for a nearby plumber who is available. The database of the app contains a huge number of service providers and can allocate the nearest desirable service to the client. The system algorithm specifies some plumbing service providers based on their location, availability, and other different filters based on criteria specified by the client. This could include, for example, filters based on prior customer ratings.

The client chooses a service provider and requests a quotation to assess the situation and perform the required repairs. The service provider accepts the job within the application and proceeds to the client's house address. Once the task is complete to both parties' satisfaction, the client will accept the job within the application and perform a rating. While the client intended originally to pay with cash for the repairs, he and the plumber get to talking while he oversees the work being completed. It turns out that the service provider has actually been in need of a consultation with a lawyer regarding the legal incorporation of his business, a service that the client also provides within the "Live Work" app. When it comes time to decide on a payment for the service provider, the client and service provider agrees that the client can draft articles of incorporation for the service provider's business, rather than paying cash. The lawyer completes this task, which settles the transaction within the application's point-based system.

In addition to the application providing convenience to the client in getting his service completed in a timely manner, the settlement method also adds value to the transaction. The lawyer is able to complete the articles of incorporation in half the time that it would have taken him to collect the parts and attempt to make the repair himself, while the plumber avoids the need to seek out a lawyer to help draft his businesses articles of incorporation altogether, saving time and allowing him to fit in another job for the day. The client saves the money that he would have spent on the plumber to be used to treat his family to a nice meal the next weekend.

## 5.2 UX and UI Wireframe Prototype

Dealing with peer to peer geolocation design can be very tricky since you must include third-party providers such as Google maps, and money transaction companies, such as Paypal, in addition to adopting user standard behaviors and cultural habits. This complexity makes it necessary to iterate designs to evaluate and choose the final design before the development stage in order to include the most substantial factors that can promote this product.

Navigation is one of the most important elements in this process. This is the foundation from which the user will experience their first interaction with the application before diving into the other uses for the application. From this aspect, the main navigation in the UI should be incorporated into the main theme of the application and be consistent and easy to navigate throughout. This includes extending the UI to the screens which match users via Geo-location. Based on this, the decision was made to make the landing page be the actual geographical positioning beside the main tab bar with universal icons. This visual look and feel set the tone for the entire user experience, from setting the configuration and extracting an appropriate directed response through enhancing usability and personal satisfaction. The UI design of "Live Work" is a highly creative process requiring the formulation of a coherent and consistent visual global design.

## 5.3 Design and Specification

Live Work is a user geo-positioning application that matches buyers and sellers based on geographic location. A flow of a sequence of steps that guide the user through the process of exploration of a huge database of services is inherent within the application user interface. It must filter many options to concentrate the client's decision and must present controlled navigation such as clear search technique, intelligible user profile, swift and simple rating procedure, and comprehensive affordable settlement methods.

The landing page requires the spirit of the geo-positioning concept, which indicates the correct live position of each user, in addition to the searching mechanism which is the entry point to the main component of this application. Figures 5.1-5.2 explain these points using the Balsamiq wireframe.

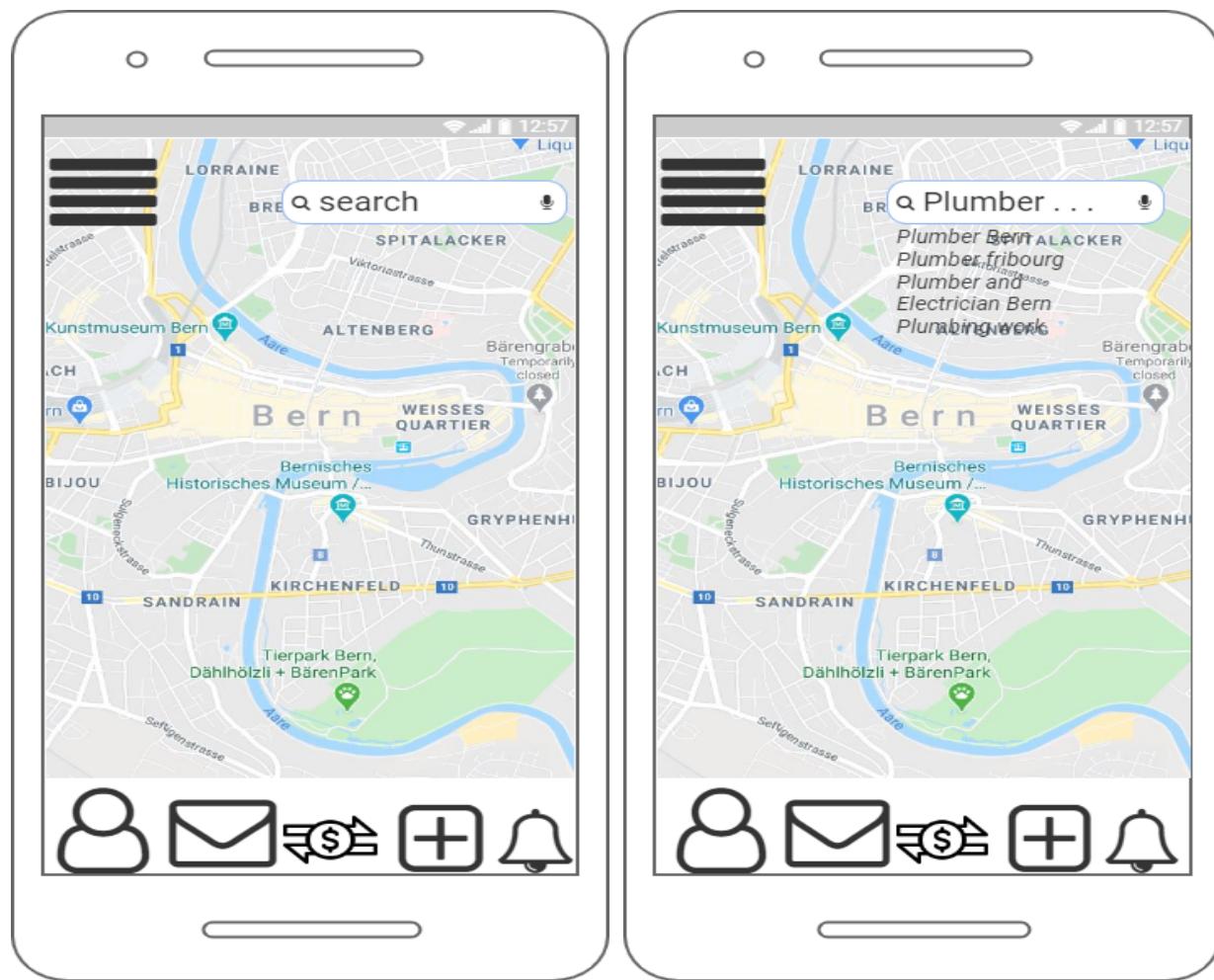


Figure 5.1: Application Home Page

The user profile will demonstrate most details about every service and user, including ratings from other users, community followers, and the actual location. This is shown in Figure 5.2.

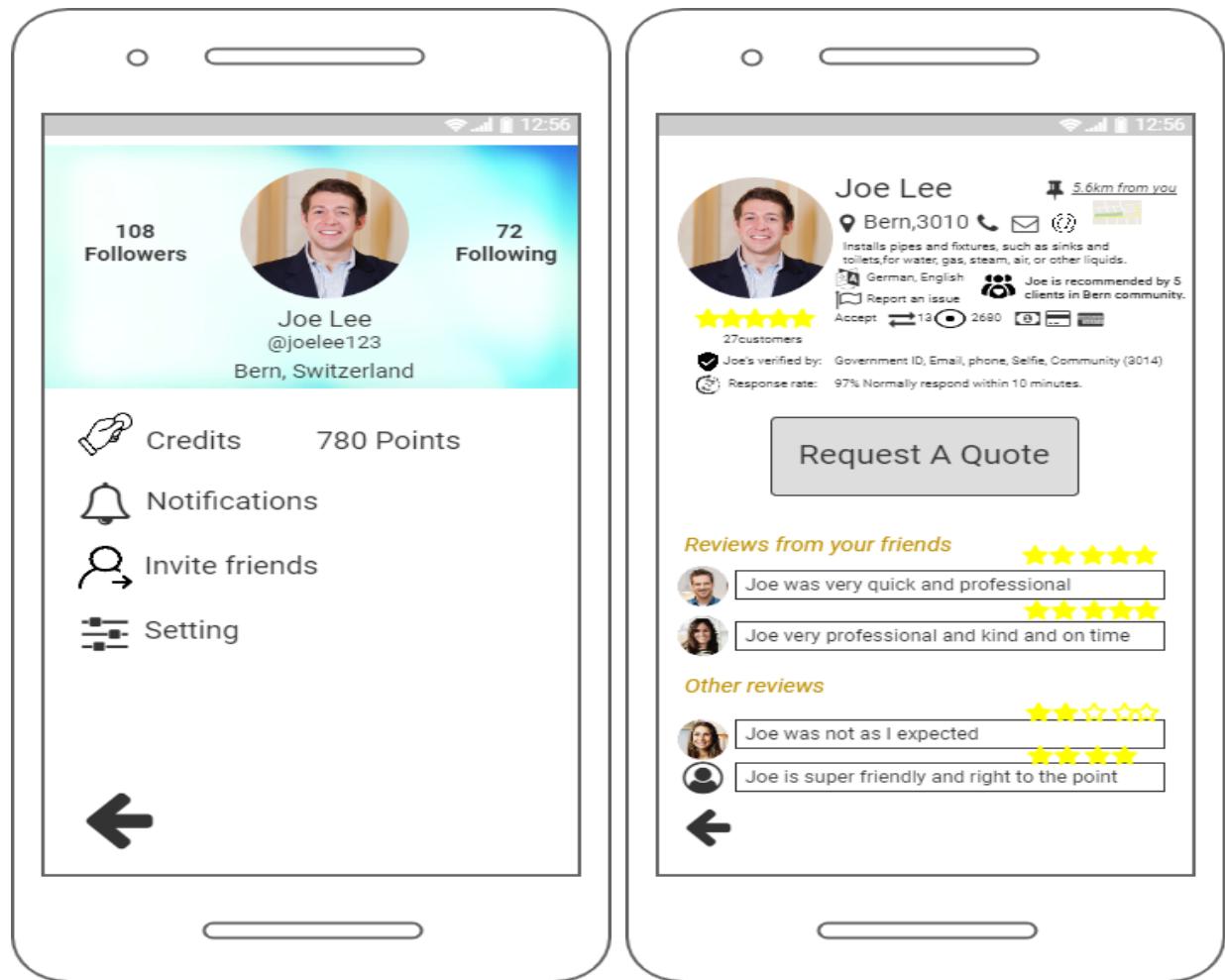


Figure 5.2: User profile

The phase of requesting service must have all the necessary inputs to describe a problem for the service provider to bid a solution to. This includes exhibiting possible payment methods and time schedules. This is shown in Figure 5.3.

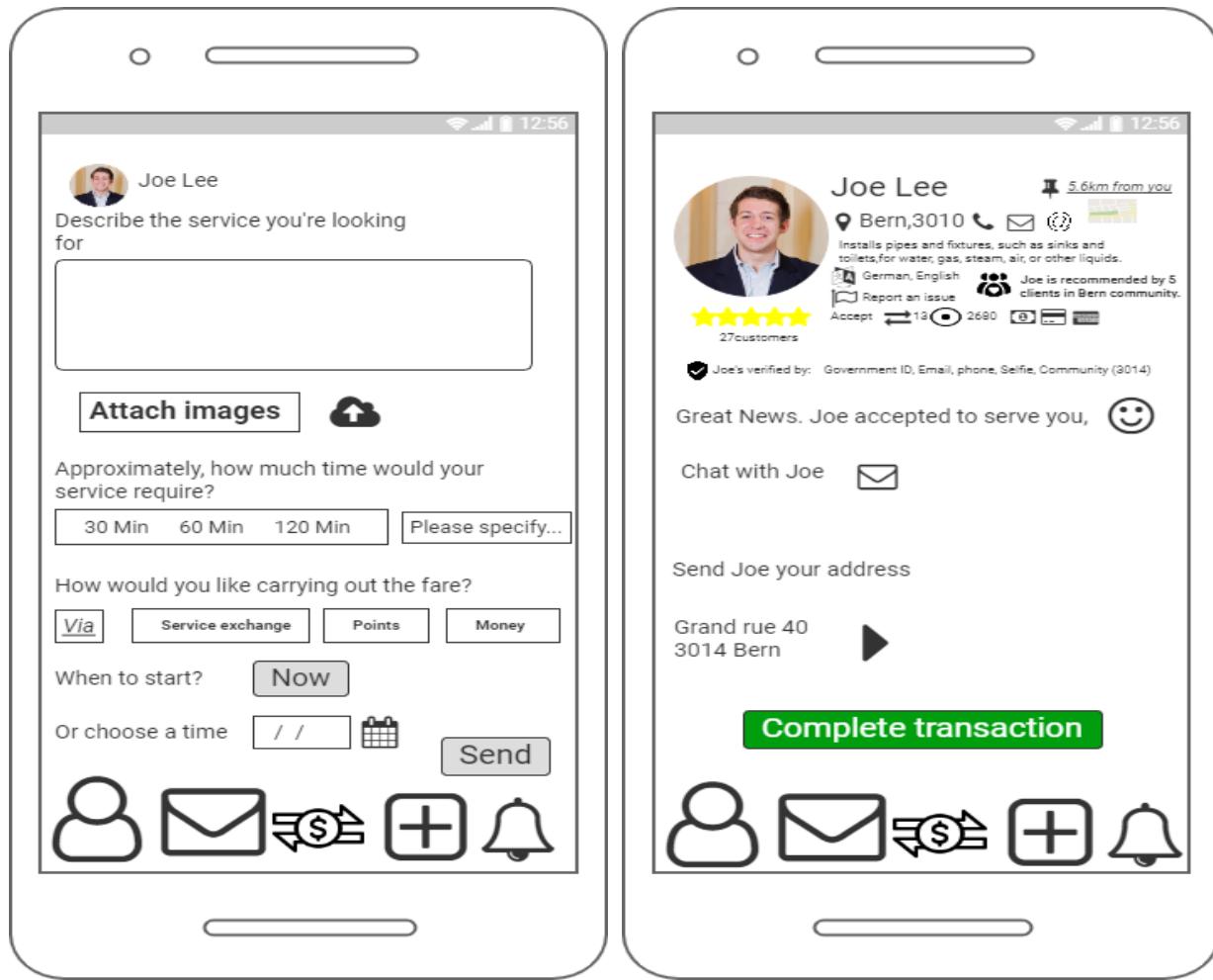


Figure 5.3: Requesting a service

## 5.4 Rating Methods

In attempting to achieve fairness in rating each user, and to deliver the optimal wireframe design for development, three rating techniques were designed and implemented using Balsamiq [18], a high-fidelity wireframe digital tool used to create and test prototypes before development. Unfortunately, Balsamiq does not provide the most suitable tools to interact with the layout, but these points will be taken into consideration during the evaluation process. The design and specification for the initial prototypes have been developed to guide the development of these prototypes. The design of the first rating technique, which is mandatory to accept the received service, is shown in Figure 5.4.

For the second rating, users are asked to optionally rate the efficiency level of the service

## Do you accept Joe's work?

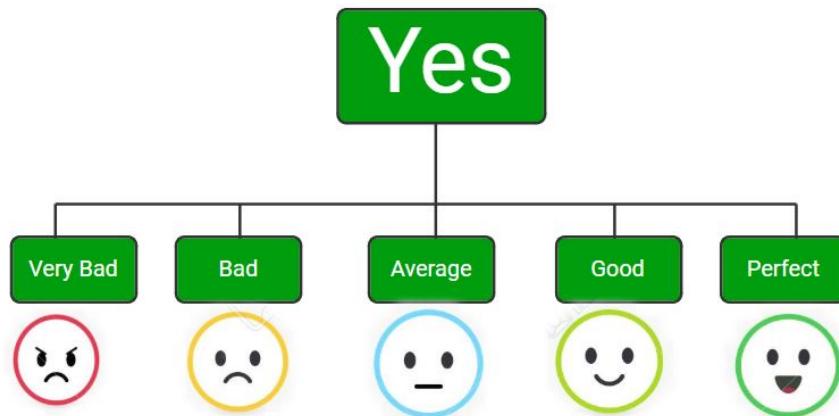


Figure 5.4: Accepting the Completed Job

provider. This optional rating step will present a scale of a ratio that symbolizes the value of the service efficiency level, including a set of five characterizations from very bad to perfect. An example of this can be found in Figure 5.5.



Figure 5.5: Efficiency Level Ratio

The third rating technique will take place twenty-four-hours after the service has been accomplished. The user will receive a push notification that asks him or her to give a rating with descriptive text that explains how the service went. This step will be optional, similar to the second step. Figure 5.6. shows an example of the third rating technique.

These criteria will make up the inputs of the fuzzy controller described within this research, which will make up the final rating for the service provider.

Additional rating methods referred to as the community criteria will not be included in the fuzzy logic controller computation for the final rating. These are intended to provide more context, such as a written narrative, that can further help future buyers to understand and interpret the ratings, and it is presented to the user as in Figure 5.7.

Write Joe a review



write a review . . .

Would you recommend Joe to  
Bern community?



Figure 5.6: Review form

Figure 5.7: Community Classification

## CHAPTER 6

# Evaluation and Results

To perform an evaluation, the author will perform a controlled experiment on twenty-seven people utilizing the prototype application. Each person will be provided with instructions about how to utilize the application within a specifically designed scenario. There are three scenarios in total, which are completed respectively.

Study participants were asked to provide a variety of demographic information, and various data were collected. In total, there were twenty-seven participants, with all having different occupations, including policemen, secretary, doctor, and Ph.D. students. Additionally, age and level of IT-Skills were collected. The ages of the participants ranged from 17-65, which is acknowledged as a significant representation of a full population. This was deemed valuable for the purposes of this study since this age is consistent with the target demographic of the application being consumers in need of services who are comfortable enough with technology to turn to it to meet this need. Self-reported IT-skills, notably, ranged from Low to High.

Each user was asked to perform the scenarios in the prescribed order using the application prototype, and then to record two or three ratings on the test protocol sheet, based on the methods described in prior chapters. Only seven people preformed two rating criteria and twenty people performed the three rating criteria. These include the compulsory rating that occurs with acceptance of the service, an optional efficiency rating, and an option 24-hrs later push notification rating. The final rating was then computed using three methods.

The first method is used when a user provides all three ratings and is computed by taking a simple average. The three ratings are summed and divided by three to obtain the final rating using method one. The second method is an alternative method of calculating the rating when all three ratings are provided. In this case, the final rating is calculated based on a weighted average. The first and second ratings are assigned weights of 30% and the third rating is allocated the remaining 40%. To compute this weighted average, each rating is multiplied by its respective weight and then summed together. The reasons for the design of method two using these weights are described in the prior chapters, but in summary, the last rating is more important because it gives the client a period of time to examine the service before providing the rating. It is also immune to manipulation from the service provider who may be witnessing the rating in person directly after the provision of the service. The third method is utilized when a participant performs only two ratings. In this case, the final rating is calculated by computing the values using the fuzzy controller whose design is described within this paper. The specific means used to calculate these ratings are through a model established within the MATLAB fuzzy logic toolbox.

## 6.1 The Scenarios

The following scenarios were presented to the users for review prior to providing their ratings within the application.

### **Scenario A - Housecleaner**

As a house owner that doesn't have much time to clean his house you request a house cleaning service via "Live Work". Your tasks are:

- Open the App Live Work
- Select "Search and insert house cleaner"
- Search for house cleaner nearby
- Choose Mary as a service provider
- Send her the task description and ask her for a quotation.

Please note the following:

- Mary was very responsive and arrived on time.
- Mary performed her task but forgot to take the trash out.
- Mary used some special products that kept the house odor very nice for a few days.
- Mary rearranged back all furniture after cleaning in between.
- Mary left chocolate pieces on the beds.

Since Mary performed her task, please accept her job by recording the first, second, and third rating into the test protocol paper. You are completely free to perform only two rating methods. only the first method is obligatory.

### **Scenario B - Plumber**

You have a huge water leak in the kitchen, and you are requiring an urgent plumber to come and fix it. your tasks are:

- Open the App Live Work
- Select "Search and insert plumber"
- Search for plumber nearby
- choose Joe as a service provider
- Send him the task description and ask him for a quotation.

Please note the following:

- Joe was very responsive and arrived on time.
- Joe was short of tools, he kept asking to borrow your tools.

- Joe seems to not know exactly what the source of the problem is.
- Joe fix the problem and clean the area around

Since Joe performed his task, please accept his job by recording the first and the second rating into the test protocol paper. Unfortunately, the water leak happens again five hours after Joe left. You are completely free to perform only two rating methods. Or perform the third rating which is normally after 24 hours of the service.

### **Scenario C - Waiters**

You are planning a big birthday party and you wish to hire two waiters to come and serve your guests. your tasks are:

- Open the App Live Work
- Select “Search and insert Waiter”
- Search for Waiter nearby
- Choose Sonia and Walter as a service provider
- Send them the task description and ask them for a quotation.

Please note the following:

- They replied in two hours and they arrive on time.
- Both looked friendly and professional and dressed in a unified uniform.
- Both show a high level of professionalism in catering and serving your guests.
- They made an announcement during your party to advertise for their services, this happens suddenly and without your permission.
- After the party, they clean the area and left.

Since they performed their task, please accept their job by recording the first, second, and third rating into the test protocol paper. You are entirely free to perform only two rating methods. Only the First method is obligatory.

Upon each user completing the ratings within the three scenarios, the final ratings were computed using the three methods. These final ratings were presented to the users along with a description of the methods used in their calculation. Subjective comments were solicited from study participants to obtain their opinion about the fairness of the final ratings.

## **6.2 The Value of Three Rating Methods**

Of particular interest in designing a rating system is striking a balance between seeking too little information from raters and too much information. Too little information may be convenient for raters, requiring for instance only a single thumb up or thumbs down. This would require very little time and very little thought on the part of the raters. The downside to this is that it provides

very little information from which to deduce which sellers offer high-quality services, especially before many ratings are collected.

On the opposite side of this spectrum, collecting too much information can be problematic. Requiring raters to submit to a full 30-minute survey, for instance, would be very valuable in terms of gleaning insights into their feelings about a particular service, but would require so much time and effort on the part of raters that most would begin to avoid leaving a rating altogether. In cases where such an exercise was made mandatory, this may even cause abandonment of the platform due to the nuisance of providing ratings. To strike a balance, the researcher prototyped a three rating system with a single simple mandatory step and two non-mandatory steps separated by 24 hours. This multi-step rating process has several advantages. First, for raters who are unlikely to provide much effort in providing a rating but may submit to a single step rating, this still is able to gather a minimal amount of information about their satisfaction with the service. For raters more willing to contribute their efforts to rating services, the second rating step adds additional fidelity to the data without becoming overly burdensome.

The third rating of the technique chosen is rather unique. It is separated from the other two rating methods by 24 hours, enabling the passage of time to let the rater's experience "set in". This provides a safeguard against potential manipulations such as the service provider insisting on directly witnessing the rating. Additionally, there were several invaluable insights that were gained when reviewing the qualitative questionnaires submitted to raters about using the third rating. By and large, many raters believed that the third rating allowed for a more accurate picture by allowing them to effectively revise their rating up or down after the passage of some time.

As an example, one rater noted that they had initially been happy with a plumbing service provider's general professionalism and promptness when completing a job. The next day, however, the job was found to be incomplete, and the leak remained. The third rating was an effective way to incorporate this new information into the rating.

Conversely, another example was observed in which a food service provider was hired, and the rater was initially upset that the service included a brief advertisement in the middle of her dinner party. The next day, however, the rater noted that they felt they had reacted overly emotionally and that it wasn't a big deal. The service provided was great, and the service provider deserved a higher rating than previously provided.

Both of these examples reflect situations in which the third rating tangibly made a difference in the final accuracy of the rating, with all things considered. Furthermore, several comments associated with these situations, and other similar ones, noted that they appreciated the ability to complete this third rating. This is indicative of the rating after 24 hours creating a good customer experience, which is desirable for the "Live Work" app.

Overall, the inclusion of the third rating 24 hours after acceptance of the service has been determined to be valuable in terms of adding new information into the rating, rather than simply rehashing the same rating through a different lens. On this basis, the research continued with the determination of the best techniques for performing ratings when all three ratings were provided, and also when certain ratings were not provided.

### 6.3 The Correlation Between The three Rating Techniques

Several notable results were observed in the collected data. When comparing the first and second ratings, which represent first the compulsory rating that gives the overall client satisfaction with the service, and second the optional rating of the service provider's efficiency in providing the service, it became apparent that some correlation existed between these two ratings. Figure 6.1 demonstrates this correlation as having a value of 0.81, with  $R^2$  value of 0.4295.

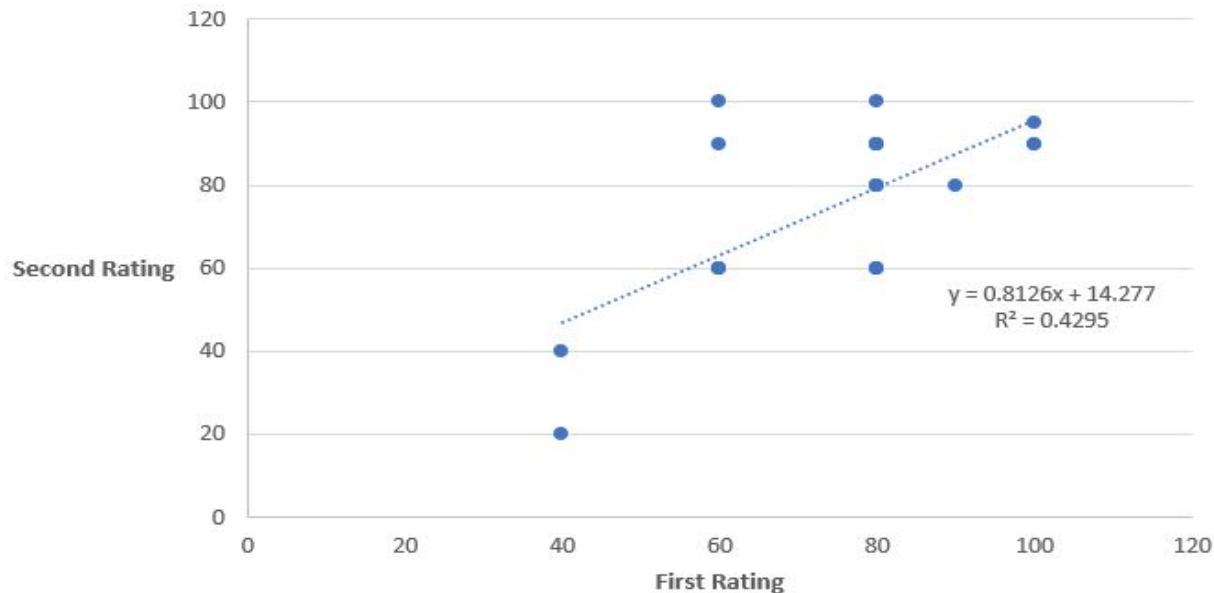


Figure 6.1: The correlation between 1st and 2nd rating

This is not altogether surprising, as one would expect that a client's happiness with the outcome of the interaction with a service provider would increase if the efficiency was higher (represented by a positive correlation). Furthermore, this would be one of several factors that would be taken into account by the client in determining their overall happiness with the transaction, so the  $R^2$  value of 0.4295 represents a reasonable weighting that efficiency would have had on the overall the happiness of the client.

A more surprising result is the outcome when making a similar comparison between the client's happiness reported during the first rating against the client's happiness reported 24 hours later during the third rating, where this rating was completed by respondents. This is represented in Figure 6.2. The data have a similar correlation between the two ratings, of 0.8689, but the  $R^2$  value is significantly less, at 0.161. This low  $R^2$  value means that there are significant additional factors that play into the determination of the third rating beyond the first rating. While on the whole, providers who receive high ratings in one rating are likely to receive ratings in the other rating, this correlation is very noisy and imprecise. This means that it is reasonable to come to the conclusion that the third rating provided 24 hours later provides significant new information that is useful in evaluating performance.

This could indicate several different things. Perhaps most intriguing is the prospect that after 24

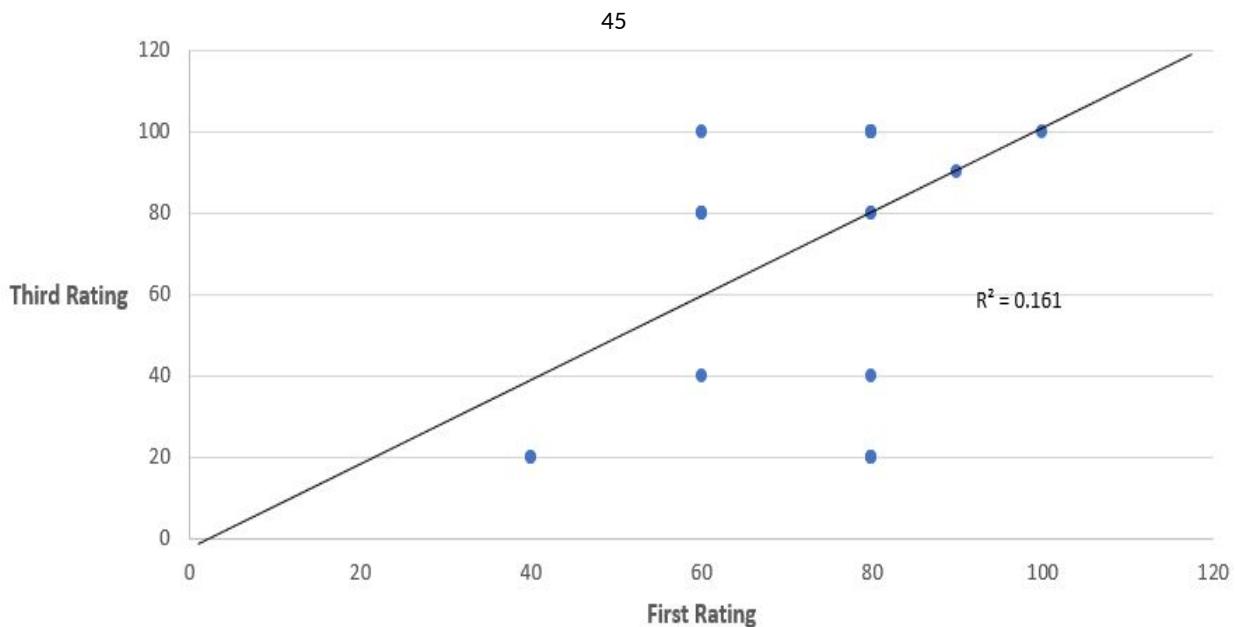


Figure 6.2: The correlation between 1st and 3rd rating

hours, clients may have formed quite different opinions of the service provided. Hypotheses that could explain this includes that failures reoccur after the service has been completed and the service provider has left, or that the first rating is subject to manipulation which is not present in the third rating. When looking separately at qualitative comments provided by survey participants, these situations all seem to have played out in one or more cases. In other cases, a qualitative description described that certain aspects of the service were more prevalent within the rater's mind after 24 hours, which ended up manifesting in the rating. In some described cases, the rater described annoyances with the service immediately when they were provided that seemed like less of a big deal the next day. In another, comment, the rater described discovering after the service provider left that the work had not been completed, which warranted a much lower rating than initially provided. These examples reaffirm that the third rating provides additional valuable information about consumer's true feelings about the service they received.

## 6.4 The Selection of the Appropriate Final Rating Technique

Following the provision of all ratings, the final ratings were calculated using two different techniques: In Final Rating Method 1, a simple average of the three different rating methods was calculated. In Final Rating Method 2, a fuzzy logic controller was applied to the rating methods if only two ratings were available, or a weighted average using the 30/30/40 weighting discussed previously was used if three methods were available. As demonstrated in figure 6.3, the ratings are very highly correlated with each other.

Following the completion of these ratings, the methods for calculating them, as well as the final numerical ratings were presented to the reviewers for comment. Each study participant provided narrative comments on their feelings on the two different methods for calculating final ratings.

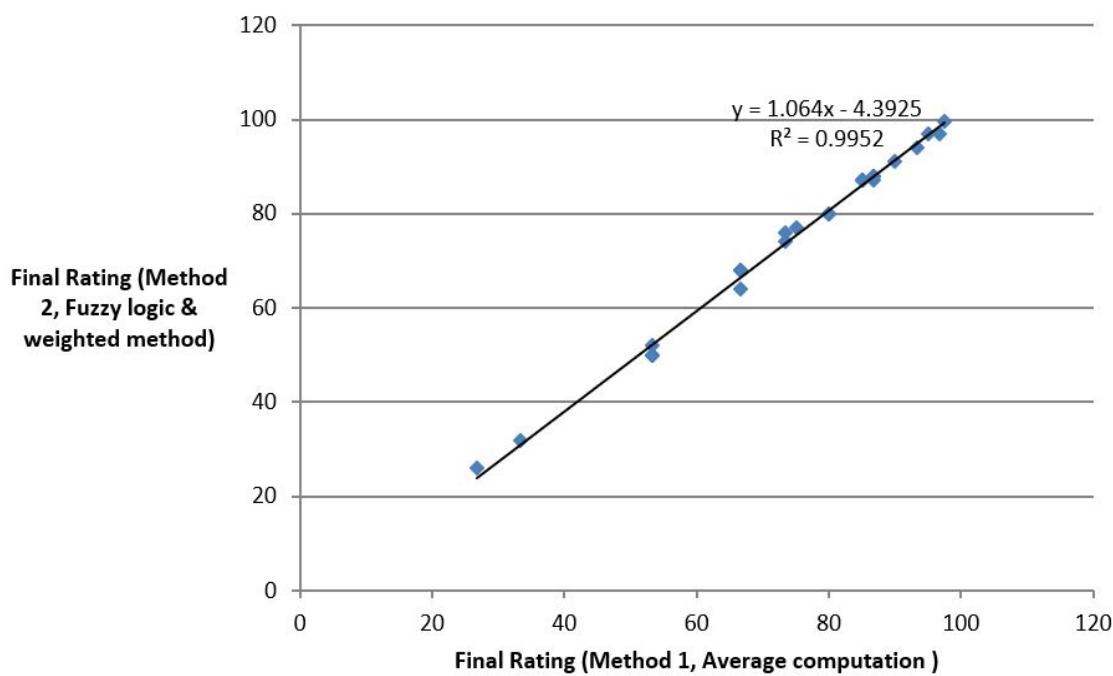


Figure 6.3: Final rating methods disparity

Each comment was then evaluated to determine the attribute being evaluated within the comment and to determine whether the comment expressed positive or negative feedback about that attribute. Six different attributes were identified in the comments and served as the basis for analysis.

These attributes included Fairness, Understandability, Benefits to Employee, Sensitivity to Inputs, Accuracy, and Uniqueness. Definitions of each of these attributes, as used in analyzing the data are as follows:

- Fairness: The extent to which the evaluator believed that the rating method represented an end rating that was just and fair, all things considered. This was often marked by the commenter specifically using the word “fair”.
- Understandability: The extent to which the evaluator believed that the model could easily be understood by a person likely to be using the ratings.
- Benefits to Employee: The extent to which the evaluator believed that the rating method was beneficial to the employee.
- Sensitivity to Inputs: The extent to which the commenter believed that each input mattered for the purposes of determining the final rating.
- Accuracy: The extent to which the commenter believed that the final rating produced by the method represented a refined, accurate depiction of their overall feelings about the service.
- Uniqueness: The extent to which the commenter believed that the rating method was unique compared to existing rating methods.

For each comment, one or more attributes were assigned, and positive or negative feedback was recorded. The following two figures depict the results of this analysis. Percentages in each figure represent the percent of comments which provided the feedback represented in the chart.

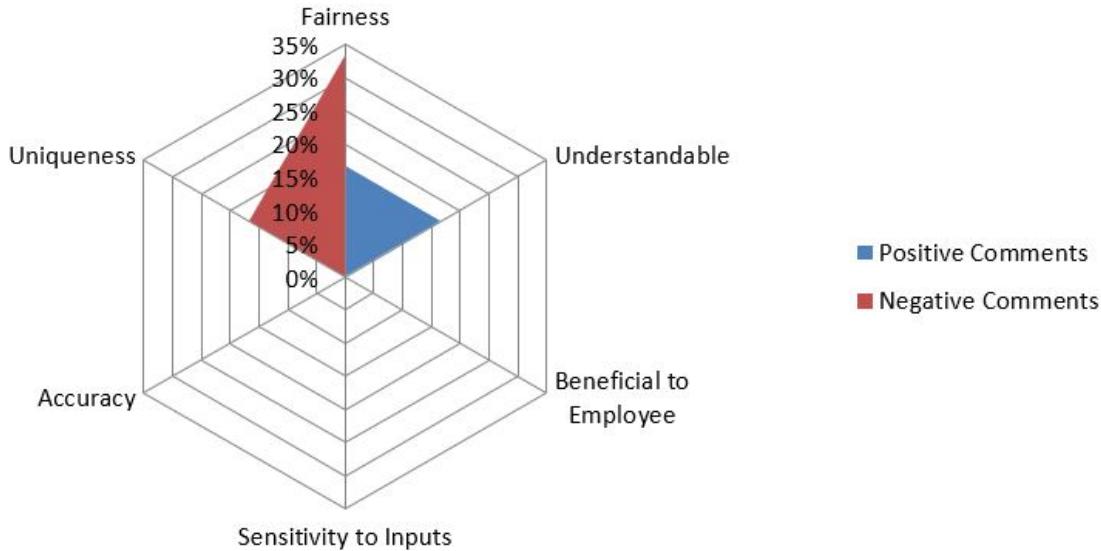


Figure 6.4: Method 1, Average computation method.

The first method, which used a simple average demonstrates an overall view on the part of the evaluators that the method was not unique but was at least understandable. More commenters believed that the method was unfair than believed that it was fair. No comments were recorded regarding the accuracy, sensitivity to inputs or benefits to employees.

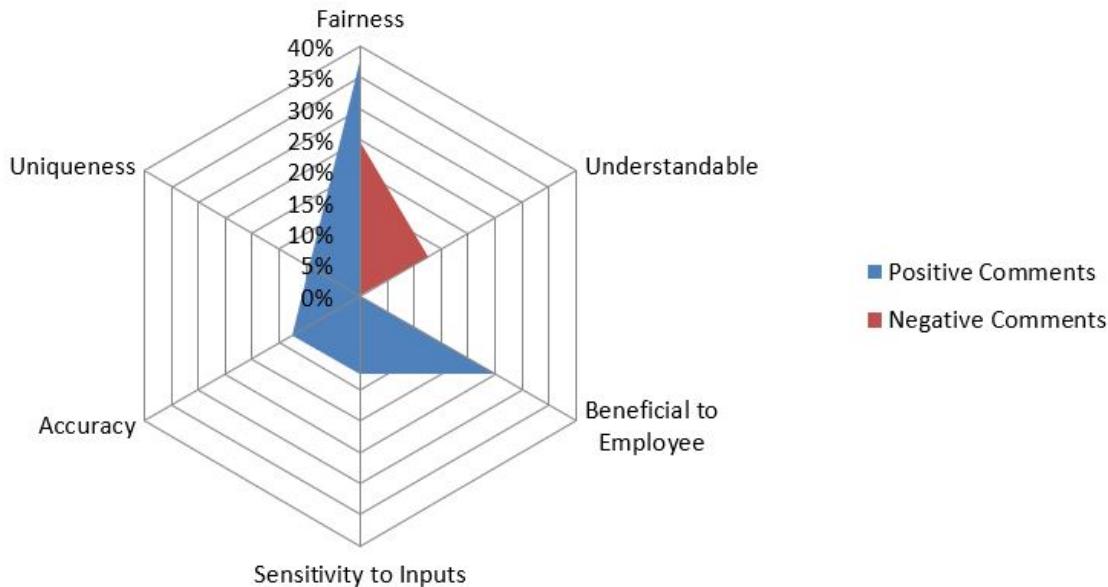


Figure 6.5: Method 2, Fuzzy logic controller and weighting method.

Method two is the method which uses a weighted average when three ratings are available, and alternatively uses a fuzzy logic controller model when only two ratings are available. Generally, this method faired better than the first method in most categories. Notably, more commenters found this method fair than unfair. The one area where this method performed poorly was in understandability. This is not altogether unexpected, as the method is somewhat technical in nature.

It is the researcher's contention that the details behind the determination of the final rating need not be understandable to raters, so long as they are fair, and so this deficiency does not represent a significant problem for using method two in practice.

Generally, this subjective commentary on the rating methods leads the author to believe that users preferred the second rating method and also believed that it gave a more complete picture of their opinion of the service. Furthermore, they appeared to believe that the second rating was better for service providers as well. Upon discussion with the research team, it was determined that the basis for this was that the fuzzy logic controller generally provided a slightly higher final rating, averaging 4.86 points higher than the simple average. This can be traced back to the generally higher ratings provided during the third rating stage receiving higher ratings.

Furthermore, the only subjective input that was noted as more favorable during the controlled experiment was that the first rating method was simpler and easier to understand. This may have an aesthetic appeal to certain people, but is generally considered inconsequential, since the users of the application do not require an understanding of the algorithm to interpret its ratings. In fact, it is the researcher's belief that an easy to understand rating may give rise to more attempts to game the rating system with fake reviews and other methods. Offering a system whose inner workings are not fully transparent may discourage this behavior to some extent.

## **6.5 Assessment of The Validity of the Fuzzy Controller Model**

In order to deal with situations in which users did not provide all three ratings, but instead provided only two ratings a Fuzzy Controller Model was used. This effectively, "fills in the blanks" of the rating by considering how third ratings would typically be assigned by users given only information about the first two ratings, so as to provide an equivalent estimated final rating without penalizing or rewarding service providers who do not receive the third rating. To establish that the fuzzy logic model is valid, we asked the same participants who provided two ratings, to perform an additional third rating for sake of correlation among the two methods. The final rating calculated from the weighted average model for services with three ratings as compared to the fuzzy logic model output for services that only received two ratings. Figure 6.6 shows this comparison.

The figure normalizes services based on ratings provided during the controlled experiment and then shows the final ratings calculated using both the weighted method and the fuzzy controller method. The orange data points in the figure represent the final rating calculated from the weighted method while the blue data points reflect the outputs of the fuzzy logic controller applied for two ratings of the same service and participant.

In all cases, the fuzzy logic controller outputs as a final rating showed a slightly greater difference to the weighted average method. This is a good result, as it indicates that the fuzzy logic controller is able to effectively estimate an adequate final rating without the need for all three ratings.

The fuzzy logic controller output is reasonable given the circumstances, representing the fact

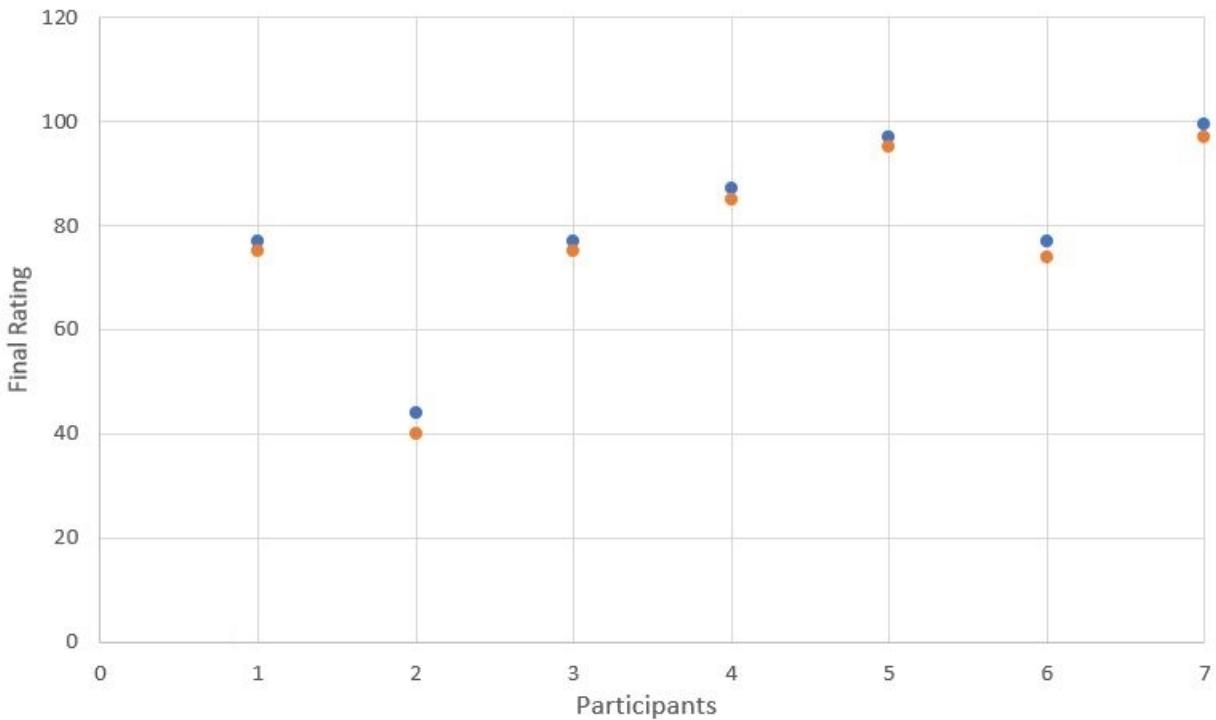


Figure 6.6: Actual Final Rating Provided (Fuzzy VS Weighted Methods )

that it can be used in a wide range of the users just wished to perform a two rating.

## 6.6 Overall Rating Method Conclusions

The findings of the study indicate three important aspects validating the “Live Work” application design. The three-steps rating system establishes additional information above and beyond traditional rating systems. Additionally, the advantages of the fuzzy logic rating calculation method were noted and appreciated by users. Finally, the system was validated as providing valid ratings even in the absence of the third rating.

On the basis of these findings, the research concludes that the proposed rating system utilized in conjunction with the 30/30/40 fuzzy controller model provides a suitable algorithm for calculating ratings on the “Live Work” application. Following the completion of this project, the researcher intends to permanently incorporate this rating system into the “Live Work” application.

## CHAPTER 7

# Discussion

In examining the findings of the analysis conducted during this study, the author was able to successfully draw several conclusions relevant to the implementation of the development of the “Live Work” app as a practical project. Throughout the development of these conclusions, several methodological choices were taken which, in hindsight, could have been improved. Additionally, only the scope of the study was such that only certain research questions could be examined, whereas multiple additional questions arose which could be examined in further research. This discussion reviews certain lessons learned from completing this study and proposes ideas for further research topics.

### 7.1 Lessons Learned

Several areas could have been improved to enhance the effectiveness of this research in terms of answering questions and providing total confidence in the findings. One area which made an analysis of the research data difficult was the relatively small sample size on which the controlled experiment was conducted. Since twenty-seven individuals were studied, certain biases were inevitable. A larger sample would be ideal for future research to ensure that individual biases, opinions, and unique characteristics of test subjects do not overly impact the overall findings of the study.

That said, efforts were made in selecting test subjects to ensure that reasonably representative populations in the space of age and gender were covered, including approximately half male and half female participants, and securing participants with age range spreading between 17 and 65. To provide more rigor in the study, and confidence in the outcome of the results, a larger sample size selected via an appropriate random sampling method would be useful. This could allow for a more representative set of potential users to be studied across even more dimensions such as income, occupation, educational background.

An additional lesson learned which arose during the completion of the analysis of the study was related to the difficulty in benchmarking the results of the study. For instance, user satisfaction ratings with the rating system were collected during the research, but these were ultimately discarded as unuseful. Overall, the satisfaction ratings seem favorable, with an average of 4.29 out of a possible 5, but it is not readily apparent whether any rating method could ever achieve a 5, or whether a particularly bad one would be likely to average near 1, 3, or some other number. This makes it so that the final rating can be interpreted based on conventional wisdom, but provides less insight than is desired in terms of how optimal the system is.

To avoid this, a comparison study would be required. This could be accomplished, for instance, by requesting user satisfaction ratings after completing the rating system within the “Live Work” application, and then also recording the same rating after completing a Yelp review or rating a product on google. This would provide a point of comparison to real systems to definitively establish whether the rating system represents an improvement over existing systems, and to what extent.

This concept was partially explored during the subjective commentary that was captured during the controlled experiment on the final rating calculations. In this case, the fuzzy logic controller method of calculating was compared subjectively against a baseline based on a simple average. This provided comparative insights that were useful in defining conclusions. It may have been more useful, however, to collect numerical data in a more structured format related to this comparison so that more meaningful insights could be gathered without resorting completely to the interpretation of the comments made by study participants. One way this could have been completed would be in requesting numerical ratings on the six attributes identified in the comments to enable more rigorous analysis. This would have removed the need to interpret free form text inputs as positive or negative and the need to label them with each attribute manually and would have additionally provided more resolution in determining the feelings of the study participants.

## **7.2 Further Research Topics Areas**

While the study focused primarily on establishing the viability of the rating system for use in the practical “Live Work” application project, there are several related topics that could pose interesting future research questions beyond the scope of this study.

The first proposed open question relates to the optimization of the fuzzy controller model and weighted average calculation. For the purpose of the study, a weighting of 30/30/40 was selected for use in comparison to other methods. This weighting was selected on the basis of several arguments, but further research could be conducted to refine and optimize the rating system when more real user data is available. Further refinement of the algorithm is expected to occur on an ongoing basis as the project continues to progress, which may include the addition of more complex methods for aggregating ratings such as the incorporation of outside data sources, use of machine learning algorithm, or weighting based on trust ratings of community members who have consistently provided quality ratings. A second open question pertains to the sensitivity of the rating system to outside manipulation. Within the paper, several deficiencies in current rating systems were noted, with manipulation by large businesses being one of the primary concerns. Future research could analyze the specific methods that are employed by businesses to conduct this manipulation and test the sensitivity of the “Live Work” application method in avoiding or countering these issues.

Furthermore, this could lead to the development of new tactics or designs within the algorithm that further improve it and ensure it is a trusted rating system. Examples of systems that could be reviewed and analyzed to determine their promise in preventing rating manipulation include the use of authenticated verification systems that ensure ratings only correspond with actual buyers and machine learning algorithms that can detect signs of counterfeit ratings.

Finally, the data collected during this study established that methods exist for processing transactions based on the non-monetary barter exchange of goods and services via the platform. Many additional research questions outside the scope of the study could be posed in this area. For instance,

the point system proposed for settling these non-monetary transactions could be compared against other potential methods, such as attempting to broker direct trades or 3-way or 4-way trades to determine whether any of these methods is even viable. Studies could address whether actual users would adopt such methods or simply resort back to monetary exchange. Insights from research on this topic could inform future modifications or features within the “Live Work” application design.

Finally, part of the next phase of the application design would involve the roll-out of a beta release for public consumption among many real users. The study considered here provided initial research to assist with the initial platform development based on the best available data, but public release of the application so that it can be used to broker real transactions “in the wild” will, in the future, provide a rich data set that unlocks many new opportunities for analysis. This could include demographic studies on the likelihood of using monetary vs. non-monetary transactions, which may inform future design decisions. Additionally, these data sets could be used to benchmark service ratings from real reviewers against other platform’s ratings of the same reviewers, enabling detailed analysis of a number of factors from sensitivity to manipulation to the accuracy of the rating in conveying the actual quality of the service. In all cases, unlocking a rich data set based on real user data will likely unearth many new insights which could lead to many fruitful research areas. Overall, as with many projects, the “Live Work” application is an ongoing work in progress and will stay that way for the foreseeable future.

## CHAPTER 8

# Conclusions

This research project set out to determine whether a practical and user-friendly rating system can be designed that is flexible to varying numbers and types of user rating inputs while maintaining fairness. This was successfully accomplished in the research. This research was able to establish a framework for considering various design decisions that are made in designing a rating system, and also a set of criteria that can be used to validate it against other potential systems. Such a system could be used by other designers of rating systems to conduct trades when designing or improving their rating systems.

For the specific implementation of the “Live Work” application, a rating system was designed utilizing between one and three ratings with final ratings aggregated in a fuzzy logic controller model or weighted average method, depending on user inputs. This model was then validated on multiple dimensions to establish that it is valid, provides accurate outputs in multiple situations, and provides subjectively better user experience based on comments collected from users. These evaluation criteria demonstrated that the designed method provides similar accuracy and fairness to simpler systems such as a basic average, while also gaining additional benefits, such as flexibility to accommodate different numbers of ratings, and positive customer perceptions around Fairness, Accuracy, Benefits to Employees, and Sensitivity to Inputs.

Additionally, potential benefits and mechanisms for processing transactions without the need for traditional currency exchange were examined, with a system for conducting such exchanges ultimately being identified with benefits validated through interviews with potential users.

Benefits of allowing non-monetary exchanges were identified, including opening the market to additional participants and fostering a spirit of community. A points-based system was identified and validated through interviews with potential users that would be able to effectively capture these benefits alongside the standard monetary means of exchange. The closure of these research questions is sufficient to enable the “Live Work” application to proceed with implementation, which was ultimately the goal of the research project.

# Bibliography

- [1] Sinan Aral, The Problem With Online Ratings. 19 December .2013  
<https://sloanreview.mit.edu/article/the-problem-with-online-ratings-2>
- [2] Valère Gogniat, Menacés de disparaître, les petits magasins tentent de se réinventer.25 November. 2015  
<https://www.letemps.ch/economie/menaces-disparaitre-petits-magasins-tentent-se-reinventer>
- [3] Binh K. NguyenHasim, AltanHasim Altan. *Comparative Review of Five Sustainable Rating Systems.* December 2011
- [4] Dominik Gutta,, Jürgen Neumann, Steffen Zimmermannb , Dennis Kundischa,Jianqing Chenc. *Design of review systems – A strategic instrument to shape online reviewing behavior and economic outcomes.* February 2011.
- [5] Noah McClain Ashley Mears. *Free to Those Who Can Afford It: the Everyday Affordance of Privilege.* April 2012.
- [6] Tran Van Ngoc. *Barter Online Network.* December 2015.
- [7] Hershey H. Friedma, Taiwo Amoo, *Rating the Rating Scales.* January 1999.
- [8] Sherry Bonelli, *70% of consumers will leave a review for a business when asked.*November 2016.
- [9] Mir Riyanul Islam. *Numeric rating of Apps on Google Play Store by sentiment analysis on user reviews.* April 2014. *International Conference on Electrical Engineering and Information Communication Technology*
- [10] Israel J. Mojica Ruiz, Meiyappan Nagappan, Bram Adams, Thorsten Berger, Steffen Dienst and Ahmed E. Hassan *An Examination of the Current Rating System used in Mobile App Stores* February 2015.
- [11] Bernhard Debatin, Jennette P. Lovejoy, Ann-Kathrine Horn, M.A., Brittany N. Hughes *Facebook and Online Privacy: Attitudes, Behaviors, and Unintended Consequences.* October 2009.
- [12] Mary McGlohon, Natalie Glance, Zach Reiter *Star Quality: Aggregating Reviews to Rank Products and Merchants.*May 2010.
- [13] Portia Oliver, Mercy Mpinganjira *Barter trading: An empirical investigation of management practices.* December 2011.

- [14] Hakan Sahin *An Essay on the Nature and Types of Money*. October 2016.
- [15] Fiorenza Belussi, Katia Caldari *At the origin of the industrial district: Alfred Marshall and the Cambridge school*. November 2008.
- [16] Casey Dawkins. *Regional Development Theory: Conceptual Foundations, Classic Works, and Recent Developments*. November 2003.
- [17] Catalin Cimpanu, Zero day. *German bank loses €1.5 million in mysterious cashout of EMV cards.*, September 2019.  
<https://www.zdnet.com>. Visited on 15.06.2020
- [18] *Balsamiq. Rapid, Effective and Fun Wireframing Software*  
<https://balsamiq.com>
- [19] Lucia Filgueiras, Plinio Thomaz Aquino Junior *User modeling with personas*. January 2005.
- [20] L.A. Zadeh, “The Concept of a Linguistic Variable and its Application to Approximate Reasoning-I.” *Information Sciences*, 8, (1975) pp. 199–249.
- [21] Mehdi Akhoondzadeh Kamal, Azizi Kamal Azizi, *Fuzzy Logic*, November 2019.

## 1 Appendix A: Questionnaires

### Rating Systems Questionnaire

#### Rating systems

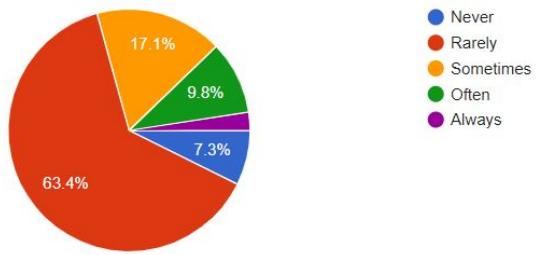
This survey is related to research work on rating and review systems of the University of Fribourg, the objective is to develop new and more user-friendly techniques for producing rating and reviews. Reviews are intended as textual comments on the quality of a received service (e.g., a dinner at a restaurant), ratings consist in the scoring of the satisfaction of a client with a received service (e.g., giving 3 stars out of 5 to a restaurant in Google Maps).

Feel free to tick multiple answers in checkbox questions.

#### First Question

How often do you rate or write a review for a service you used

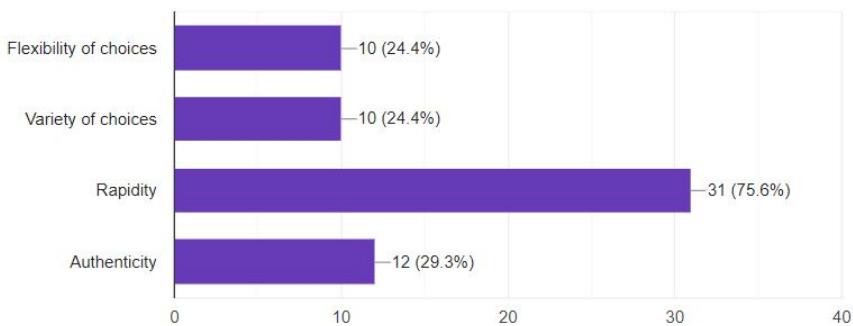
41 responses



#### Second Question

What do you find important when performing a rating or a review?

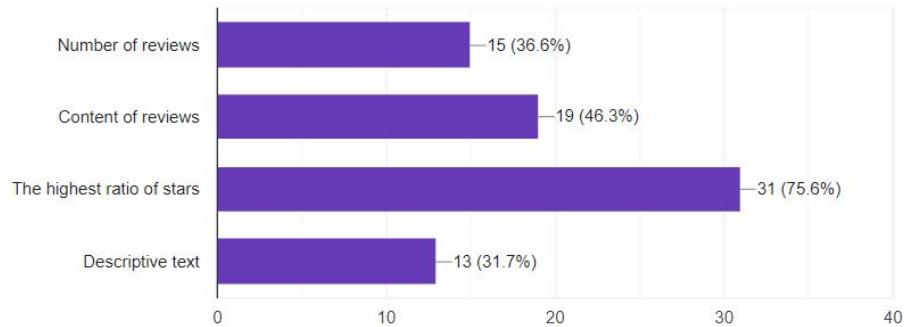
41 responses



### Third Question

Imagine that you are visiting a new city, and you need a service (e.g., getting a hair cut, or you need to rent a car). Supposing you have access to an online database with all the providers of the needed service in your area, on what do you base your choice?

41 responses



### Fourth Question

Q: What would you do to enhance ratings in general?

Answers:

- Read the reviews and make improvements accordingly
- Giving an incentive to people so they rate a service
- I'm not sure I understand the question, but if I like a service (usually a restaurant or a hotel), I try to write a detailed review to help the place get a better rating
- Make it easy and simple
- Adding direct contact with the manager to complain directly
- Reduce fake reviews, increase number of people who do ratings and reviews, easy access to reviews
- The client gets a recompense in return
- Make it one click to review. Like Netflix
- Being able to write it as fast as I can.
- It would be nice to be able to chose how much in detail one can rate a place (e.g., chose if to give only an overall rating, if to rate more precise, but still general, aspects of the experience - like food quality, service and price in a restaurant or if to rate even more specific aspects of the received service.
- No exaggerations, experience, special knowledge
- Improve service according to the reviews
- Maybe giving a short way to show the person you want him to rate how far the ratings might influence and been taken into account.
- Acceptable service and personal interaction.
- Que le commentaire ne puisse pas être anonyme afin de pouvoir être sûr que qqn existe derrière le commentaire
- Les commentaires méchants.

- Promote the importance of it through incentives
- Honestly from People, Structured feedback, fake not possible.

### Fifth Question

Q: In general, when you write a review, what do you find irritating ?

Answers:

- Having to sign in with the username and password
- Having to justify yourself too much. I like writing a comment but not for every section.
- If there are too many questions to fill in
- It can be faked easily.
- Sometimes if it takes much time to submit the review or if I need to fill too many fields. I prefer it to be flexible, easy, and quick.
- Some platforms required minimum characters.
- It takes time and energy
- describing the point
- Sometimes they ask so many things, Booking for example, is just too long.
- It needs to be easy and intuitive
- when the system is asking about to give an example of what happened.
- Being impolite to explain a situation ONLINE.
- Limitation of words while writing, ignorance from the provider or generic reply that we are sorry and we will take action.
- Long process, explaining what happened at the moment,
- Long questions
- Too many criteria
- Sometimes, it is important to have some guidelines, an example of the things to be considered in the review. When we have a negative experience with a service, we tend to focus on that in the review, instead of reporting also the things that we are happy with. These guidelines are most of the time missing.
- When I do not get an answer on my critics
- Not enough space for the text
- The collapse of the system when I want to submit or because limitations of wor
- The minimum characters required to type, such as 200 in TripAdvisor
- Je n'aime pas les commentaires méchants vulgaires ou qui nuisent gravement à la réputation de la personne
- The complicity
- Writing the review. I prefer multiple choices questions.

## Settlement Methods Questionnaire

### Settlement Methods

This survey is related to research work on settlement processes at the University of Fribourg, the objective is to develop new and more user-friendly settlement methods like an exchange of items or services rather than monetary transactions.

Feel free to tick multiple answers in checkbox questions.

Figure 1: Questionnaire description

What is your age?

12 responses

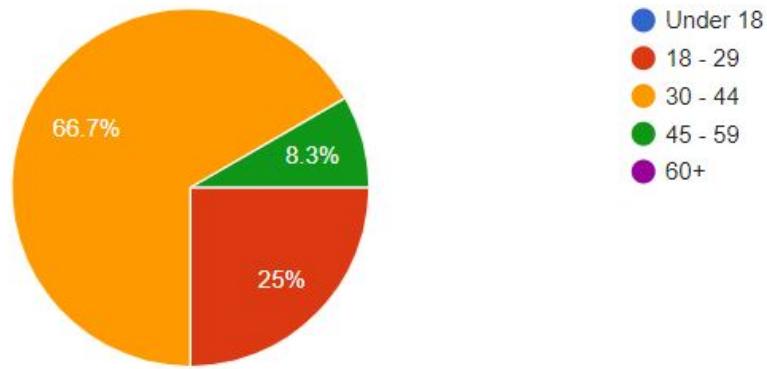


Figure 2: First Question

How do you settle your invoices?

12 responses



Figure 3: Second Question

What are the most important for you, while using online payments?

12 responses

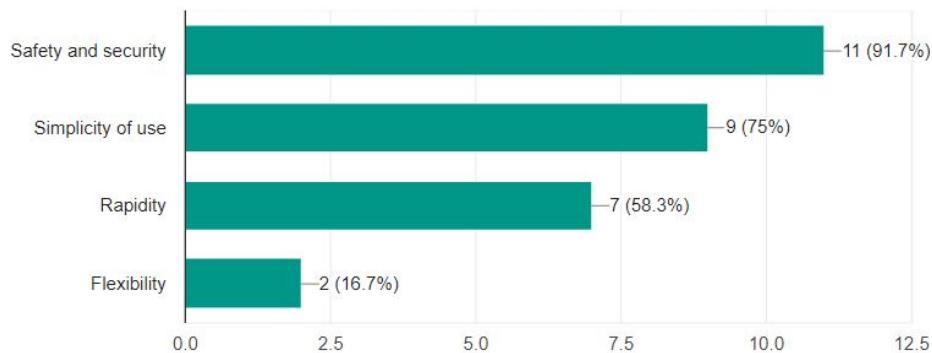


Figure 4: Third Question

Let's assume you would have the ability to pay your gardener with an exchange of unused items or simply by performing a service that the gardener accepts, based on your skills.

What would you choose?

12 responses

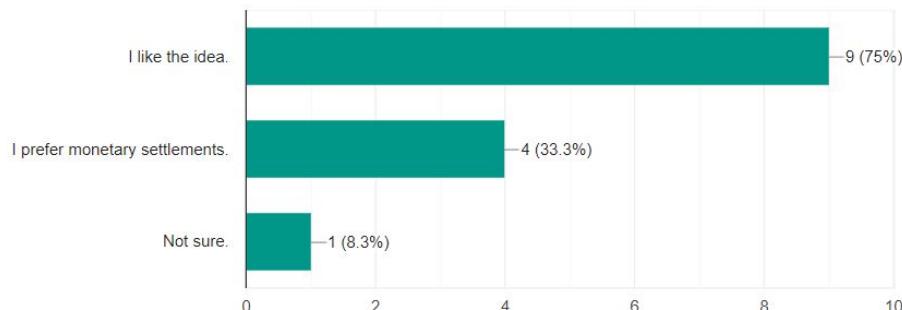


Figure 5: Fourth Question

### Fifth Question

**Q :** If you can not afford to pay for a service, What would you propose as a settlement instead?

Answers:

- Exchange of another service from me to him
- Gadget
- An exchange will be great
- some good that I do not need or another service in return.
- To teach a french lessons.
- I could offer to provide a service in exchange, if I know the needs of the person offering me the service.
- Set of my skills
- Any stuff in my house
- Not sure, Because i always pay cash
- Rien

## 2 Appendix B: Interview

Due to the global pandemic of COVID-19 the interview was held online and the 25th of May 2020. The duration of the interview was 30 minutes and the researcher proceed on a very structured track to define the primary questions which were sets by the interviewer to gain the most relevant results of this interview. The interview was with Mr. and Mrs. Claude and Isabelle Meylan-Vidal. Mr. and Mrs. Vidal. are both very engaged in agriculture and ethical activities to encourage the population to consume local products, non-violence movement, recycling, climate change. they both found and manage the association, The Meal Mies <https://themealmies.ch>

**Q:** Presenting the idea of “Live Work Application”, what do you think about it?

**A:** It’s a great idea and very beneficial, for both parties, and it’s very weird that it doesn’t exist yet. I would be very happy to share it around and participate in it. I think it’s going to solve a lot of problems.

**Q:** Do you think people are willing to try “Live Work”?

**A:** Absolutely yes, because people are looking for fast and cheap services in general. But maybe it will take time to be well known around people because people will download it once they want to use it only.

**Q:** What could be the encouragement of people to try and switch from our current monetary system?

**A:** It will be recognized around people who don’t have a regular income, as well as for students who want to enhance their revenue by having a certain stock of many services to use anytime they

want.

**Q:** What could be the best method to achieve such a barter system between communities?

**A:** It would be great to have an organizer/responsible or a manager that manages the community matters. This manager will be the connection between communities and members, services, and admins. Also, a storage area to store good (in case it exists).

**Q:** What could you enhance about “Live Work”?

**A:** To set plans concerning the tax declaration, enhance. Set strict rules to monitor every user’s activities and transparency towards other members. Set different regulations to compensate users who could be victims of fraudulent schemes.