



DEPARTMENT OF ELECTRONIC, ELECTRICAL AND COMPUTER ENGINEERING

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# Intelligent Wardrobe: Using mobile devices, Recommender systems and Social networks to advise on Clothing Choice

Final report for MPhil individual Project

MPhil Electronic and Communication Engineering

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## Chapter 1

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### 1.1 Aims of the project (Introduction)

This project considers ways in which combinations of technologies can be brought together to help users make decisions related to their choices of clothing in order to decide ‘what to wear’. This sees the choice of clothes, either in a shop or at home as a form of everyday decision-making which could be supported by a variety of decision-support systems. By considering a simple process such as choosing what to wear, the project provides a focus for discussing the potential impact of technologies on everyday behavior. It might be expected that choosing clothes does not require support or guidance. However, the popularity of television programs that provide advice on what (not) to wear suggests that there is an interest in such guidance. Besides, the fact that some people like to buy clothes with friends in order to use their advice suggests that the process of buying clothes can be more complicated than simply walking into a shop and buying the first thing that one finds or simply picking the first item that comes to hand from the wardrobe. Alternatively, the decision-making process might not be complex because it involves many points to consider, so much as ambiguous in that there might not be a ‘correct’ answer for any one of the points, and this ambiguity might require some social support to assist the person, e.g., in terms of giving confidence about a particular choice. Furthermore, people might possess a large number of clothes that they keep in their wardrobe. Some of these clothes might be out of style, some might no longer fit the person, some might not be suitable for the person to wear for a specific occasion. The purchase of new clothes could also be regarded as a process of ‘updating’ the wardrobe, e.g., in terms of checking whether the new clothes could be worn with existing clothes or whether they duplicate existing clothes or whether they are in fashion.

The primary aim of this project is to design, develop, and evaluate a novel concept for managing the purchase, storage and wearing of clothes using user-centred methods and techniques. Initially, this involves defining different sorts of clothes shoppers (using the notion of Persona) who will be able to use the resulting system in different ways. The project will explore ways in which combinations of technology can be used to support buying clothes and deciding what to wear.

This thesis explores conceptual designs for a system to help people to decide what to wear and buy by using different methods:

- By using a recommender system find a suitable outfit
- By managing their wardrobe, via their computer or mobile phone, to find a suitable outfit or to add or remove clothes from the wardrobe
- Discuss what to wear or buy with friends, using social networking sites (sharing picture of clothes)

Each part of this project has a different method in which users with different tastes or personas could use the system.

## **1.2 Comparing the Concept with Competitor Products**

Nowadays social networking, recommender and ‘intelligent’ wardrobe websites are quite common and appear to be useful. Some of these websites are provided by clothing retailers and are used to encouraging people to make purchasing decisions. Some other websites are provided by fashion publishers and are used to encourage people to think about clothing decisions and which of the current fashion trends to follow.

Before overviewing the main concept of this project, this section will review some of the products which are currently on the market. Then at the end of these reviews there are a comparison between the proposed system and the other implemented available systems. The review begins with a consideration of social networking sites.

Facebook is one of the most popular social networking website which let users to communicate with their friends, colleagues, teachers and families in different ways such as sharing pictures, videos, location, status and many different others aspects of their life. Other popular social networking websites are Twitter, Orkut , Instagram , LinkedIn and etc. which offer variations on sharing ideas and information by users.

In the area of social networking sites, there are several applications which are close to the concept of the ‘Social Networking Room’ in this project, such as “I wear” and “My fashion closet” which are all available free of charges on iPod , iPhone and iPad.

“I wear” (Free of charge) is a complete and easy to use catalogue of a user’s wardrobe. For example in the morning when the user wakes up , he/she can grab their Iphone/Ipad/Ipod and decide what they want to wear, which clothes from their wardrobe can be matched with other clothes . They can also let their friends know what they want to wear today or share what new clothes they have just bought, or ask them if they think that the chosen clothes are suitable for today (Jan Mazurczak, 2013).

Users can also create a show room and send it to other “I wear” users, in the form of a book. Everyone who gets this book via E-mail, or the users’ websites, could get clothes from them and add the chosen clothes to their own “I wear” wardrobe. For creating these show rooms users first need to store their own clothes by taking a picture and storing them in the right category. After having all their stuff in their “I wear” account, users can start creating a show room for themselves by mixing and matching their own clothes. This application is beneficial for time consuming and gathering friend’s opinions.

There are many features available for this application such as adding clothes pictures from camera or photo library, removing background from the added clothes, creating categories and assigning clothes to them, simple drag and drop clothes system, saving composed clothing in photo gallery or sending by email and etc. This idea of allowing users to create a catalogue of their clothes feels as if it might be very time-consuming and something which only the very fashion conscious would really want to spend time doing. On the other hand, the ability to simply share with friends what you plan to wear today feels as easy to do and potentially attractive (Jan Mazurczak, 2013).

“My fashion closet” (free of charge) is implemented to make picking outfits more fun, easy and organized. Start by taking a picture of all the clothes in a user’s closet including tops, skirts, pants, dresses and shoes. My fashion closet then organizes user’s clothes such that they can easily scroll through all the available clothes while mixing and matching different pieces of clothing to find the perfect outfit. Once the users finalized their outfit, then they can share it with their friends and families to get their opinion on what they choose to wear. While there is an effort involved in taking pictures of the clothes, the idea of allowing these pictures to be combined together into an organized catalogue is interesting and could form the basis of a recommender system (Modiface, 2013).

Recommender websites can help making decisions easier by providing people with their own recommendations. Two of most recognized recommender websites between people are Amazon and eBay, which help people to find what they want to buy with the best price or quality.

A lot of online fashion websites are now trying to help users to mix and match what people want to buy with the existing available stuff in their storage.

One of the popular fashion online website in UK is ASOS. ASOS online shopping is one of those websites which helps their users to mix and match what they would like to buy or wear with the existing matched stuff. For example, when one wants to buy a red dress, the website will recommended that he/she can match the chosen dress with a white available shoes or gold accessories (Asos, 2013).

“The man’s closet”, “Wardrobe assistance” and “Bag gallery: My pocket closet” are new developed applications which are really close to the concept of this project (Intelligent wardrobe) and for better understanding two of these application are chosen to be explained (Adrian Baudy, 2013).

“The man’s closet” (Free of charge) provides advice on clothing for men,.Users can automatically enter and categorize their entire collection of shirts and ties using their own camera.. This feels very similar to the “Fashion closet” concept, which was discussed before (Adrian Baudy, 2013).

“Wardrobe assistance” (free of charge) is a tool for wardrobe assistance. The wardrobe assistance is aimed to organize user’s closet and create outfits with no need to try them on and rearranging the users dresser (Sonettic, 2011).

After taking into account many comments from their consultant, they created a user-friendly application in hopes that it will become the best and the most honest friend when it comes to picking an outfit. The application helps professional wardrobe assistants to track multiple wardrobes of their customers; stylists who work on different looks and people who like to dress with taste. If users have more than two shirts in their closet and they want to mix and match their outfits, this application can help them easily in order to decide what to choose. This appears to

take the recommender system approach by basing guidance on some ‘rules’ of fashion (Sonettic, 2011).

Digital wardrobe is the newest idea in the market, which connects all these application for people to use. There are many smart wardrobe implement applications in the market but these applications are not as famous as social networking or recommender websites. But nowadays people are quite into technologies and many of them have a smart phone or a tablet such as Iphone/Ipad and Ipod that let users to be introduced to all these implemented applications (Trendsta, 2011).

There are many implemented related application in the market which are very close to this project (IN room), such as “What’s in my wardrobe”, “Closet buddy” and “Smart dresser”. Two of these applications are mentioned below.

“Tangtansu” and “Digital wardrobe” are also implement application which let users to save their entire closet in their own computer or mobile phone which are described in chapter 2.

“What is in my wardrobe?” (£1.49) is an application that user can have their own wardrobe and use it while on the go, like to pack for the weekend. This application let the user to know what they’ve got, where it is, keep track of their belonging, at the same time when they need to find something, help save money by not buying other stuff they already own and free up valuable space. This application is very easy to use and users can easily enter an item by taking a photo and add the location, category, list and write a note on it (Intelligent maintenance LLC, 2013).

“Closet buddy” (£0.69) helps users to catalogue and organize the contents of their closet. User can easily create custom categories. They can take photo of their belongings with the Ipad and closet buddy will allow users to import these pictures, and create an easy use catalog of their belongings. Again, this is very much like the fashion closet application (Bijan Bowen, 2011).

The following table (Table 1) has been designed to show how the concept of this project is similar to or different from the implemented available applications which are reviewed earlier in this chapter.



	Recommender	Social networking	Capability of saving clothes picture	Similarity	Difference	Extra comment
Intelligent wardrobe	Room 1 represent recommender system (Give recommendation for different occasion )	Room 3 represent social networking (communication between users)	Room 2 represent Intelligent wardrobe (capability of saving all the clothing on computer)	-----	-----	This project have a new idea of combining all these feature to work to gather
Facebook	-----	One of the most famous social networking website	Let the users to upload their pictures and share it with the chosen friends	Both are social networks, and capability of sharing pictures	Facebook users do not have the opportunity to have their virtual wardrobe in their account	There are many useful ideas in Facebook that can be added in Intelligent wardrobe
Twitter	-----	Same as Facebook	Same as Facebook	Same as Facebook	Same as Facebook	Same as Facebook
Orkut	-----	Social networking website	Capability of uploading pictures	Both are social networks	Orkut users do not have the recommender and virtual wardrobe	Same as facebook
Instagram	-----	Video/photo social network	Enable users to take photo/video and share them on a variety social networks/ex Facebook	Same as Facebook	Instagram do not have recommender system and the virtual wardrobe	The idea of sharing photos with other social networks can be useful for IN wardrobe as well
LinkedIn	Has recommendation opportunity for job seekers	Professional social network	-----	Both are social and recommender networks	LinkedIn is mostly for professional use	The idea of multi-language feature can be used in IN wardrobe for different nations
I wear	-----	Users can share their own	Users can save their	Both are virtual wardrobe	This system don't have the	The idea of having show

		clothes with their friends via email or users websites	clothes by taking picture via Iphone/IPad	application which let the users to have and manage their clothes in their Iphone/Ipad/Ipod	recommender part and users only can communicate other users via emails or other websites	room which let the users to save the outfit they liked and review it when ever they want can be a nice idea for IN wardrobe as well
My fashion closet	-----	-----	Users can save their clothes by taking picture via Iphone/IPad	Both are virtual wardrobe application which let the users to have and manage their clothes in their Iphone/Ipad/Ipod	My fashion wardrobe do not have the recommender system and social networking	While there is an effort involved in taking pictures of the clothes, the idea of allowing these pictures to be combined together into an organized catalogue is interesting and could form the basis of a recommender system.
Amazon	Recommender online shopping website	-----	-----	Give recommendation to users for easier decision	In Amazon people do not have the virtual wardrobe	The product recommendation feature based on the similarity of item can be used on room 1 IN wardrobe
Ebay	Recommender online shopping website (consumer-to-consumer corporation)	-----	-----	Same as amazon	Same as amazon	The technique of recommender system in Ebay which is based on other users with the same taste can be used for IN wardrobe
Asos	Recommender online shopping	Users can send the chosen	Users can save what	Both are clothing websites and	Asos is an online line	The technique for mix and

	website	item to their friend via emails	they choose and save it in their own basket and later mix and match it with other available clothing in Asos	give recommendation to user on what to wear for easier decision	shopping website and users can not share their wardrobe with other users and do not have the virtual wardrobe	matching clothes can be used in IN wardrobe
Man's closet	Provides advice on clothing for men	-----	-----	Both system can help users to mix and match outfit and help them to make their decision easier	This application is only designed for male users	This application have many stored picture which help users to mix and match clothes base on existing style and color , this concept can be used in general recommendation of IN wardrobe (Room 1)
Wardrobe assistance	The wardrobe assistance is aimed to organize user's closet and create outfits without users trying them on and rearranging their dresser	-----	Capability of saving clothes photos by taking picture via Iphone/Ipad	Both system have a virtual wardrobe and recommender system	Wardrobe assistance don't let the users to share their clothes with their friend for easier decision	The application will help professional wardrobe assistants to track multiple wardrobes of their customers; stylists who work on different looks and people who like to dress with taste and this system can be used for IN wardrobe
Tang Tansu	-----	-----	Capability of saving	Both websites are virtual	Tang Tansu do not have	The designed system can be

			clothes in users PC by designed system (hanging clothes on the designed system for saving and managing the clothes picture in pc)	wardrobe and let the users to have their own goods in his/her computers	the social networking and recommender system	one of the choices for users to save their clothes picture in their computer
Digital wardrobe	This application give outfits ideas out of users own clothes	The system have an option which called my network and let the users to know about what other friends like	Capability of saving clothes photos by taking picture	Both are virtual wardrobe application which let the users to have their clothes on computers or mobile phones	Digital wardrobe do not have general recommender system	This system is very similar to IN project but it is very simple , the IN wardrobe can be more user friendly for users
What is in my wardrobe	-----	-----	Same as digital wardrobe	Same as digital wardrobe	This system is only a virtual wardrobe and do not have the recommender system or the social networking	This application can be one of the sample in how to organized users clothes for IN wardrobe
Closet buddy	-----	-----	Same as digital wardrobe	Same as digital wardrobe	Same as digital wardrobe	Closet buddy will allow users to import their clothes pictures, to create an easy use catalog of their belongings which can be added in IN wardrobe features

Table 1. Comparison between this project and existing program

As it was mentioned in table # 1 there are both many similarities and differences between the implemented websites/applications and IN wardrobe. The main difference between these implemented websites/applications and this project is that IN wardrobe is a new idea of combining recommender system, social networking and the virtual wardrobe which let the users to choose what they want to wear considering their different personalities and tastes.

As it was mentioned above, after reviewing all the implemented application by other people's work and this project, it can be said this system is a combination of all these application together (social networking, recommender system and intelligent wardrobe). All the implemented application have most features of this project, except the idea of having intelligent wardrobe, communication with other users (social networking) and getting recommendation from the recommender all together. This is a new idea of the system that people are very interested in and it is very likely for them to use this system. Many of the applications require users to take photograph of their clothes, and using these photograph as the basis of the digital wardrobe. Some applications then apply 'rules' to the wardrobe in order to help people to decide which combination of clothes might be suitable for a particular occasions or which combination of clothes might go together. Some applications provide social networking support so that people can seek advice or share clothing decisions. What is less apparent from the descriptions of these applications is who they were designed for and whether different types of users might want to use them in different ways. If is not obvious who the potential users might be in a given application, then it is not easy to evaluate its usefulness. Therefore, it is important to have an idea of who will use the application and what they might want to use it for.

This project represents different types of decision-support systems to be used by different user personas (various personalities, mentioned in chapter 3), e.g., photo sharing (discussing with your friend what to wear by showing pictures of clothes in your wardrobe), recommender system (to find a suitable outfit and match an outfit from users wardrobe), and a digital wardrobe (managing wardrobe, finding clothes and matching outfits). These aspects come together in the form of an intelligent wardrobe which helps people to see their entire wardrobe, and choose outfits no matter where they are. The high-level class diagram (Figure 1) illustrates how each part of system works and how the relevant features connect with each other.

As it illustrated in Figure 1 each box needs to be provided by some information and each box describes separate functions of the system. This system is divided into three different rooms (Recommender, social networking and intelligent wardrobe).

For better understanding one box is explained below:

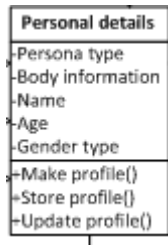


Figure 1. personal details box

When the shopper wants to register for the system, the first thing she/he needs to do is to make a personal profile. As can be seen in Figure 1, the user needs to provide persona type, body information, name, age and gender for the system to make profile, store profile and update it for users whenever they want to change it.

Each of the areas (rooms) are discussed in the report. Not all of them are fully implemented in this project, but a description of the implemented system is provided in the final chapter.

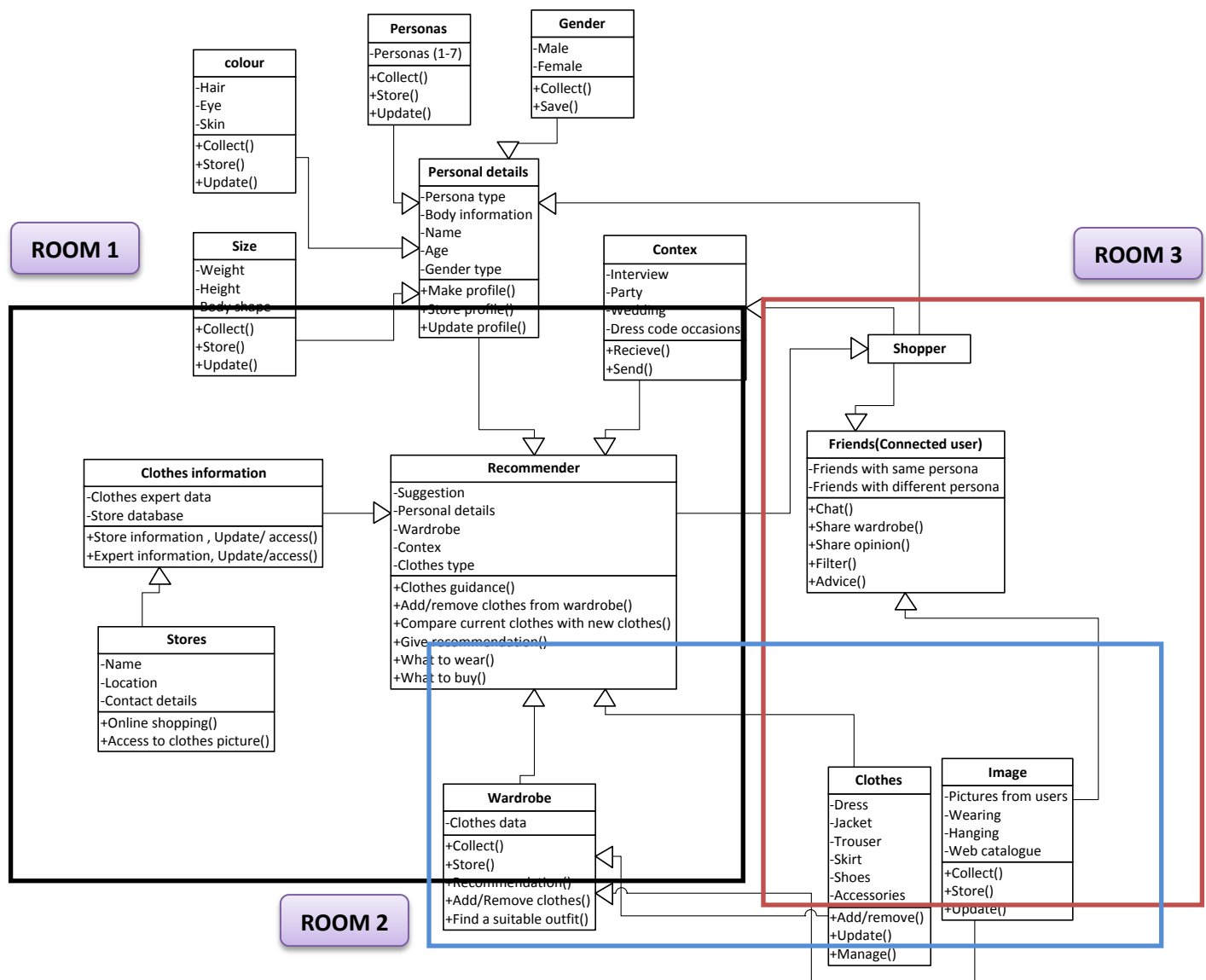


Figure 2. Rooms Class diagram

There are three different 'rooms' for users. The following charts explain how users can see all the features of this system with different usages and also how each room can be connected to

others. These charts are designed for the users to understand the idea of project in a simple way, and to realize what they have at the end in this system.

As illustrated by Figure 2, Room 1('Recommender') provides different recommendations for users. For example, it gives users general information about what to wear and buy on different occasions, perhaps in response to different dress codes. It also suggests where to find what users are looking for by looking at the favorite shops of their friends with the same personas, as well as matching, adding , and removing clothes from wardrobe.

For example, when users want to buy new clothes and need a recommendation, the first thing to do is to enter room 1 (recommender room) and by clicking on add/remove clothes from the wardrobe, the system will automatically refer them to the wardrobe data base to compare new clothes with owned clothes and as a result, try to mix and match it together. Recommender room is the most implemented part of this project. Users can start getting general recommendation by using intelligent wardrobe website. They can also use the recommender 2 to choose what they like to wear using what recommender system recommends them and at the end they can compare them together. There is also a link available in this website which lets the users to buy the chosen dress. Finding a suitable outfit, recommendation by other people personas and mix and matching clothes is the future work of this section.



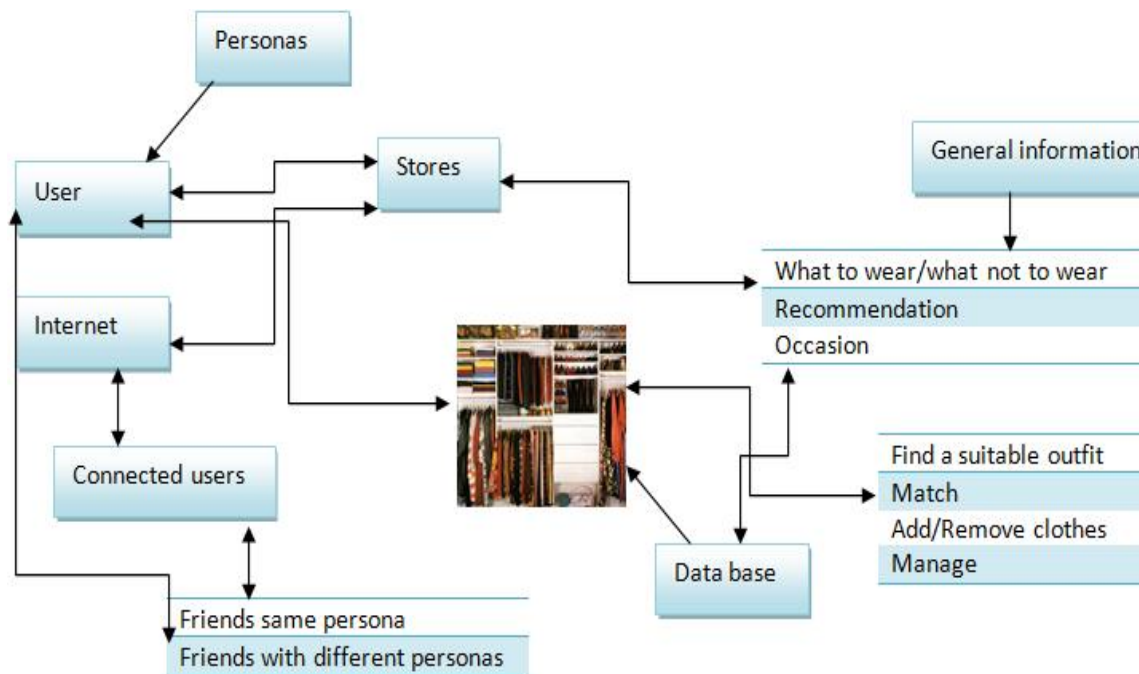


Figure 3. Overview of Room 1

Room 2 ('Wardrobe') allows users to mix, match and manage their clothes by using their computer or Smartphone. For example, by taking photos with their phone they can bring clothes into the intelligent wardrobe; and then they can navigate through the wardrobe (Shown by Figure 4).

As explained in the chart below, each user can refer to the already managed section of the chart in which they can mix and match their existing outfits. However, if they fail to choose a suitable outfit and find themselves in the need of a recommendation, they can do so by clicking on the find suitable outfit icon (see below) and as a result, the system will refer them to the recommender room once more. The implemented part of this room is a camera system which let the user to take a photo of his/her wardrobe and save it in their database. The different ways of how these pictures can be saved and categorized are mentioned in the following chapters. Also there is a sample of how this room will appear in this website as well. The connection between room 2 and the other rooms are the future work of this project.

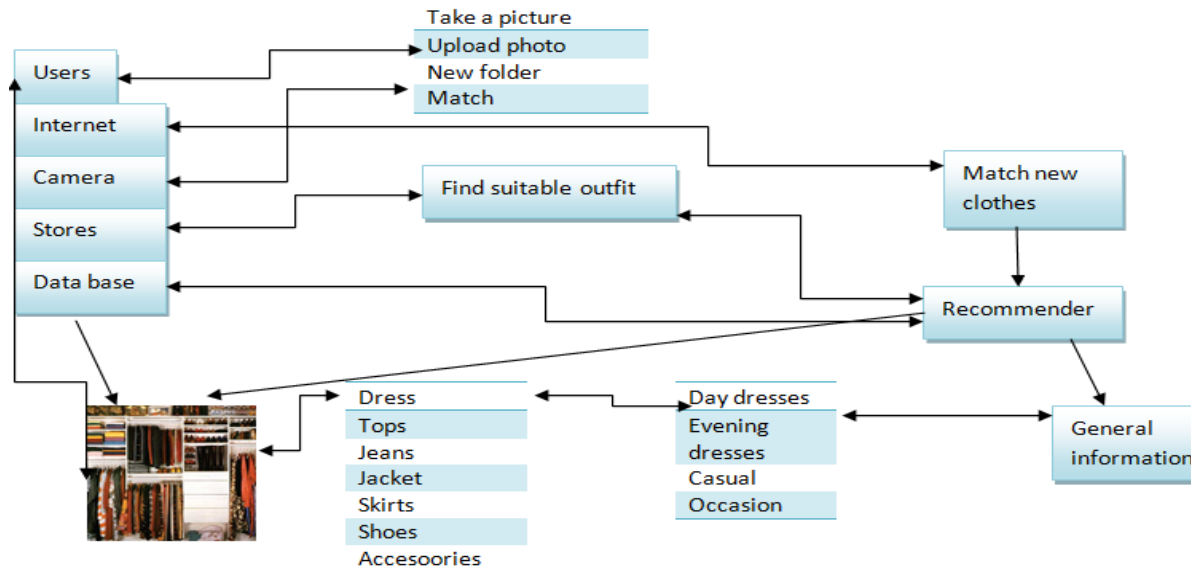


Figure 4. Overview of Room 2

In room 3 ('Connected User'), social networking applications help users to communicate with their friends by sharing pictures of clothes from different stores, and picture of their own clothes from the wardrobe in order to ask their opinion about what to wear and buy (as shown in Figure 5).

As can be seen in Figure 5, each user can share his/her wardrobe with other users by clicking on share it with my friend's icon. At the same time the users can also decide who should not have access to their wardrobe by clicking on the limit and privacy icon. For social networking room the implemented part is the communication between users. Each user can send text or pictures to his/her friends by using AQL system which is mentioned in the next chapter. The connectivity between these rooms and the detail feature of this room is the future work of this project.

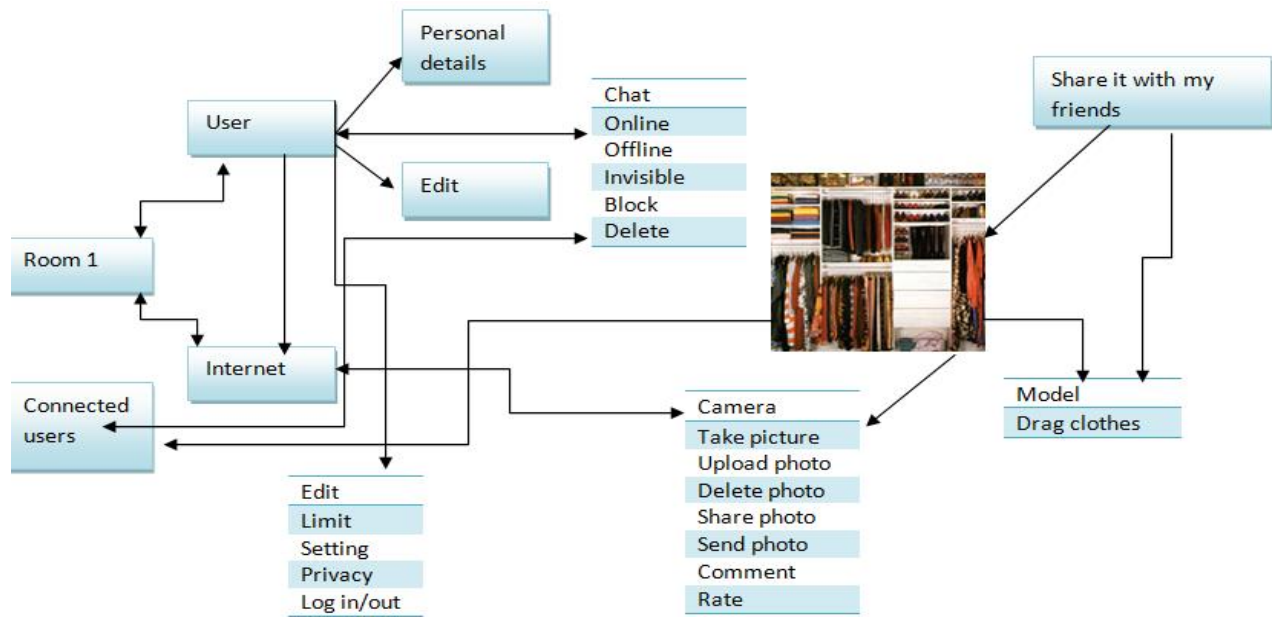


Figure 5. Overview of Room 3

In order to develop the concept, the report begins with literature review covering mobile social networking, camera phones, recommender systems, intelligent wardrobes. Furthermore, a discussion of decision-making in consumer behavior is presented to consider why, how and when people buy clothes. This helps to define the types of decisions that people make when shopping and is used to indicate how these decisions could be supported by these systems.

For a better understanding of this project an example is presented below, covering usage of system.

- Name: Maral

Age: 24 A person who shops regularly and loves to shop with her friend , has many clothes in her wardrobe and likes to shop online and also in store.

Occupation: Student/part job time shop assistance

Maral really enjoys shopping and will buy clothes every week. She likes to shop with friends because she values their advice. One day she is on a lunch break from her part-time job and decides to browse some of the clothes shops in the high street where she works. She sees a dress that looks very pretty but can't decide whether to buy it or not. Usually she would ask her friend but today she is by herself. She takes the dress to the changing rooms and tries it on. It looks

very nice but she is still not sure. She takes a photo of herself wearing the dress and sends it to her friend and to her wardrobe. The wardrobe sends a message back to say that she has a dress a little like this one, and shows a picture. Maral decides that the new dress looks different and asks what she can wear with it. The wardrobe sends back pictures of shoes and a jacket she owns which would go nicely with the dress. Meanwhile, the Recommender system advises her that the colour and style is very good on her, and her friend replies that the dress looks really good on her. Based on the system suggestions and her friend's positive recommendation she finally decided to add this new dress to her wardrobe.

This system, on one hand can help people to decide what to buy, what to wear, mix and match suitable outfit and manage their wardrobe, and on the other hand, it builds on user's own social networks and allow them to communicate with their friends and having fun.

### **Type of behavior (system support):**

The following diagrams (Figure 6) were designed to explain how users and the system can connect with each other (type of behavior system support)



Figure 6. Type of behavior

As it is mentioned before there are three rooms with different features which can support different usage. The above diagram is designed to show how users can communicate with each

other and also shows the connection between different features of the system; the data base of the clothes is the main connection between all these features and the system needs to go through clothes data base before doing any further actions. Basically, clothes data-base of the system can help each room to continue their operation.

For example, when user number 1 wants to communicate with the social networking room and start talking with his/her friends, first the system needs to connect to clothes data base for doing any further action, such as sharing their wardrobe to mix and match or need their friends opinion for buying and adding a new clothes in their wardrobe. Therefore, when the system connects user number 1 to her/his clothes database then the system can share the specific part of user's wardrobe to another user (friends) for continuing their needs and action.

This matter occur for most part of the system such as getting recommendation, add or removing clothes, mixing and matching and etc. Only some parts of this system have general data base and there is no need for connecting to the clothes data-base in the first step. For instance, when the users want to get general information (Dress code) or only chat with their friends by sending text messages without sharing any pictures, then the system can connect users to a chat room or to general information data base and complete their need with out connecting to the provided clothes data base.

The following chapters will explain each room and the concept of the project in more details.

## 1.3 Outline of chapters

This thesis contains the following chapters.

1. Introduction: This chapter gives an introduction about the project, the main objectives of the project, comparison between this project and other people work and the structures of the report.
2. Literature review: In this chapter, we emphasis on the review of previous research such as consumer behaviour, social networking, recommender system and ambient technologies and consider the new options that this project is going to offer. At the end of each review there is a brief explanation of how the review helps to develop this system.
3. User requirements and specification: This chapter gives an explanation of how this concept is designed and implemented by defining different surveys.
4. Recommender system: This chapter focuses on the literature review of the recommender system, and explains the rules by which an implementation is created, and finally presents a comparison between personal choices with recommendations.
5. Web design and evaluation: in this chapter, we focus on versions of web pages, initial survey and QUIS.
6. Conclusion: This chapter briefly comments on the result of this project for each unit and gives suggestion for future work which can enhance and upgrade the project.
7. References: This section lists the references used during all phases of project and preparing this report.
8. Appendix: This section will include the visual studio, C++, C#, .Net application code PHP, SQL, HTML and Dreamweaver.

## Chapter 2

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### Literature Review

This chapter introduces mobile social networking and recommender systems. It reviews some principles of consumer behavior and the concepts relating to ‘intelligent wardrobes’ which are essential for this project. At the end of this chapter, an overview of project concept (particularly in terms of the type of behavior for the system supporting) and its derivation are explained.

In this chapter, different reasons of why people shop and how they like to shop will be explored. This chapter provides a basic review of the project and includes surveys to see how much money users spend on clothes, how they like to shop and how often they shop. Surveys 1 and 2 (provided in appendix A and B) were designed for this matter. The chapter also considers some of the problems that people encounter in the shopping behavior. In this case, we came up with the idea of developing a system which can help users manage their shopping behavior in a different way. But before start making this project and adding different features to it first we need more information on, what exactly users wants and need from the system to make their life easier and what kind of device can be developed to save users time and help them to decide on what they want to buy and wear.

### 2.1 Consumer behavior, recommender system, social networking, mobile technology and intelligent wardrobe

Consumer behavior research is concerned with analyzing how, why, when and where people decide whether or not to buy products (Consumer behavior, 2008). Consumer behavior is a multidisciplinary topic that draws on psychology, sociology, social anthropology and economics. We should analyze the following factors that affect consumer behavior for different ages:

- Why do people buy clothes and how do they decide what clothes to buy?

- How do other individuals (like friend, member of family, store sales assistance) affect a consumer's decision? (Consumer Behavior, 2008).
- How do people prefer to shop: (Online, Catalogue, and Store).

#### 1. Why do people buy clothes and how do they decide what clothes to buy?

Clothing was used to cover and protect human bodies. Nowadays clothing is more than just for basic reasons like protection or covering. Clothing is a form of identification (Kang, 2005). "The reason for wearing clothes are numerous, complex and interrelated. The attitudes consumers hold toward clothing influence their choices even though they may be unaware of the specific reason for certain clothing choices. The attitudes may also affect the closeness or looseness of fit in clothing" (Williams, 1974). Users seek a variety of benefits from clothing. "It would be beneficial to apparel companies and researchers to identify the benefit traits and characteristics consumers want from clothing" (Swan and Combs, 1976). "Self improvement, social status/prestige, Figure flaw compensation and fashion image had the highest mean scores on the nine clothing benefits factors sought" (Shim and Bickle, 1994).

Some consumers like to share their ideas with others to follow the new fashion trends (Bertrandias& Goldsmith, 2006; Ellen, 2007; Sproles, 1979; Westbrook & Black, 1985). For some shoppers, the main reason for shopping is to express themselves (Westbrook & Black, 1985). Others can be named as fashion 'ideas leaders' since they like to help others to decide through interpersonal communications and be known for their ideas and their styles in fashion shopping (Bertrandias& Goldsmith, 2006).

Sometime it is hard for people to decide what to wear and what to buy and find suitable outfits. For this reason we decided to design a system to help people to make their decisions easier. Such a recommender system can help people to decide what to wear and what to buy, particularly when they need a second opinion. Although shopping can be a favorite activity for some people, others find it a chore. Even those who enjoy shopping can become confused by the variety of choices in clothing. Therefore, it is proposed that some form of recommender system offer the potential to make this process easier and more enjoyable for users.

Fit is one of the important reasons that help to confidence and comfort of wearer. Fit preference is very different from person to person. Fit preference is affected by two main criteria. One is a



personal decision on how the garment looks on the human body. The other is the comfort level of the garment based on both tactile and visual responses from the customer (Alexander & Connell & Presley, 2005). Other studies have used demographics, body, 'advantage' required from clothing, for example fashion innovativeness and figure flaw compensation, and body style of the respondent to examine shopper's approval with fit.

Body cathexis is defined as the "degree of satisfaction or dissatisfaction with the various parts or processes of the body" (Secord and Jourard, 1953, p. 343). In terms of clothing, 'fashionable' clothes have a standard sizing which is not realistic and when clothes do not fit them, people might blame their own bodies which in turn reasons a negative body image (Alexander & Connell & Presley, 2005).

The size of the garments is communicated to the consumers through the size labels on the clothes. Customers choose clothes according to the size labels and they will return the clothes if they are not happy with the garment. Only a small section of the population has what is culturally considered perfectly proportional bodies. Designed and ready clothes are made for customers with different bodies.

In the USA in 1940s the standard size was established by a Federal Trade Commission and the Department of Commerce. However, nowadays women's clothing, most producers and designers ignore the standard sizing and follow their own sizing standards. One of the most important reasons that women wear designer clothes that are not following standard sizing is that different firms have different target populations of women with different lifestyles, incomes and body shapes (Alexander & Connell & Presley, 2005). "Fit is an individual preference and there is no way the pattern companies are going to meet the needs of every person" (Hazen, 1998).

The fit problems and dissatisfaction in the ready-to-wear market signal to production that significant fit difficulties exist in the sizes available and substantial stages need to be taken to update the outmoded standard sizing system (Alexander & Connell & Presley, 2005). Research has shown that women are more responsive to clothing fashion than men, and that the degree of innovation is related to, for example, age, and for this reason mature customers do not adopt into new fashion as quickly as young customers. Customers between the age of 40-63 purchase their clothes based on quality, body shape fit, ease, material, garment style and design rather than

price and fashion ability (Nam, 2007). In their survey, Holmlund, Hagman&Polsa (2010) showed that mature shoppers think that their body shapes are not suitable for many ready-to wear clothes and designers and most of the ready-to-wear styles are suitable for younger customers. They preferred good quality fabric, good fit, loose and comfortable fit, elastic band in waistline, suitable fit for their body shape, XS petite/XL large ranges, good fibres, and comfortable to wear, soft fabrics. Although mature customers find it hard to estimate garment quality, they often consider brand as a replacement indicator of product quality (Auty and Elliott, 1998). The most important reasons for clothes refunds have been found to be dissatisfaction with fit and style of garment and having difficulty to find a right size (Alexander, 2005) .

In every season designers release new clothing for customers, because they know that consumers. Women follow fashion changes and trends, and they consider fashionable clothing and new season style as an important part of their lives. By buying new pieces they estimate their own fashion ability continuously, as well as making them feel better about themselves by giving themselves a prestige. Research shows that majority of women bought clothes approximately between six to eight pieces for each season: spring, summer, autumn and mid-winter and it is fun, positive, easiness and enjoyable process for them.

### **How people prefer to shop: (Online, Catalogue, Store).**

### **Recommender systems for shoppers**

Wearing clothes is not only about keeping people warm is a fact of what to wear, making a decision, fashion, personality and fun. Sometimes when people want to shop or find a suitable outfit, they can not make a decision by themselves and need a second opinion. So after finding out why people shop and how they do it, we realised sometimes they have problem in choosing clothes therefore by using recommender system people can make a decision much easier by looking at other people ideas and recommender comments. For helping people find their suitable outfit and shop easier a recommender system were designed in this project. This recommender

can help users in different ways, such as what to wear and not to wear, finding general information, what to buy and what not to buy and etc.

For example when user want to attend a wedding and don't know what to wear, he/she can use a general information on recommender system and recommender system will recommend them by giving lots of information on subject of what to wear to a wearing, such as:

“Most weddings will specify a dress-code, so it's crucial to understand what terms like ‘black-tie’, ‘white-tie’ and ‘smart-casual’ can mean. Our guide to what to wear to a wedding explains what will be expected of you when confronted with different dress-codes – so you won't feel lost when planning your wedding outfit.

White tie: white tie doesn't mean that you wear all white, as most people get confused with. In essence ‘white tie’ for men means that you opt for a tail-coat rather than a dinner suit. Shirts, waistcoats, ties and bow ties have to be white and patterned or gimmicky ties. For women ‘white-tie’ means longer dress styles rather than short ones. White tie is a formal code for wedding.

Black tie: this is most common dress code for wedding and you can have the flexibility to go very glam, tone it a little with sophisticated suite style or wear a feminine dress with an evening style twist. The only rule is should look more dress up than normal. For men tuxedo or a dinner suite is ideal for a black tie occasion (Burke, 2009).”

All these information is available for users when they use the system; so by going on general information in recommender system, they can decide what to wear easier after going through all recommendation.

Basically a recommender system is designed to help customers find their way through today's complex online shops and entertainment websites (Bentley, 2003). Recommender systems can be divided into three main categories, collaborative system, content-based system and combinations of content-based system and collaborative system. Recommendation, based on cooperation, is known as a collaborative system. The most common method, based on individual's past behavior, is collaborative filtering (CF), which makes use of what the user did in the past (for instance, the history of transaction or how the user rates different items). CF algorithms recognize relationships between users and products, and makes associations using this information to predict user interest (Mcleod, 2004). Collaborative filtering is one of the most successful

methods that let the prediction of user's interest in the recommendation systems. There are three main processes in these types of recommendation systems:

- object data collections and representations
- similarity decision
- Recommendation computations (Mcleod, 2004)

Collaborative filtering aims at finding the relationships between the new product and what customers bought before, which is stored in a data base, in order to give users recommendation about what they need to buy. How similar are two products supposed to be in categorizing to confirm the preference prediction? Similarity is defined in a different ways by collaborative filtering method. For example customers that like and dislike shopping for the same categories of product would be measured as the ones with similar consumer behavior (Frasconi, 2008). Nearest-neighbor algorithms can then be applied in the implementation of the recommendation systems (Marinho, 2006). "The designs of pioneer recommendation systems focus on entertainment fields. The challenge of conventional collaborative filtering algorithms is the scalability issue" (Avesani, 2006). "Conventional algorithms explore the relationships among system users in large datasets. User data are dynamic, which means the data vary within a short time period. Current users may change their behavior patterns, and new users may enter the system at any moment. Millions of user data, which are called neighbors, are to be examined in real time in order to provide recommendations" (Frasconi, 2008). Searching over millions of neighbors is a time-consuming process and newer systems use item-based algorithms to enable reduction of computations because properties of items are relatively static (Sarwar, 2001). For example, Amazon.com employs item-based algorithms for collaborative-filtering-based recommendations (Frasconi, 2008). Collaborative filtering technique collects and established profiles, and calculates the relationship between the information according to similarity models. The possible types of the information in the profiles include user preferences, user behavior patterns, or item properties. There is one important assumption in all of the collaborative filtering algorithms, users who have similar preferences in the past are most likely have the same preferences in the future, so by this theory, the system can save all the data about users' preferences and history, and predict the items that they want to get in future. There are users who have the same personalities and taste and also people with different personalities and taste

(neighbor algorithm). Recommender system looks at the similarity in their preferences on a particular item. This assumption can't be true all the time, but for the purpose of recommendation, it is true enough (Breese et al., 1998).

In order to give users recommendations, the system has to collect data. The final goal of collecting information and data from users is to get an idea of user preferences, which can later be used to make predictions on future user preferences (Breese et al., 1998). There are two different ways of collecting data for recommender system. The first way is to ask for explicit ratings from a user, typically on a concrete rating scale for example giving one to five stars to the specific movie or clothes. The second one is to collect information implicitly as the user is in the domain of the system that is, to log the actions of a user on the site and it is an easy process to work with. The rankings that a user gives can be interpreted as the user's preferences, making it easier to make extrapolations from information to predict future ratings. However, the drawback with explicit data is that it puts the responsibility of data collection on the user, who may not want to take time to enter ratings.

The best result that recommender can give the users is when these two methods combine with each other. One could gain the advantages of explicit voting when the user chooses to rate piece, and could still make recommendations when the user does not rate items by implicitly collecting data (Breese et al., 1998).

Recommendation based on combining content-based and collaboration is known as a hybrid system. This will recommend product of interest to people based on data which is stored in data base such as previous usage patterns, the usage patterns of other users, and features of the products themselves (Meek, 2003). As mentioned before, Collaborative filtering (CF) method gives recommendations to the user by using the interest of other users that have similar interest to that user. A variety of methods have been proposed for performing recommendation, including content-based, collaborative, knowledge based and other methods. To improve performance, these methods have been combined in hybrid recommenders (Burke, 2009).

Hybrid recommender systems combine two or more recommendation techniques to give better performance with less drawbacks of any individual one. Most commonly, collaborative filtering

is combined with some other methods in an attempt to avoid the ramp-up problem. Hybrid recommender can be divided in three categories:

- A weighted hybrid recommender is one in which the score of a recommended item is computed from the results of all of the available recommendation techniques present in the system. For example, the simplest combined hybrid would be a linear combination of recommendation scores. It initially gives collaborative and content-based recommenders equal weight, but gradually adjusts the weighting as predictions about user ratings are confirmed or disconfirmed (Meek, 2003).
- A switching hybrid builds in item-level sensitivity to the hybridization strategy: the system uses some criterion to switch between recommendation techniques. The Daily Learner system uses a content/collaborative hybrid in which a content based recommendation method is employed first (Meek, 2003).
- Mixed hybrid system where it is practical to make large number recommendations simultaneously, it may be possible to use a “mixed” hybrid, where recommendations from more than one technique are presented together. The PTV system (Burke, 2009), uses this approach to assemble a recommended program of television viewing. It uses content-based techniques based on textual descriptions of TV shows and collaborative information about the preferences of other users. Recommendations from the two techniques are combined together in the final suggested program. The mixed hybrid avoids the “new item” start-up problem: the content-based component can be relied on to recommend new shows on the basis of their descriptions even if they have not been rated by anyone. It does not get around the “new user” start-up problem, since both the content and collaborative methods need some data about user preferences to get off the ground, but if such a system is integrated into a digital television, it can track what shows are watched (and for how long) and build its profiles accordingly (Burke, 2009).

2. How other individuals (like friend, member of family, store sales assistance) affect a consumer's decision? (Consumer Behavior, 2008).

Shopping is not only related to purchasing products; it also lets people socialize and communicate with other people (Arnold & Reynolds, 2003; Bellenger&Korgaonkar, 1980). For customers from age of 13 (teenager) to middle-aged and older, shopping is a really important part of their communication and socialization. Shopping provides opportunities for them to meet and see other people (Piacentini& Mailer, 2004).

Social communication occurring in shopping and customers' satisfaction of social needs have been associated with good selling and marketing presentations. Selling and marketing results can be improved by incorporating the social shopping component in sales planning (Babin,Darden, &Griffinet, 1994).

On the other hand, advances in fashion retail systems and information technologies can render social shopping experiences more difficult to maintain. In reality, consumers have lots of options for where they can shop, how and with whom they can shop. Consequently, consumers extend their social shopping experiences to several fashion retail markets.

Customers, while they shop with a group of friends or with their family, pay attention to what they want to buy and wear and how much money they spend on clothes to compare other people ideas with their own ideas (Luo, 2005; Tauber, 1972), "These close referents provide customers with subjective and normative standards for their selections or purchases, and feedback from this group reinforce the consumer's selection as the right one" (Mangleburg, Doney, & Bristol, 2004).

"Shopping is the way to spend time together with friends and/or family members" (Arnold and Reynolds', 2003p. 80). In shopping, customers like to be with groups of people with the approximately same style and same ideas to share their opinion and idea together and decide what to buy and wear with different opinions. Teenagers like to shop primarily with friends and like to be with friends during shopping and they like to go shopping with their friends because

their opinion make their decision easier for what to buy and what to wear (Mangleburg et al., 2004).

For fashion design companies, social shopping and consumer behavior for fashion carries a special and important meaning because previous research have identified that social activities occurring in shopping to customers' satisfaction of social needs contributes to retailing and marketing results such as store support, positive attitudes toward a designer store/brand, and extended shopping time and spending, it is thus important to fit in the social shopping component in fashion industry planning to produce wanted retailing and marketing outcomes (Babin, 1994; Bellenger&Korgaonkar, 1980; Jones, 1999; Paridon, 2004).

The theory of comparison in social shopping is important for defining social shopping for fashion. Social comparison, consumers' essential needs to calculate themselves by comparing with other consumers, is a basic motivation that drives social behaviors (Festinger, 1954). Social comparison is to be expected to happen in the fashion shopping area because shopping behaviors inherently involve social and interpersonal activities (Bloch et al., 1994; Cowan et al., 2004; Tauber, 1972) and fashion is "so peripheral or so visual that it becomes an easy target for social comparison" (Kaiser, 1997). The modern fashion shopping contains lots of different choices for customers and they have broad complex products to increase customers for their brand (Festinger, 1954). Social shopping for fashion industry is when people discuss their opinion on the products such as clothing, shoes and related accessories with each other (Kang, 2005).

Fashions change a lot and, because of huge retailing system and information technology provide a perfect deal of products and outlets, in this case the standards of what to wear and what to buy and recommendation for customers for the best option may not in fact exist. "Particularly in daily consumption of fashion, individuals often face ambivalence that rises between conformity and individuality" (Kaiser, 1997).

Customers' satisfaction is the key contributors of competitive retailing, and so, one of the most important results for retails companies is customers satisfaction (Otieno, Harrow and Lee-Greenwood, 2005). Satisfied customers have a higher level of purchase intention and loyalty and



positively influence other customers. On the other hand, unsatisfied consumers are most of the time give a negative word-of-mouth and even take legal action (Otieno, 2005).

Shopping with close referent such as friends and family can help customers to decide easier on what to buy and what to wear by having fun, on the other customers by communicating with stranger such as sales person in store can decide easier on their purchase by having recommendation on products (Chang, 2004). Social activities in shopping are determined by looking through outcomes of shopping such as how much time customers increase per shopping trip, how much they increased frequency of unplanned purchases, or for how long they might continue shopping after purchasing a product, how much they increase in spending money, how much they increase partiality for the store, and patronage behavior (Bellenger&Korgaonkar, 1980; Paridon, 2004; Reynolds & Beatty, 1999).

Most likely people who share their opinion with others during shopping showed a high level of patronage behavior (Kang, 2005). Also, customers who are more engaged of social needs and really into social shopping behaviors were found to be in the section that has a high purchasing records and store loyalty compared with other shoppers who are less into social motives and were less engaged in social behavior in shopping (Reynolds & Beatty, 1999).

The preceding discussion shows how (for some people) shopping is a very important part of their social lives, and how the opinions of other people become important in their decision-making. This raises the question of whether digital technology provide the same sort of social experience, or can (as proposed in this thesis) digital technology be put into the social shopping experience, particularly with increasing purchases through the World Wide Web. Consequently, a research has been done on social networking and how we can design a system to help users to communicate with their friends easier.

### **Mobile social networking**

Shopping through social networking could become very popular in order to let users to communicate with other connected friends to share and upload photo from different store and from their own wardrobe, to ask their opinion about what to wear and buy.

Social network is set of people that are connected by different sets of social relations such as co-working, friendships and information exchange (Jones, 2000). Social networking analysis emphasizes on patterns of relations between people and organizations. It seeks to describe networks as fully as possible. It traces the flow of information. This approach facilitates the study of how the information flows and how people acquire resources (Jones, 2000).

Rapid growth of social networking has been observed within the last few years. Social networking web sites introduce a variety of methods for communication through the internet whether with PC or even with mobile phone (Social networking, 2007). Users can create their own online profile and display a network of contacts, or “friends”. Web site users are able to communicate via their own profile with their friends and people who they are interested in but are not in their contact list. This method is one to one basis (very similar to email) or even in a public way so that or can be seen by everyone else (Social networking, 2007).

In terms of shopping what is obvious is that friends like to shop together for having more fun and also to have their opinion about clothes they want to buy (Kiesler, 2005).

Sometimes friends can not manage to go together, so for this part a system were designed to let users to communicate while they are in stores, this system is called social networking system. By using social networking system (Room 3) they can communicate with each other and ask about their opinion via mobile phone when they are in stores and also they can communicate via computer when they are at home and want to ask their friends opinion to find a suitable outfit.

For example when a shopaholic person want to go somewhere and have many clothes in her wardrobe then most of the times she need a second opinion. By using this system user can easily communicate and share their wardrobes with other users and try to mix or match a suitable outfit together where ever they are.

3. How people decide to buy clothes and how they prefer to shop? (Online, Catalogue, Store)

There are two main reasons for online shopping:

1. Convenience.
2. Pricing.

### **Convenience Shopping**

Customers like the idea of shopping in their own home whenever they want by their own time schedule because online stores are open for 24 hours (Nielsen, 1999).

They also like the reason of not facing traffic or parking when buying online especially during holidays and weekend. They can do all their shopping at home and then items will be delivering to their door. Shoppers also know that they can find exactly what they are looking for online. They do not have to hop in their cars and go from store to store until they find the items they want. It is all available to them on their computers (Nielsen, 1999).

### **Comparison Pricing**

Shopping online allows people to find the best possible price for the purchase they want to make. Customer wants to make sure that they pay fair price for products. . By purchasing online, it is very easy for them to evaluate their savings. Comparison in online shopping is very easy for people. All they have to do is go through different websites to know which one offers the best deals. This is much easier than going to different stores in different places (Nielsen, 1999).

Some of the most important reasons that people shop online are:

- Large variety of product

- Lower price
- Easy to place an order
- Faster service and delivery
- Detailed and clear information about what is being offered
- Easy payment procedure (Nielsen, 1999)

and also:

- Capability to shop at a time that is suitable for users
- Sometimes it is cheaper to shop online
- Customers have opportunity to compare as many clothes and prices as they want without going through different shops
- Saving time
- No driving and parking
- 24 hours shopping
- Sometimes tracking of shipping is available (Norman,2008)
- Most online stores have a refund and exchange policy

For customers the internet has countless capability to increase the quality and quantity of information, remove time and distance limitations from shopping, and decrease data distribution cost (Sultan and Qualls, 1999).

There are lots of problems of producing content and implementing software system for most companies while some websites have recognized new content generation can bring lots of great value for customers beyond substituting for existing retailing practices. There are different benefits of websites such as:

1. Using recommendation advice by connecting the customer to a live recommender by using email, ex: drugstore.com
2. By increasing variety of information to help the user for example when the user wants to buy a book by going through amazon.com there are over a million titles of books for them to choose
3. By ordering what they need from stores online and delivery of groceries ex: tesco.com
4. Finding cheaper price on items like airline tickets ex: eBay.com hosts

Lots of websites provide general information about products and let customers develop individual comparison matrices across relevant subsets of products. One of the new terms of screening products, like bikes and cars, is Personal Logic, which helps customers to limit the products that do not fit their requirements. “Fire Fly Inc. and Net Perceptions pioneered collaborative filtering” (Shardanand, Maes, 1995, Resnick, Iacovou, Suchak, Bergstrom, Riedl, 1994) as a way to understand what products a customer might prefer. In collaborative filtering, customers first for products, for example books, are used to bring customers attention and identify a preference profile of people in that cluster (Sultan and Qualls, 1999). This is discussed in chapter 3.

One of the most important topics in online shopping is the role of trust in marketing between the users because they need to trust their online partner or buyer to exchange and transfer information (Moorman, Zaltman, and Deshpande 1992, Morgan and Hunt 1994).

When a customer enters into discussions with a seller, an amount of trust based on information and comfort must exist on the part of both exchange partners; a trust that there will be no wonders when an agreement is reached (Moorman, Deshpande, and Zaltman 1993).

Users must believe the data are useful and correct when they make a decision, in the case of internet websites. Trust works in different ways depending on a customer’s level of knowledge.

If customers are imperfect in their product knowledge, it is more possible for them to improve trust when the salesperson knows their concerns, attempts to listen to their needs, and takes on the role of a consultant. This submits that the knowledgeable customers will have a less preference for using a web-based advisor than the less knowledgeable customers (Sultan and Qualls, 1999). To develop a trust based prototype of a web recommender, first the dimensions of trust should be identified that would work as cues in the websites. Some research on the concept of trust discovers that clients expect the Internet exchange to be based on a social contract built on a relationship of trust. If consumers do not trust that their own personal data will be kept private and that payment is secured and executed only with appropriate authorization, they will not use the Internet to do their shopping (Sultan and Qualls, 1999).

For example, eBay.com sends consumers evaluations of each person or online stores that propose products at auction in terms of the amount of positive and negative evaluations and allows buyers to communicate with past customers by email. In parallel with electronic development, consumer behavior is also changing. One of the important technologies that creates and innovates communication is global network or the Internet. With the rapid growth of e-commerce (electronic commerce), business practices have changed and people are more interested in online shopping. Due to many attractions in the internet business there are new and emerging websites tailor-made to each customer's specific need (MacManus, 2009). For online succeed first there are several questions to ask, like why customers shop for certain items and online facilities. There is a growth of online shopping; therefore companies must first understand the reason of why people shop online (Nielsen, 1999).

Due to the reach of the internet, many retailers can supply good services to customers. Customers can refer to their friends or other people, post comments and suggestions on these sites. However, if they have limited knowledge of a product range, they may simply decide on the basis of their previous experience (MacManus, 2009).

Relying on previous experience might not be the best way to follow fashion or select appropriate clothes (RS, 2008). One way to overcome such problems is to use a program called a recommender system. This program works by accumulating and collecting user's profile and their interests in order to suggest similar items and ideas to users. Presentation of information can then make their decision easier (RS, 2008). These systems are regularly used by Electronic-commerce websites as marketing tools to increase profits by explaining products that the users is possible to buy. A website using a recommender system can develop knowledge of user's interest and dislikes to make an understanding of their individual requirements and thereby increase customer loyalty (RS, 2008).

And secondly people who like to shop in stores because of previous mentioned reasons such as having fun with their family and friends and for some other reasons such as:

- They don't have to pay anything for delivery

- Sometimes users have to wait more than a week to receive the items
- It is also better to try the size and feel the quality before buying it
- Personal attention from salesman
- Can be more secure and safer to use credit card in stores than using it online
- They cannot try on clothes or feel the material (Norman,2008)

This project can support both taste of consumer behavior, in shopping by using recommender system for people who likes to shop online and by getting recommendation about what to buy. Social network system is good for people who likes to do shopping in stores but they need their friend's suggestion about what they want to buy.

Before start using a recommender system and social network system, we need another program to help users to access to their wardrobe and share it with other people. For this part another system were designed to help people to manage, mix and match clothes in their wardrobe by using computer or mobile phone, this system is called intelligent wardrobe. Intelligent wardrobe can help people in different ways such as, helping users to realize if the new clothes match the other ones that users already owned while they are in stores.

For designing this part a research has been done on intelligent wardrobe to see the existing software and other people's comment on how useful the system can be for users, which is mentioned below.

These day people pay a lot of attention to social networking sites, most of people are registered in different social networking sites to communicate with their friend and other people. Nowadays people use social networking sites for different usage such as communicating with other people, organizing events, advertisement, invitation and many other usages.

As it is mentioned before, shopping through social networking is a new concept in this project. This can become very popular in order to let users to communicate with other connected friends to share and upload photo from different store and from their own wardrobe, to ask their opinion about what to wear and buy.

The most famous social networking sites are Facebook, My space and etc. which can help users to communicate with different people and organizations by chatting, photo sharing and lots of other facilities which most of people which have an access to internet join these websites.

In terms of shopping, what is obvious is that friends like to shop together for having more fun and also to have their opinion about clothes they want to buy (Kiesler, 2005).

Sometimes friends cannot manage to go together, so by using social networking system (Room 3) they can communicate with each other and ask about their opinion via mobile phone.

In comparison of this project and other existing social networking websites we can say this project let users to communicate and share their photos with their friend with the difference of while they shopping and choosing their outfits they can have their friend's ideas and opinion to mix and match their clothes.

In room 3 which is social networking room, the user can chat and share their photos with selected friends. This room also is connected to room 1 which is recommender system room and can help recommender to make a decision in giving advice to user by going through other user's opinion and rating, with same persona.

Now a days, mobile social networking and personal computers are the most famous devices and most of people have one of these devices, even some people can not leave without these devices and their entire work and time saving are depends on these devices. Social networking review is the main practice for this project, after the above review we realize on how people like to shop (online, catalogue or store) and how we can separate users shopping behavior and their character (personas).

For social networking part, a survey has been designed (which is provided in appendix A) to find out about how users like to shop (in store, online, by friend, alone, and etc.), how likely is for them to use this devices and by going through the entire questioner we can categorize different personality (personas) for different person. These personas can help the system in different ways such as giving recommendation, finding their suitable outfit, finding friends with the same opinion and taste, finding their ways to use the system and etc.( for better understanding 2 sample of the answered survey are provided in appendix L)



## Ambient technologies (Smart Wardrobes)

Digital Wardrobe allows people to view their entire wardrobe, and choose outfits no matter where they are. Users can easily mix, match and organize their clothes digitally on their computer or Smartphone (Digital closet, 2010). So easily by taking photos they can bring it right into the digital wardrobe; and now they can move through the wardrobe. This program helps people to bring their wardrobe to its fullest potential, Users can try on pieces they want to buy with clothes they already own, planning what to wear for the entire week or month with the built in Calendar, allows them to easily create an outfit by mixing and matching items from your wardrobe with slide through dressing room feature. And by adding rating features to this application, Outfits can be organized in categories more and listed on a 5 star rating system allowing people view outfits from top rated to lowest (Digital closet, 2010).

The digital wardrobe is like a virtual mirror which has the user's body shape stored on it , so user can drag her/his clothes from inside of wardrobe on the body shape and find a suitable outfit(Digital closet, 2010). There are different applications were invented so far for iPhone, PSP, and Google in this area. Figure 7 below, shows the sample of dressing room:



Figure 7.Digital wardrobe

For having an intelligent wardrobe and sharing photo we need to have a camera system to take those photos and another system to store those photos and share it with other people. In this section, we explain how system takes picture of clothes and send it to the database. There are many reason and benefit for users to store pictures of clothes and text in database. The followings are some benefits of using database:

- Database allows the users to manage the data by taking backup on a regular basis and easily.
- The data can be restored to another kind of database on another system or other users.
- By using standard SQL language, user can easily add, update or delete stored data.
- The stored data can be easily inserted and retrieved by using standard SQL language for text or by using AQL system (which is mention in this chapter) for pictures.
- User can send back pictures to other users by using AQL system.
- Many users/applications can access the same database at the same time.
- Improved data security by requiring username and password to access the data in the database.

The following chapter explains how users can take a picture of clothes when they want to buy new clothes and send it to other users for their opinion (Room 3(Connected users)) or adding a new picture of clothes in their own intelligent wardrobe (Room 2(Intelligent wardrobe)).

### Smart clothes hangers (TagTansu)

TangTansu (Tsukada,Tsujita& Siio,2008) helps users to easily take picture of their clothes by adding information on it by simply hanging clothes on a hanger built into a wardrobe. TagTansu is a system which can easily capture pictures of clothes with simple explanations to help creating picture database of clothes. TagTansu generally consists of sensors and capture components attached to the inside doors of a wardrobe. A wardrobe with double doors to utilize both door surfaces, selected for this system. For taking picture and tagging information on it they attach hook sensors to one door and attach capture components -a camera, lights and an LCD- to the other door.

For using this system first, when a user opens the wardrobe doors, the lights are turned on automatically. Then, when the user hangs his/her clothes on a hook sensor, an image of the clothing is captured by the camera. Since TagTansu has multiple hook sensors, he/she can specify the type of clothing by hanging it on different hooks (for example for saving trousers pictures in the data base user need to hang it on specific hook and for different kind of clothing users need to use the other hooks). Moreover, hook sensors also discover estimated weight of clothes. So, TagTansu can capture types and estimated weight of clothes in addition to the picture itself. Finally, the captured picture is uploaded to the server (Tsukada,Tsujita& Siiio,2008).



Figure 8.TagTansu



Figure 9. Smart clothes hanger

1. Hook sensor
2. Lights
3. LCD
4. USB camera
5. Connection wires between hanger and camera
6. Connection wires between camera and server

There are three hook sensors attached on a human shaped wood plate. Each hook has a different pressure sensor, which detects weight of clothes hung on the hook. These sensors are controlled by the host PC (Tsukada, Tsujita & Siio, 2008).

“Two hooks are located at neck level, and one hook is located at waist level of the human shaped model. Users can add different tags by hanging clothes on different hooks: a "tops" tag on the upper hooks and a "bottom" tag on the lower hook. Moreover, each upper hook has different length. Users can add an "inner" tag on the short (inner side) hook and an "outer" tag on the long (outer side). In this way, users can easily select types of their clothes using a natural mapping like human body. The magnet switch detects the open/close states of the doors for turning the lights on/off” (Tsukada, Tsujita & Siio, 2008).

For taking picture of clothes first, when a user hangs his/her clothes on a hook, the pressure sensor detects weight of it. “Then, when the weight exceeds a threshold and remains over the threshold for a given amount of time, the system begins countdown for capturing pictures. After a few seconds, the system captures an image of the clothes with the USB camera and plays a shutter sound. The captured picture is displayed on the LCD and saved to the host PC in a JPEG format” (Tsukada,Tsujita& Siio,2008).

The system also adds information -one of the three types and estimated weight of the clothes, and a timestamp- to the picture as clothes details. Figure 10 shows examples of pictures captured by TagTansu. These pictures are uploaded to a server and categorized by types of clothes (Tsukada,Tsujita& Siio,2008).

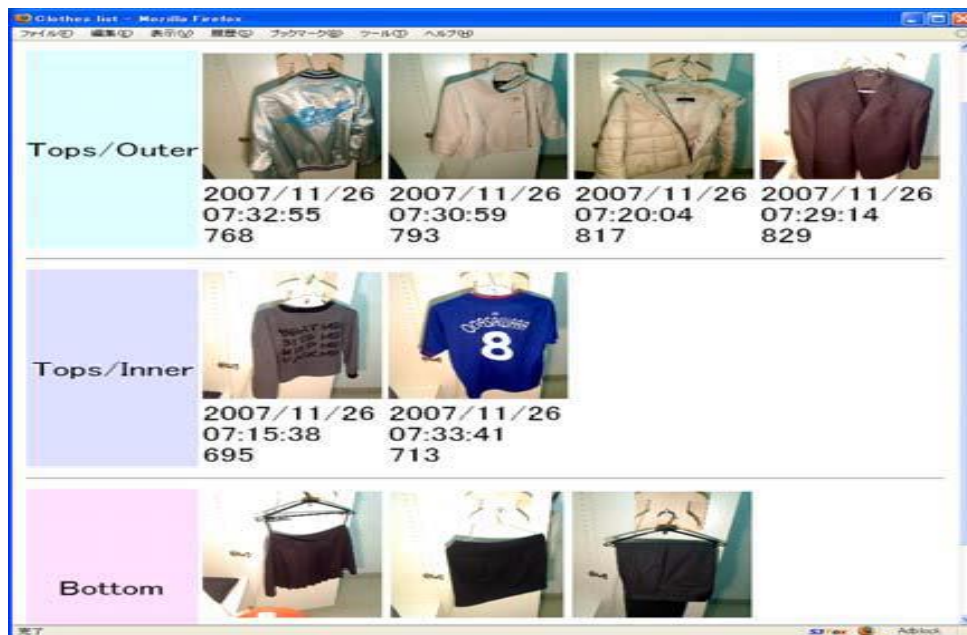


Figure 10.Database for clothes picture

As mentioned above there are different ways of putting information and picture of clothes in database. By having all these information in computer, users can have their intelligent wardrobe and by having IN wardrobe, they can access to it when ever they want and find their suitable outfit when they want to go somewhere, or also they can go through it while they are in stores and want to mix or match a new item with owned clothes.

While the TagTansu system presents an interesting way to trigger the capturing of images of clothes, it is limited to one location. The user has to place clothes in the wardrobe to be photographed. This could be a useful way of building a database of clothes that you own (and for this project, it will be assumed that such a database already exists perhaps created using TagTansu).

However, TagTansu clothes not offer two important aspects. First, as the clothes are not photographed on the person, it does not indicate how well the garments fit or suit their owners. Second the system cannot be used when the person is in a shop.

For example let's say a 19 years old guy went for shopping, he is in store and want to match new pair of jeans with the clothes in his wardrobe.

First thing he need to do is to take a picture of the jeans and send it to his intelligent wardrobe, then the recommender system will send back a recommendation and pictures as to what he can wear the new item with such as a white shirt and a white sneaker.

## Design

The other aspect of the project which is concerned is how user will put data in database; some these ideas are mentioned below:

Setting up the camera which runs on windows CE also known as windows mobile to take a picture and save it in database. For doing this a smart phone which has a built-in camera is chosen. Because the operating system of the smart phone is windows CE which is optimized for devices that have minimal storage and also windows CE adjusts to the definition of a real time operating system, with deterministic interrupt latency (Phone history, 2007).

HTC (high tech computer) touch cruise which is chosen for this project has ability of windows mobile 6 for programming and also camera. This phone also support visual studio which for taking picture of clothes by using smart phone, the program was written in visual studio.

So for taking a picture and using this system user need to use HTC windows mobile phone. Then he/she can normally take a picture of clothes from stores or clothes that they want to store in

their digital wardrobe. After taking a picture they ask to type the purpose, colour and style of clothes.

At the end users need to send that picture to the server for data base or for sharing it with his/her friends for their opinion.

This is one way of storing picture in data base which is selected for this project and it is discussed how it works in the next section of this chapter.

There are many other different ways that user can put their information and picture in data base which some of them is easy and available for user to use and the other ways are the future work of these project.

- The first one which is the easiest one but can bored the user is by simply typing the information such as clothes name, style and colour in the data base
- Scanning machine (RFID) which nowadays most of smart phones and iPhones have it, is the other way of putting clothes information in data base, so users easily can scan what they bought from the store and save the information in data base
- By using webcam and camera phones user can easily take a picture and add it to the data base
- By saving a picture of clothes from online-store whenever they bought clothes from online stores they can easily save the picture of clothes straight away into data base
- Voice recognition which a new iPhones ( iPhone 4s) support this program, so for the users who don't like to sit and type all the information for each single clothes they can use this system
- And by taking a picture every time they get ready and want to go some where or save a picture which users tagged in by other users from social networking sites
- Using TAGTANSU program which is mentioned in literature review

The picture below (Figure 13) shows the last sample of how users can put data in the clothes data base and how they can see their own wardrobe in a different ways. As you can see there are different ways of storing pictures in database such as taking a picture in parties, in store fitting room, by saving picture of clothes from online stores or by taking a picture of clothes when they buy it.

## Implementation

AQL was established in 1999 as a provider of internet based services (email, hosting, and domain registration) and diversified rapidly into the telephony sector. Initially, their telephony offerings were centre around mobile SMS text messaging. However, the technology required to provide these services can also be applied to other areas of the telephony area (Laaksonen, 2002).

Every AQL account includes the FREE text back service, and also offer user advice and solutions for short codes and reverse billing, hosting GSM sim card, and now also offer multimedia message which includes one or more audio recordings, camera images, video recordings, text and more (Laaksonen, 2002).

[www.aql.com](http://www.aql.com) that provides a number to send mms messages to. These messages can then be forwarded via email or placed on a web server via http post. The second option is quite straight forward. £6 gets user a starter account which gives free use of 077 numbers to receive messages along with free forwarding. The advantage of this is that SMS can be replies to the user only with ~ 8p a message (£6 gets 50 message credits for replies). There are API's that allow easy access to send / receive messages from an application written in any programming language.

For performing this project the second option which is AQL is used. So for sending MMS to the server, user must send a multimedia message to the AQL.

AQL MMS share number is 07740 404142 that everyone can use it. The first word of message should be keyword that is choose for project (keyword: d1366), followed by any text that user want to appear in the body of the email which is contain the style, type, occasion and name of clothes that is taken. The MMS message will be forwarded by email to the specified destination, with multimedia files attached to the email. Keywords are not case sensitive (Laaksonen, 2002).

The message project keyword AQL mms to email will be emailed to the address (etebarid@gmail.com) specified for the keyword. The email body will contain AQL mms to email' and the multimedia content will be attached to the email. So when the users take picture from some places, the first word of the message must be the key word (d1366) followed by



remaining message and then they should send it to the AQL share number. Pictures were taken before is asked to be sent by MMS to the server by using AQL method. Received MMS is shown in Figure 11.

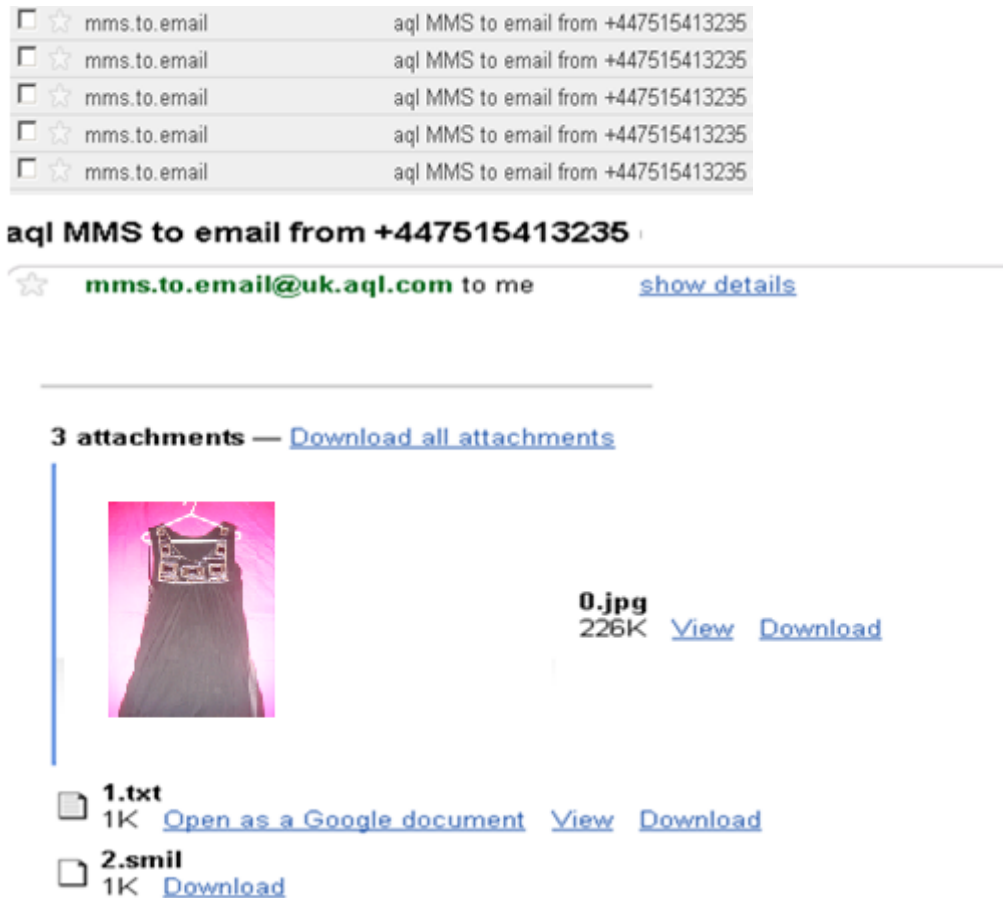


Figure 11.MMS

For example, as it is shown in Figure 11, user take a picture of her own clothes and she want to store it in her digital wardrobe, so user send MMS to the server by using AQL approach.

**Gmail Login**

Username:  Password:

Type Characters Above:

**Folder**

☒ Inbox ☐ All Mail ☐ Drafts ☐ Sent Mail ☐ Spam ☐ Starred ☐ Trash

**Options**

Path To Save Gmail Emails To:

☒ Save Each Email To Separate Text Files ☐ Save All Emails To Single Text File

From	Subject	Received Date	Body
<input checked="" type="checkbox"/> mms.to.emai...	aql MMS to email fr...	Mon, 16 Mar 20...	52.45062666,-1.93226043,Ilc
<input checked="" type="checkbox"/> mms.to.emai...	aql MMS to email fr...	Mon, 16 Mar 20...	52.45032512,-1.931928339,z
<input checked="" type="checkbox"/> mms.to.emai...	aql MMS to email fr...	Mon, 16 Mar 20...	52.4510471,-1.93190001,nat
<input checked="" type="checkbox"/> mms.to.emai...	aql MMS to email fr...	Mon, 16 Mar 20...	52.45042085,-1.93231114,rs
<input checked="" type="checkbox"/> mms.to.emai...	aql MMS to email fr...	Mon, 16 Mar 20...	52.45096378,-1.93186372,bz

Figure 12. Gmail email to text file software

After users send a MMS to the server by using Aql, server will receive a new email. The next thing to do is to convert that email to a text file for sending information to data base in order to save the data.

For this part of project Gmail downloads multiple emails to text file software is chosen. Consequently, an email address was setup for this software. Each new email will be saved in a separate file for data base. Figure number 12 shows how the email was set up for this software.



Figure 13.Clothes database

For better understanding of this part, as it is shown in Figure 13, there are different ways for users to store their picture in the database. Figure 13 shows a final sample of having intelligent wardrobe through smart phones. As it is shown in the first row user can store her/his picture by taking a picture of clothes in store fitting room and upload it in the database or share it with other users, or by simply taking a picture of their own dress while they shopping and also when they take a picture of themselves with other friend in a party. The second and third rows shows the same dress in a different position, users can find their dress online or in magazine and save it, they can also upload their picture when they wear that dress, so they see how the dress fit them and where they wear it before.

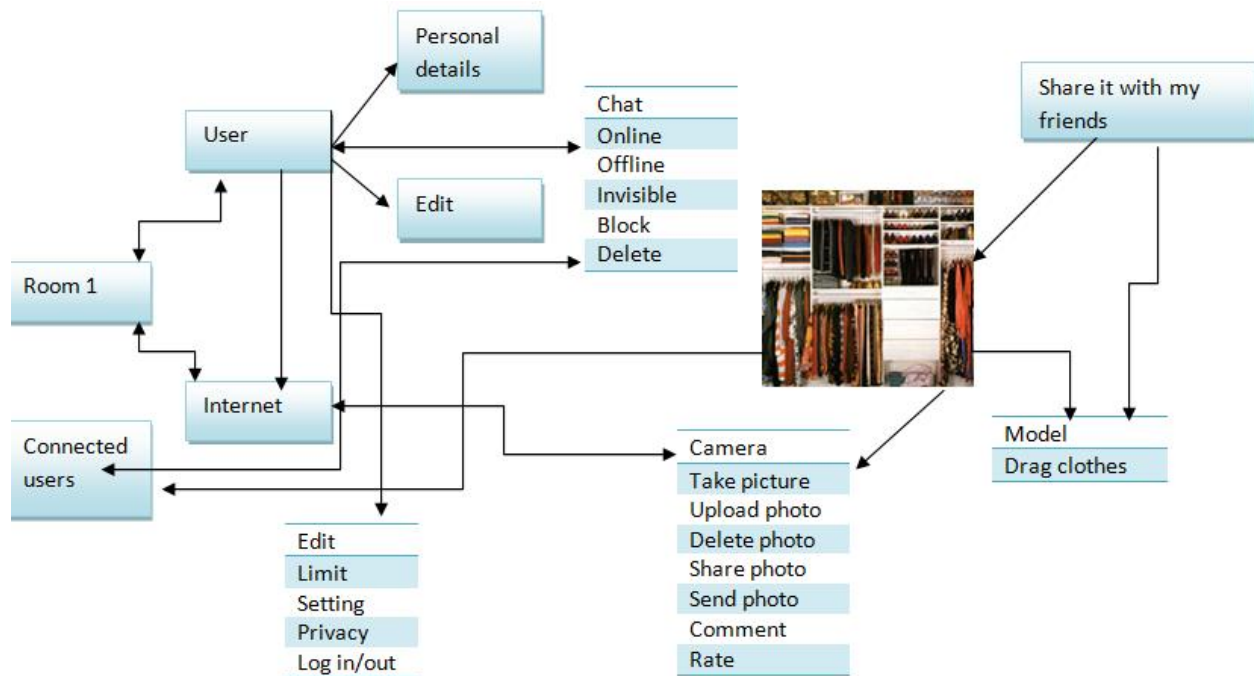


Figure 14.Connected user room

As mentioned in chapter 1, Room 3 ('Connected User') which is shown in Figure 14, is a social networking applications will helps users to communicate with their friends by sharing pictures of clothes from different stores and picture of their own clothes from the wardrobe. By using this system users can communicate with the other users and send pictures by using AQL system and store it in a server data base.

As an example, after taking picture of clothes in this system, users can tag information on photos by using smart phone and send it to other users to get their opinions.

Tagging system can help users to rate the pictures and also to tag information about where and when the users wore the clothes, to mix and match the clothes, and also to decide in an easier way next time to finding suitable outfit.

Tagging system can help users to manage their wardrobe by adding information about size, colour and type of the clothes.

On the other hand recommender system can use tagging information to recommend users what to buy and what not to buy. For example when the user want to buy a black top and get recommendation, the recommender system can check how many black tops with the same style and colour, user already have in his/her wardrobe and can reply back to user: you have 5 black tops with same style! How about buying it in different colour or style?!

Digital wardrobe is the most new idea of this project. After going through the above review we came up with the idea of developing a new system that can help people to store all their clothes information and pictures in their own mobile phone or computer data base. The intelligent wardrobe can help users to manage their wardrobe in their computer and find their outfit easily. There are different feature for intelligent wardrobe that can help the users to mix and match, buy and add new clothing or remove the old clothes from their wardrobe with out going through the actual closet; users can easily go through all their stuff by using their mobile phone or computer. As it is mentioned in chapter one some companies developed an application which let users to save all their clothes in their data base via using smart phones. But these applications are not still famous, and the reason for that is because they are not easy to use and as complete as users needs. So for this part we asked users in different survey how likely is for them to use intelligent wardrobe and how the intelligent wardrobe can help them to manage their wardrobe and make their decision on what they want to wear or buy by using this system. These surveys are provided in appendix A and E.

## 2.2 Conclusions

After going through literature review, many different surveys were designed to see what users are more interested in and how likely are for the users to use this system. Different users are interested in different part of this project; some users are really into social networking and some are interested in recommender and intelligent wardrobe. So at the end we came up with the idea of combining these concepts.

The idea of this project is to connect social networking and recommendation (recommender system) and digital wardrobe together used for helping and answering people question about what to wear and what not to wear, what to buy and also get new information and recommendation from the server through looking at the other friends and people rating and interest. Also the digital wardrobe can help users to manage, mix and match their own wardrobe by putting all the data (picture of their clothes) in their personal computer or via mobile phone.

This chapter has shown how the different aspects of the proposed system relate to consumers behaviors and indicated how a clothing database could be populated using tagged image of clothes (and how these images could be shared).

With respect to the mentioned factors in consumer behavior, a survey has been designed and developed which is demonstrated in chapter 3, so we would be able to focus more on the desires and interests of people.

## Chapter 3

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### 3.1 User Requirements and Specifications

In the previous chapters, the main idea of the project was discussed, and some background material reviewed. In this chapter, the questions of what people think about the concept and whether people might be interested in using the system are explored. For these questions, surveys were designed.

### 3.2 Shopping behavior survey

After reviewing consumer behavior research, a survey was designed to explore clothes shopping in terms of how many clothes people own, how much money people spent on clothes in the previous 6 months and how people do shopping. The main reason for designing this survey was to find out about people shopping behaviors. In this case 6 people between age of 19 to 24 (4 female and 2 male) from different countries and culture (British, Iranian and Italian), were asked to complete this survey to see how many tops, jeans, and shoes they buy in 6 month, how much money they spend on clothes, and how they would like to shop.

The survey was kept as simple as possible in order to allow to be used as the basis of an interview with respondents (while some of the respondents completed this via email, follow up questions were used to clarify any points they had made and to check that they had not omitted anything relevant).

As shown below (and in Appendix A) this survey contains 6 questions (with sub questions).

Name:

Gender:

- 1) How many tops have you bought in the last 6 months? What colour?
- 2) How many jeans have you bought in the last 6 months? What colour?

- 3) How many shoes have you bought in the last 6 months? What colour?
- 4) How much money do you usually spend on clothes, monthly?
- 5) What is your purpose in buying clothes? (ex: like or need)
- 6) How do you decide if the clothes suit you or not?

Most significantly this survey helped us to understand how a recommender system could change user's decision for buying clothes and how the system can help them to decide what to wear. So, by asking users how many clothes, shoes and related accessories they buy within 6 months and their decisions as what to buy and how they go about it, how much money they spend in 6 month for their clothes and how they spend that money; whether this is buying while socializing with friends or just buying clothes individually, buying it as a necessity or as a hobby, what is the minimum and maximum a person can spend money on clothes and to what extent they release it , The chart below shows how people responded to the questionnaire.

	Tops	Jeans	Shoes	Cost	Shopping	Opinion
<b>(1)</b> <b>(Female,</b> <b>24,</b> <b>Iranian)</b>	13 (cream, white, red, black, pink)	4(white skinny, dark and light blue, black )	8(2black, 2white, and pink heels, trainers, Toms, flat white )	Around 600 pound	Love shopping	Trying clothes and asking friends opinion
<b>(2)</b> <b>(Male,</b> <b>20,</b> <b>British)</b>	5(All black)	2(Blue)	4 (3 black and 1 white)	Between 150-200 pound	Usually out of need	By trying clothes on



<b>(3)</b> <b>(Female,</b> <b>22,</b> <b>Iranian)</b>	35(white, blue, red, orange, yellow, pink, green, black)	10(blue and washed out blue)	5(Brown, white, red)	600 pound	Compulsive shopper	Impulse by wearing clothes
<b>(4)</b> <b>(Female,</b> <b>19,</b> <b>Iranian)</b>	12(Blue, black)	2 (Sky blue, black)	1 (Dark brown)	Around 100 pound	Want to wear different clothes everyday	Consulting with friends
<b>(5)</b> <b>(Female,</b> <b>24,</b> <b>Italian)</b>	25(Different colour from black to pink)	4(Blue and black)	15(Black, red, beige and pink)	700 pound	Love shopping and follow fashion	By trying on clothes
<b>(6)</b> <b>(Male,</b> <b>20,</b> <b>Italian)</b>	10 (Blue, White, Pink)	3(Blue, Beige)	5(Brown, black)	500 pound	Occasional impulse	With my own opinion

Table 2. Survey 1

After going through this system we realized that most of the people do shopping not just because of their needs, but they like to shop because they have fun with their friends and also like to follow fashion. The respondents here can be seen to represent a particular type of shopper. The average spend, over the 6 month period, was £450 ( $\pm$ c. £240). This, one feels, suggest that these are well-off shoppers who have plenty of leisure time to engage in shopping. The number of items that they have bought is around 27 ( $\pm$ 16) items per month, and the average price per item is around £17 ( $\pm$  £7.75).

In one way the ‘recommender system’ can help users to be aware of how much money these people are spending on their clothes by telling them what they already have in their wardrobe. Given the number of new items of clothes that they are buying, this might either help manage the

storage problem that so many new items can raise or help avoid duplication of items or help decide whether an item can match clothes they own or to indicate that there is nothing to go with it, also sometimes there is no need for adding new clothes because of several reasons such as having similar clothes with similar colour. On the other hand, users can save a lot of time by using intelligent wardrobe system to manage their clothes in computer and share it with selected friends to socialize and ask about their opinion by only using computer or smart mobile phones.

This short survey raises some pointers as how a recommender system could be useful in different ways, for example the recommender can help the users to spend less money when there is no need to add another item in their wardrobe, or the system can help them to see what they have in their own intelligent wardrobe in order to mix, match or decide what they want to wear or buy. However, it is apparent that the limitations of the survey are not only the number of people contacted but (more importantly) the fact that they all appear quite similar in their attitudes towards shopping. Consequently, a more detailed survey was required to consider how attitudes to shopping might vary across different type of persons.

### 3.3 Personas survey

Before implementing the designed product, first it is important to find out about who is the target of that design (Cooper, 2004). The best solution to successfully accommodate a different type of users is to design for each specific type of person with different needs. Services that can satisfy some users will likely interfere with the satisfaction of others. There are many different ways and methods to defining target groups such as interview, survey and etc.

Also it is important to understand a different usage of users from system before designing intranet or website project therefore it is easy to realize the structures and functionality that will make the intranet or website a success, and how the system can help users with different taste, usage and levels of skill (Cooper, 2004).

There are different ways to find out about what users want from the system, such as usability testing, interviewing people, and surveys. However one of the most popular methods that have developed in popularity and acceptance is the use of personas.

“A persona is a user model that is represented as a specific set of characteristics for named individuals. These personas are not actual people, but are archetypes: a set of characteristics that have been constructed based on direct observations of the needs and wants of real people” (Cooper, 2007).

Personas are model users of an intranet or website which defines what larger group of users from system, in terms of their goals and personal personalities (Cooper, 2004).

Although personas are shown as individuals, because they serve as archetypes, they characterize as a class or category of user of a specific invention. A persona can help the designer of website to see if the system will be useful for different character of users and how successful the design can be by the analysis of interview data, or survey data and the conclusion that they came up with.

The idea of persona creation is to recognize different target groups with similar objective sand expectations to a specific system (Cooper, 2004).

Personas are used to identify different requirements and needs of the users therefore, making them a tool. This tool will help the designer to recognize the user’s needs and different usages of the system.

By using personas technique, persona will help intranet and website teams to focus on users need (Cooper, 2004).

Also by using personas for intranet or website project will bring a number of advantages:

- Users' requirements and goals become a most important point of focus for the website designers
- The design can be more concentrate on managing set of personas which can helpful for needs of different users
- Having personas can help to avoid the trap of building what people ask for instead of what they will actually use
- Start putting effort for designing the new system in the project cab be based on the personas, for more success
- Disagreements on system design final decisions can be based on referring back to the personas
- Designs can be continually evaluated against the personas, reducing the frequency of huge and expensive usability tests (Cooper, 2004).

For this project a personas technique has been chosen, to find out about different shopper and how the users with different personality can use this system.

After finding about the behavior of people, more detail questions needs to be asked for better understanding in terms of shopping such as how much time they spend for shopping, how they like to do it whether buying clothes online, in store, by catalogue, alone or with friends and, how they manage their wardrobe, how easy is for them to find all their stuff and make a decision for finding a suitable outfit and etc.

In terms of understanding people opinions about clothes with different taste, style and personality and how likely it is for users with different personality to use this system, a questionnaire with 14 questions was designed and 60 people were asked to fill it; 40 out of 60 were female, ranging from the age of 13-50 and the other 20 were male ranging from the age of 18-56. This questionnaire was given to people from Europe, middle east and north America with different occupation such as student, sales assistance, business people, housewives and teachers. This survey provides feedback on how people manage their wardrobe, how many clothes they have how easy it is for them to choose an outfit and etc. Completed from the 60 questionnaires that was collected. As a result I came up with 7 different personas with 7 different personalities which are mentioned later in this section; This survey is provided in appendix B.

Some of these questions are provided below and the rest are mentioned after personas diagram. Also the reason of designing each question is explained for better understanding of survey.

1) How often do you shop for clothing?

- More than once a week
- Once a week
- Once a month
- I don't like to shop

2) How do you prefer to shop?

- Internet (online )
- Shops
- Catalogue
- TV (shopping channel)

3) How do you prefer to shop?

- Alone
- With friends
- With a shopping advisor
- I don't like to shop

4) Why do you go shopping with your friends?

- Opinion
- Fun
- Advice
- I don't like to go shopping with my friends

5) How long does your shopping take?

- More than one hour
- A whole day
- Less than one hour
- As long as it takes

The first 5 questions are designed to understand how users behave when they go for shopping, how they like to shop? By internet or by going in store, how they prefer to shop, alone or with friends. These questions are provided to understand how likely are for the users to use the social networking part in this project and also how likely the recommender can help user who don't like to shop at all in different ways.

6) How do you manage your wardrobe?

- Style basis
- By colour scheme
- By occasion
- Randomly

7) How many items of clothing do you have?

- Between 10 to 30
- Between 30 to 50
- Between 50 to 100
- More than 100

Question 6 and 7 were designed to understand how users manage their wardrobe, how hard or easy is for them to do it by having in mind how many items they have and to understand how likely is for digital wardrobe to make this process easier for users.

8) How often do you discuss what to wear with your friends?

- All the time
- Most of the time
- Sometimes
- Never

9) How easy it is for you to choose an outfit?

- Very easy
- Easy
- Hard
- Very hard

Question 8 and 9 were designed to understand how easy is for the users to choose a suitable outfit and how likely is for them to use the recommender system to make their decision easier and to use the social networking room to communicate with their friends.

In this part, after 60 questionnaires have been collected from different people with a different taste, culture, age, nationality and personality, seven different personas were resulted. And the method which how I came up with all these personas has been described below.

The first 9 questions explains how people like to shop (In store, Internet, with friends, alone and etc.), how often they shop, how many clothes they have, how they manage clothes in their wardrobe and how easy it is for them to choose what to wear.

For start I went through all the first 9 questions to separate different user's character and personalities.

#### Method

First I separated female and male surveys from each other. Then I went through all the surveys and came up with 4 different sections.

#### Section 1

(Female=13, shop with their friends=7, shop alone =6, like to shop in store=13, have between 50-100 clothes or more than 100 clothes=9, 10-50=4, easy to find their outfit=8, hard to find what to wear=5)

The first section covers females who shop every month, like to shop in store and mostly have between 30 to 100 clothes.

So then I separated females who like to shop with their friends and manage their clothes with those who like to shop alone and it is hard for them to find what to wear because they manage their wardrobe randomly.

As a result of this section I came up with persona 1 and 2 and wrote a story for users to choose their personas.

As an example Roxy (26 years old, female, student, British) and Monir (50 years old, female, house wife, Iranian) are chosen to compare with each other.

Roxy like to shop every month and have more than 100 clothes, she prefer to shop alone and it is hard for her to find her outfit because she has many clothes (so as a result we can include her in the persona 2 category).

Persona 2: I shop every month and I prefer shopping directly from stores to see the exact colour and find the suitable size, for that reason I don't trust online shopping.

I rather to shop alone instead of shopping with my friends , because it is easier to make a decision alone rather than getting some one else opinion, and also it is faster to shop alone because you can concentrate more on what you want to buy. I have more than 10 clothes in my wardrobe and I manage them just randomly ,for that reason it is really hard for me to find what I have in my wardrobe and also it is very hard to find my outfit.

On the other hand Monir shops every month, have more than 100 clothes, and prefer to shop in store but with her friends. So in this case she can choose personal for her character.

Persona 1: I shop every month and I prefer shopping directly from stores to see the exact colour and find the suitable size, for that reason I don't trust online shopping.

I always go shopping with my friends, when I am with them I can have lots of fun and I can ask for their opinion as well. I have more than 50 clothes in my wardrobe and I manage them by colour and sometimes by style.

## Section 2:

(female=24, once a week=14, more than once a week=11, shops=20, In store or on the internet=3, internet=1, like to shop with their friends=16, like to shop alone=6, alone or with their friends=2, more than clothes 100=16, between 50-100 clothes=7 , between 30-50 clothes=1, it is easy or very easy for them to choose their outfit=10, it is hard or very hard to find what to wear=14)

This section is for the users who like to shop every week and even sometimes more than once a week; they like to shop mostly directly from stores but they are also flexible with online shopping or shopping with catalogue.

Then people who like to shop alone with those who like to shop with their friends were separated from each other. In this section I came up with persona 3 and 4 and wrote a story for users with more details, to make it easier for them to choose their character.

As an example of this section we can choose the same person from chapter one

Name: Maral Age: 24 A person who shops regularly and loves to shop with her friend, has many clothes in her wardrobe and likes to shop online and also in store, Occupation: Student/part job time shop assistance

Maral really enjoys shopping and buys clothes every week. She likes to shop with friends because she values their advice. It is sometimes easy for her to choose her outfit because she loves fashion and have many clothes to wear but also sometime it is very hard for her to choose her outfit because she has many clothes in her wardrobe and it takes time to find something to mix and match.

As a result she can choose persona 3 for her character which is mentioned below:

I shop every week, sometimes even more than once a week, and I prefer shopping directly from stores because I don't have to wait for delivery but sometimes when the stores are sold out what I need, I am using Internet and catalogue for shopping.

I always go shopping with my friends, when I am with them I can have lots of fun and I can ask for their opinion as well. I have more than 50 clothes in my wardrobe and I manage them by colour, occasion and sometimes by style.

On one hand, it is easy for me to find my suitable outfit from my wardrobe because I have lots of choices but on the other hand finding clothes from my wardrobe is a major job for me to do, and sometimes it takes more than hour to find something.



### Section 3:

(male=15, one a week=13, more than once a week=2, like to shop in store=12, by internet=3, like to shop alone=5, like to shop with their friends=9, have clothes between 50-100 or more than 100=5, between 30-50 clothes=10, it is hard/very hard for them to find outfit=2, it is easy/very easy to choose what to wear=13)

Section 3 is only for the men. And in this category users like to shop every month or sometimes more than once a month and has between 30 to 50 clothes, but again I separated those who like to shop with their friends and it is easy for them to find their suitable outfit with those users who like to shop alone and have difficulty finding their outfits.

As a result of this section I came up with persona 5 and 6.

### Section 4:

(Male=6, female=2, don't like to shop=8, they shop by internet=3, in store=5, like to shop with their friends=0, alone=8, have clothes between 10-50=6, more than 100 clothes=1, between 30-50 clothes=1)

Last section is for female and male users who hate shopping, have between 10 to 30 clothes and manage their wardrobe randomly because they don't really care about what to wear.

In this section I came up with persona 7 to have all the possibilities for the users to choose their personas with their own opinion and all these personas are listed below.

Some chosen components of this survey, in the manner which they are organizing in different section are provided in Appendix M.

In this project the following personas can help the system to get familiar with users personality and taste. So when the user want to sign up for the system , the first thing they need to do is to read about all personas and select the persona that they think is suitable for their character and set it in their personal profile.

Following section describes all 7 personas which is the consequence of the questionnaire. This table (Table 3) will be given to users when they want to start registering for the system.

<p>Persona 1 (Female=7 Male=0)</p>	<p>I shop every month and I prefer shopping directly from stores to see the exact colour and find the suitable size, for that reason I don't trust online shopping.</p> <p>I always go shopping with my friends, when I am with them I can have lots of fun and I can ask for their opinion as well. I have more than 50 clothes in my wardrobe and I manage them by colour and sometimes by style.</p>
<p>Persona 2 (Female=6 Male=0)</p>	<p>I shop every month and I prefer shopping directly from stores to see the exact colour and find the suitable size, for that reason I don't trust online shopping.</p> <p>I rather to shop alone instead of shopping with my friends , because it is easier to make a decision alone rather than getting some one else opinion, and also it is faster to shop alone because you can concentrate more on what you want to buy. I have more than 10 clothes in my wardrobe and I manage them just randomly ,for that reason it is really hard for me to find what I have in my wardrobe and also it is very hard to find my outfit.</p>
<p>Persona 3 (Female=14 Male=0)</p>	<p>I shop every week, sometimes even more than once a week, and I prefer shopping directly from stores because I don't have to wait for delivery but sometimes when the stores are sold out what I need, I am using Internet and catalogue for shopping.</p> <p>I always go shopping with my friends, when I am with them I can have lots of fun and I can ask for their opinion as well. I have more than 50 clothes in my wardrobe and I manage them by colour, occasion and sometimes by style.</p> <p>In one hand it is easy for me to find my suitable outfit from my wardrobe because I have lots of choices but on the other hand finding clothes from my wardrobe is a major job for me to do, and sometimes it takes more than hour to find something.</p>
<p>Persona 4 (Female=11 Male=0)</p>	<p>I shop every week, sometimes even more than once a week, and I prefer shopping directly from stores because I don't have to wait for delivery but sometimes when the stores are sold out what I need, I am using Internet and catalogue for shopping.</p>

	<p>I prefer to shop alone because I love shopping by myself and I prefer to spend all my time for myself, and I have enough confidence to buy cloths by my own. The only reason for me to go shopping with my friends is to have fun.</p> <p>It is really hard for me to find my suitable outfit because I have lots of choices and I manage them by different ways like style, colour and occasion but I still have difficulty to find some particular clothes.</p>
<p>Persona 5 (Male=13 Female=1)</p>	<p>I shop every month, some times even less than once a month. I prefer shopping directly from stores and every so often I use the Internet for shopping.</p> <p>I always go shopping with my friends, when I am with them I can have lots of fun and I can ask for their opinions and advices, and it will be much easier to decide what to buy.</p> <p>I have more than 30 clothes in my wardrobe and I manage them just randomly. It is very easy for me to find my suitable outfit to wear because I really don't care what I am wearing and I am not kind of person who waist my time for finding a suitable outfit.</p>
<p>Persona 6 (Male=2 Female=0)</p>	<p>I shop every month, some times even more than once a month. I prefer shopping directly from stores and every so often I use the Internet for shopping.</p> <p>I rather to shop alone instead of shopping with my friends, because it is easier to make a decision alone rather than getting some one else opinion, and also it is faster. The only reason for me to go shopping with my friends is to have fun.</p> <p>I have more than 50 clothes in my wardrobe and I manage them by occasion.</p> <p>In one hand it is very easy for me to find my suitable outfit from my wardrobe because I have lots of choices but on the other hand finding clothes from my wardrobe is really hard for me, and sometimes it takes along time.</p>

Persona 7 (Female=1 Male=6)	I hate shopping; I shop only if I have to! I prefer shopping directly from stores to see the exact colour and find the suitable size as soon as I can. Also online shopping is an option for me, for example: I always prefer to buy my shoes online because I exactly know what size is suitable for me so in that case it is much easier for me to use online shopping.  I have between 10-30 clothes in my wardrobe and I manage them just randomly. It is always very easy for me to find my outfit, because I don't really care what to wear and I don't want to waist my time
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Table 3. Personas

Question 10 and 11 can be useful for understanding of how often people are using their computers and how many of them are interested in using the social networking sites to communicate with their friends and like get notified by the news.

10) How often do you use your computer?

- Every day
- Every week
- Sometimes
- Only when I have to check my mail

11) How often do you use social networking sites on the internet (Facebook, MSN messenger, etc)?

- Every day
- Every week
- Sometimes
- I hate social networking sites

And finally in the last 3 questions, respondents were asked questions about each room:

12) If there is a social networking site which let you discuss what to wear with your friends (showing pictures of your clothes), do you think you would use it?

- Definitely
- Maybe

- I don't know
- No , never

This question was designed to understand how many people are interested to use social networking room which let them to communicate and share their wardrobe with their friends and other users.

13) If there is a program to help you find a suitable outfit, how likely is it that you would use it?

- Not at all
- Unlikely
- Very likely
- I don't know

This question was designed to understand how many people are interested to use recommender system room which let the users get recommendation from the recommender system about what to wear and not to wear and what to buy and not to buy.

14) If there is a program helping you manage your wardrobe, how likely is it that you would use it?

- Not at all
- Unlikely
- Very likely
- I don't know

And the final question was designed to understand how many people are interested to use intelligent wardrobe which let them to mix and match, share clothes, manage wardrobe and find their suitable outfit.

The following table shows the number of people and how they respond to each question. On one hand, most of the people who don't like shopping (persona 7) are male and they don't like to use the system which recommender can recommend them to use the application to buy and decide what to wear easier.

On the other hand people who love shopping and like to go shopping with their friends can use social networking room to share and communicate with their them and etc.

As a result this system can offer different usage for people with different personality and personas, so no matter what kind of personas or shopper they are; they can use the system in a different ways. This questionnaire is provided in appendix B.

So the last three question of the survey has been designed to see what people with different personas are more interested in, what recommendation they need from system, how they like to communicate with their friends by using social networking, how they like to manage their wardrobe via mobile phone and computers. More than 70% of people have acknowledged that, they are interested to use this program.

The table below (Table 4) shows the positive response to last three questions, it shows how many people in each persona categories like to use the system in different ways, and as it is shown below if people don't like to use one of the systems, they can use the other part.

(Personas)	1	2	3	4	5	6	7
<b>Social networking</b>	6/7	4/6	12/14	10/11	13/14	½	5/7
<b>Recommender system</b>	5/7	4/6	10/14	10/11	11/14	½	2/7
<b>Intelligent wardrobe</b>	5/7	6/6	13/14	11/11	13/14	½	1/7

**Table 4. Positive response to concept**

And others who are not really into shopping, using computers or social networking site, they can use this system in a different way, for example people who don't like shopping and it is difficult for them to decide what to wear (Persona 7) can use only the 'recommender system' room to get recommendation and to find a suitable outfit faster or by using, social networking' room they can communicate with their friend to get their opinions and make their decision easier.

After finishing this survey we asked Maral (a same person from chapter 1) to write about how she can use this system in different ways.

Room 1 (Recommender room):

- In the case of shopping for a new outfit, mix and matching old clothes with something new or having lack of time to look around all shops and online stores, a recommender system can recommend various shops with respect to the customer tastes and favorite shops.
- In some special event like a party with specific dress code but you doesn't have any idea what to wear, you can easily search what to wear by going through general information guide in the recommender system.
- And mostly the recommender system can help to find out what you have in your wardrobe. Consider the case that you want to buy new clothes from a store and don't know if you already have a similar thing or if you can match it with anything else, the recommender can easily notify searching in your wardrobe.

In the second room (Intelligent wardrobe) you can easily access to all you have, categorize them with your preferences (style, colour) and search throw your cloths instead of not finding anything because of huge number of clothes in your wardrobe.

The third room, which is called the connected user room, can help in different ways:

- When you are in store and want to buy new clothes for your wardrobe, you can take a picture of it by using your phone's camera system, send it to your friends and they can give their opinion about a new clothes and communicating with you by using chat room.
- You can also share your wardrobe with your friends to ask their opinion. For example it is useful when you want to go out and need to mix and match your clothes to find a suitable outfit.
- Basically you can always chat and share your photos with your friends by using this system.

This system, on one hand can help people decide what to buy, what to wear, mix and match suitable outfit and manage their wardrobe, and on the other hand, it build on users own social networks and allow them to communicate with their friends and having fun.

## Chapter 4

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### 4.1 Review of recommender system and how it works

This chapter introduces the recommender system. After a literature review, the concept of the recommender system for this project is explained and its development is outlined. The chapter concludes with formative evaluation of the prototype which was developed

### 4.2 Recommender systems for shoppers

As it is mentioned in chapter 2, a recommender system is designed to help customers buy and navigate their way through today's complex online shops and entertainment websites (Bentley, 2003). The basic idea of having a recommender system in this project is to help the users decide on their clothes and shopping behavior and also have an interesting and fun application on their mobile phones or computers which can help them to save a lot of their time. For this project, the recommender system can be thought of as a simple form of decision-support: the shopper requires advice on clothing and seeks this advice from the recommender system. One approach to this problem would be to imbue the recommender system with an appropriate set of knowledge that can be applied to the user's question. In this project there are 4 different parts of the recommender system. For each part, different surveys were designed to evaluate people's interest and to see how likely they would be to use the recommender system. In the first part, users can select their size, personas and body shape to get recommendations (what to wear and not to wear). In this part, the recommender system gives recommendations based on advice taken from popular fashion books. The advice is presented as text to the user.

In the second part, users have to choose their size and height to get recommendation (what to wear and not to wear), but this time the recommendation is presented visually, e.g., a pictures of recommended dresses.

The third part is for user's personal choice, which they can choose what they like to wear with their own opinion by simply clicking on the button and at the end compare it with recommender choice.



In the last part, the recommender system can help users to buy what they are interested in by linking them to the related websites.

In next sections of this chapter we will explain how each part works in detail and how different users with dissimilar persona can use this system in different scenarios.

As mentioned above, for each part of this recommender system a survey have been designed, tested and evaluated by different users with different persona, age and culture. These surveys are explained in the following sections.

While the first two parts are simply presenting guidance to the user, based on their personal details, the third and fourth part offer the potential for the guidance to be of a recommender system (by canvassing opinion from users and applying this to advice giving).

In this project, a recommender system can help people in different ways, such as what to wear, what not to wear, what to buy, what not to buy, general information for different occasion, managing wardrobe, mix and matching user's wardrobe, so there are different ways and databases for recommender system, to give recommendation to users.

When people shop in Amazon, the recommender will help them to find out about related accessories or what other people with the same taste bought, for example when the user wants to buy an Ipad from Amazon, the recommender system will recommend user to buy Ipad cover which most of users will buy it for their Ipad screen protection and other usage, the recommender system will notify them with the most popular colour and the cheapest available prices, based on people's purchases and store rating.

To compare our recommender system with existing recommender systems, we can say, when people want to buy something and do not know where to shop, the recommender system could help them to find an appropriate store by considering where other people with the same persona and taste shop. After the user has purchased some clothes from the store, the recommender system can also help them by mix and matching the related accessories such as shoes, necklace or etc with what user bought, through store rating, store matching and looking at what other people bought when they purchased the same clothes. There are many other different ways that recommender can help users to decide easier.

Recommender 1 and 2 which is implemented in this project, give recommendation about what to wear and what not to wear to users by using fashion expert database, based on what information users provide about themselves in the login part.

Then recommender 3 let users to choose what they like to wear by their own opinion. This part is implemented in this project for rating system, so recommender system also can show people what other people think about each clothes and let them to compare both choices (recommender system, and people opinion).

At the end which is future work of this project, all these recommender systems will be combining together, so users can have both recommender system recommendation and people rating all together and make their decision by comparing both opinion (people rating and fashion expert recommendation).

#### **4.3 Defining Expert Recommendation: Survey of advice (What to wear and not to wear)**

Popular fashion books by Gok Wan, Trinny and Susannah, Coleen Rooney and different fashion websites were reviewed to collect clothing recommendations for people with different size, height, skin colour, hair colour and body shape.

This advice is summarized in a database. It is important to mention that different experts had different opinions but I have tried to go with the majority. Therefore, this data base synthesizes advice from several sources and seeks to present the most popular opinions. These popular opinions are stored in the recommender data base. However, all the experts have based their recommendations on the same criteria which are acceptable everywhere in the world such as different body shapes and heights. There are 6 different body shapes that users can relate to, as it is seen in Figure 15, and three different heights such as petite, normal and tall in order to find a suitable outfit.

In this project, users are provided with recommendations on what to wear based on what is stored in the data base. All these recommendations have been given to the users on the basis of their body shape (size), heights and personas.



Figure 15. Different body shape

For example, in order to understand the concept of using fashion expert book and websites for recommender database, one piece of clothing (straight jeans) has been chosen to discuss, as it is mentioned below:

“There are different types of jeans such as skinny jeans, boot cut jeans and straight jeans. All people have got a favorite pair that they live in and can’t live without; they are as comfortable as a second skin. But then jeans have always been the benchmark garment when it comes to how people feel about our bodies. On good days, best jeans can make you feel like the sexiest person alive. On those not-so-hot- days, they can make girls feel anything but. And that, girls, is why fashion designer shouldn’t be so quick to keep our denims in the comfy bracket-they may be the

easiest thing in the world to pull on and forget about, but to get whole lot more wear out of them, jeans need a little fashion fix, too” (Wan, 2009,P40-48).

“The story that straight jeans tell ladies, is cool and classic. More than most styles, straight legs never really date and are a good all-rounder. For curvy girls who like the idea of skinny but don’t want to look top-heavy, the straight style is perfect for them: this style of jeans will give leaner look and, with more depth at the crotch, a dynamic derriere, too. This classic shape is also a great bet for older girls, as it doesn’t dictate a full-on fashion look” (Wan, 2009, P40-48).

“Straight legs are the classic jeans shape and will suit most Figures and all ages. Traditional jeans brands, such as Lee, Wrangler and Levi’s, design great-quality classic straights for around 60 pound, and buyers can probably wear them for years. With a boyish or petite frame, straights will give them more defined outline” (Wan, 2009, P40-48).

“Jeans are such a major part of wardrobes that it’s worth buying different styles for different occasions (Rooney, 2008, P38-46). When people get ready to go out shopping for jeans, they must be sure to put on the kind of top or tops that intend to wear with or they can also take a good belt as well. It may sound like a hassle, but a little bit of planning works wonder, and just think that jeans are such a big part of wardrobes that it’s worth putting the effort in” (Rooney, 2008, P38-46).

“The trick is to find a pair of jeans that highlight the best bits by cover up the not-so-good parts. And remember, the sizing from on brand to the next can be completely different, so don’t think size, think shape. So, the trick is to think about balance and to use a few styling tricks” (Rooney, 2008, P38-46).

“One of the most important things to get right with jeans is the length. Most of women wear high-heeled shoes with jeans now, and if their jeans just a tiny bit short it can have a major effect on the rest of looks. For taller women, it can make them look gangly, and for shorter ladies, it can make them look stumpy” (Rooney, 2008, P38-46).

“Straight jeans because of their straight up-and-down classic shape are a good bet for anyone who likes a slim-leg look but who feels that skinny jeans are too edgy for them. Straight jeans are goof fit for most shapes and they can try different brands and labels to see which one suit

them best. Straight jeans make legs look longer, but only if the hem length is right. Ladies can wear straight jeans with high, square heels or wedges, a great tan and a brown leather belt” (Rooney, 2008, P38-46).

As you can see above most of fashion expert have a same taste and idea, for example all of them have a similar discussion on straight jeans, they all agree on the fact that straight jeans are classic shape and will suit most Figure shapes, it is also really good for curvy, rounded and over-size people, so as a conclusion we can consider saving this information about straight jeans in our data base, as it is mentioned in table below.

The table (Table 5)below shows a sample of recommendation with different size and body shape which I came up with, after going through all these fashion experts books and websites.

Body size	Body shape	Jeans	Tops	Shoes	Dresses and skirt	Trousers	Jacket and coat
Petite	Triangle shape	High-waisted	Blouse	High heels	Short dress	The peg	Blazer
	Rectangle shape	Boyfriend jeans	Polo neck	Wedge	Pencil skirt	The chino	Military coat
	Rounded shape	Straight	Black shirt	High heels	Black dress	Capri pants	Cropped blazer
Curvy	Inverted triangle shape	Boot cut	Waist top	Mid heels	Prom skirt	Straight	Blazer
	Hourglass shape	Straight	V-neck	Long boot	Pencil skirt	Wide-leg	Military
	Rounded shape	Straight	T-shirt	Mid heels	Shirt dress	Straight	Statement coat
Tall	Triangle shape	Skinny	Pull- over	Long boot	Pencil skirt	The chino	The Mac
	Rectangle shape	Colourful jeans	Tight top	Flat	Pencil skirt	The chino	Leather jacket
	Rounded shape	Boot cut	Crew-neck	Mid heels	Shirt dress	Wide-leg	Statement coat
Normal	Rectangle shape	Skinny	V-neck	Mid heels	Pencil skirt	The peg	Leather jacket
	Diamond shape	Boyfriend	Blouse	Flat	Wrap dress	The chino	Blazer
	Rounded shape	Straight	Blouse	High heels	Shirt dress	Wide-leg	The Mac

Table 5. What to wear and what not to wear

There is more general information from fashion expert books which can help people what to wear in general occasion such as interview, wedding, birthday parties and etc. This part is

another future work of project, by storing general information about what to wear and what not to wear people can search about the event dress code that they want to attend and find their suitable outfit.

For example, 21 years old woman wants to go to an interview for the first time and does not have any idea about what is appropriate to wear in interview, so by going through general information about what to wear and what not to wear in recommender system she can get an idea of her suitable outfit.

Dressing the part is never something that will get you the job, regardless of how clean your shirt or shinny your shoes. However, it could put the employer off if you fail to follow some basic rules:

- Not too casual: if you get the vibe that casual is OK they stay on the smart side of casual. Ripped jeans, threadbare t-shirts and scruffy trainers should all be left at home. A smart pair of jeans and an open necked shirt is the bare minimum that is expected.
- No headwear: under no circumstances wear a cap, beanie or hoodie to an interview- you will look like you have got something to hide. There are obvious religious and medical expectations to this rule.
- Get the right fit: although it may work in certain industries, cleavage and midriffs should be covered up for job interviews. You should be relying on your other assets to secure you the role.
- Wacky ties: as hilarious as you think they are, your interviewer is unlikely to see you as a new fun addition to the team, instead seeing someone who's not serious about the job.

## 4.4 Rules and implementation

For recommender system part 1, the webpage was designed to allow users to select their sizes, body shapes and height, by using mobile phone or computer, to find out what to wear and what not to wear, get familiar with the simple guidance of recommender system to see how it works and make their decision as to whether if they want to carry on with the system or not which is shown in Figure 16 and 17.

These pages will appear for the users after they go through all signing up process for joining the system which is mentioned in chapter 5 step by step.

After the user signs up, the system can login whenever they want by using their own username and password, after going through the system if he/she wants to use the recommender system, they can link to the recommender page by simply clicking recommender room.

As an example, one of my classmates was asked to use this system; she is 23 years old and Iranian student. She found herself in persona number one, which is the one who shops every month and prefers shopping directly from stores to see the exact colour and find the suitable size, for that reason she doesn't trust online shopping. She will always go shopping with her friends, and when she is with them she can have lots of fun and can ask for their opinion as well. She has more than 50 clothes in her wardrobe and she manages her clothes by colour and sometimes by style. After selecting her persona (persona 1), she selected her size and body shape which is size 1(8-10) and the first body shape (hourglass shape). She then clicked on what to wear to get recommendation .As a result of stored data base which is completed by fashion experts' book such as Trinny and Susana , Gok Wan, Coleen Rooney ,the recommender system recommended the user what to wear and what not to wear by going through her size and body shape, which is mentioned below.

What to wear: jeans (Skinny, Straight), Tops (polo neck, blouse), shoes (high heels, wedges)

What not to wear: jeans (High waisted), Tops (Short T-shirt), Shoes (Flat shoes)

This recommendation was designed to give a general information to users, about clothes shape and what is suitable for them to wear and what clothes are not appropriate for their size, users can easily find out about their suitable outfit shape by just simply select their size and shape and they can not go wrong anymore by having these information in their mind.

For example a person with a size between 14-18, categorized as curvy and rounded shape, can be aware of the fact that always straight jeans are a good choice for them and skinny jeans are not really suitable for their shape for the reason that it can make them look bigger.

By using this system people don't need to go through all fashion experts text book and find out about different opinion anymore, because this system can simply notify them what to wear by combining all these fashion experts' ideas together.

All these options are not implemented and many of them are the future work of this project, only some options are implemented for users to get familiar with the system. The first, second and the third row are implemented and all the information (recommendations) is stored in the data base. Now for testing this part users can choose option 1 (persona1, size1, shape1), option 2(persona2, size2, shape2) or option 3 which is persona, size 3 and shape 3. All the information is provided based on the expert table but storing clothes recommendation in to the database is the future work of this project.



Figure 16.Recommender website



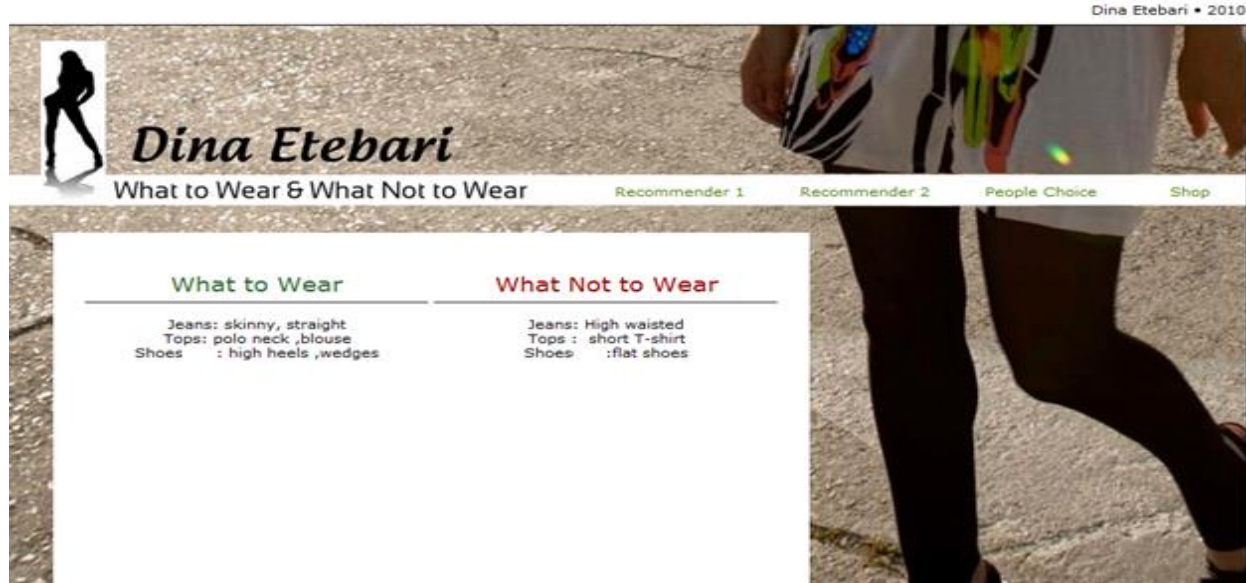


Figure 17.Recommender result

This program is written in HTML, Javascript and PHP

There is an iframe between index page ( main window), that open the second page inside the iframe by clicking on what to wear icon. The result will appear based on users choice in the first webpage, these data are stored in PHP file which can recommend people what to wear and what not to wear.

## 4.5 Formative survey of recommender system

### Recommender 1

For this part a questionnaire was designed to compare what people think and get their idea about the recommendations which the recommender system provide for the users and to find out about how this system can be helpful for the users.

By designing this survey we can see how people choose their outfit regarding to their size and how recommender system recommends them what to wear. As it was mentioned before, this is the first recommender has been developed to show users what to wear and what not to wear according to their size and body shape by text. The future work of this part is when users want to

know the reason of recommendation in details, like why the specific clothes shape is not suitable for them? , they can see the whole combination of fashion experts idea and the explanation of why the clothes are suitable for their size and body shape and why it is not appropriate. This survey is provided in appendix C (2 answered sample of this survey is provided in appendix N), and as an example one of the questions is mentioned below.

1) What type of jeans you normally wear?

1.1 Skinny

1.2 Boy friend

1.3 High wasted flare

## Method

Six people between age of 18 to 32 from different nationalities such as Iranian, British and Spanish with different occupation such as student, sales assistance and business men/women were asked to complete the questionnaire; this survey provides feedback on what kind of trousers, top, shoes and jacket with mentioned styles, they wear according to their size, body shape and height.

## Results

The table below shows people choice with different size, height and personality. The green stars present the agreement between recommender system and people choice, and the other red stars present people disagreement with recommender.

After completing this survey we gave people all the result to see what people feel about their disagreement with recommender, and why the recommender, recommend users not to wear some specific style related to their size, height and body shape and of course most of them agree with recommender by going through all the recommendation chart .

For example when the first person with the height of 1.62 m choice to wear long boots more often than high heeled shoes recommender system will disagree with user's opinion, recommender system recommend her to wear high heels shoes more often, because high heels

shoes can make all girl legs look taller, flat shoes and long boots can make girls with a petite heights looks shorter.

As a conclusion this part of system can help people to decide what to wear with out making mistakes and find their suitable outfit by going through what shape are suitable for their sizes and body shapes.



Recommender and People choice (with same opinion)



Recommender and People Choice (with different opinion)

Name/size/height	JEANS	TOPS	TROUSERS	SHOES	JACKET	DRESS
1.M/8/1.62	★	★	★	★	★	★
2.A/10/1.62	★	★	★	★	★	★
3.T/8/1.58	★	★	★	★	★	★
4.E/12/1.62	★	★	★	★	★	★
5.L/10/1.69	★	★	★	★	★	★
6.S/12/1.74	★	★	★	★	★	★

Table 6.Survey 3

From table 6, you can see that all 6 people agree with the recommendations for jeans, trousers and jackets. There was one person who disagreed with the recommendations for dress, but we can assume that 5/6 still represents a majority agreement here. However, the recommendations for shoes (4/6) and tops (3/6) did reach meet a majority agreement. This suggests that the recommender system needs to be able to take personal preference into account as well as draw on expert opinion.

## Conclusions

This survey has been designed to compare people opinion with recommender system. As it is mentioned before all information which is stored in the recommender database is based on fashion experts book and website, so before going any further first we need to find out what people think about each clothes. The main reason of designing this system is to realise if we are using suitable information for our database.

As it is shown in the above table most of the stars are green which represent the agreement between recommender system and people opinions , and the red stars represent the disagreement between what people choose in the survey and what recommender system recommend them to wear.

Over 70 % of people agreed with the recommender and they like to get recommendation on what to wear and what not to wear, and even the users who didn't agree with the recommender, after explaining to them why the recommender think that outfit is not suitable for their size and height and find them a suitable outfit to wear, they agreed with the recommendation.

## Recommender 2

The second part (Recommender 2) WebPages were designed to allow users to select their sizes and heights and click on the what to wear icon to get recommendation by using mobile phones or computer to find out what to wear and what not to wear, in this part which make it different from the first recommender is that the system shows the picture of the clothes regarding to fashion experts data base and recommend user what to wear and not to wear, as you can see in Figure 18 and 19.

So as an example a person who is tall and is a size 12-14 is recommended to wear a maxi dress because of her height but she is also recommended not to wear stripe print dresses because of her size, stripe print dress can make her look big.

So this part mostly can give user the idea of what the shape of their suitable outfit is, regarding to their size and heights. In this part some selected black dresses from different websites and online

store were chosen to just give a user an idea of how this system works for finding their suitable outfits. The future part of this part is to show users more clothes and accessories such as trousers, shoes or t-shirts with different colour, so user can easily decide to wear and buy what she/he want without searching more in other websites for their suitable outfit.

In this part data has been store in an array within the PHP page; later for extending the data base in the recommender we can write a program in MySQL to store a huge amount of data which the result can obtain by querying that data base.

For the result part SELECT CASE program is chosen which by selecting a different combination of radio button, the program can show a different result to users form data base.

Each result has different pictures which are saved in the picture folder. The information of each picture in array form comes up in the next webpage.

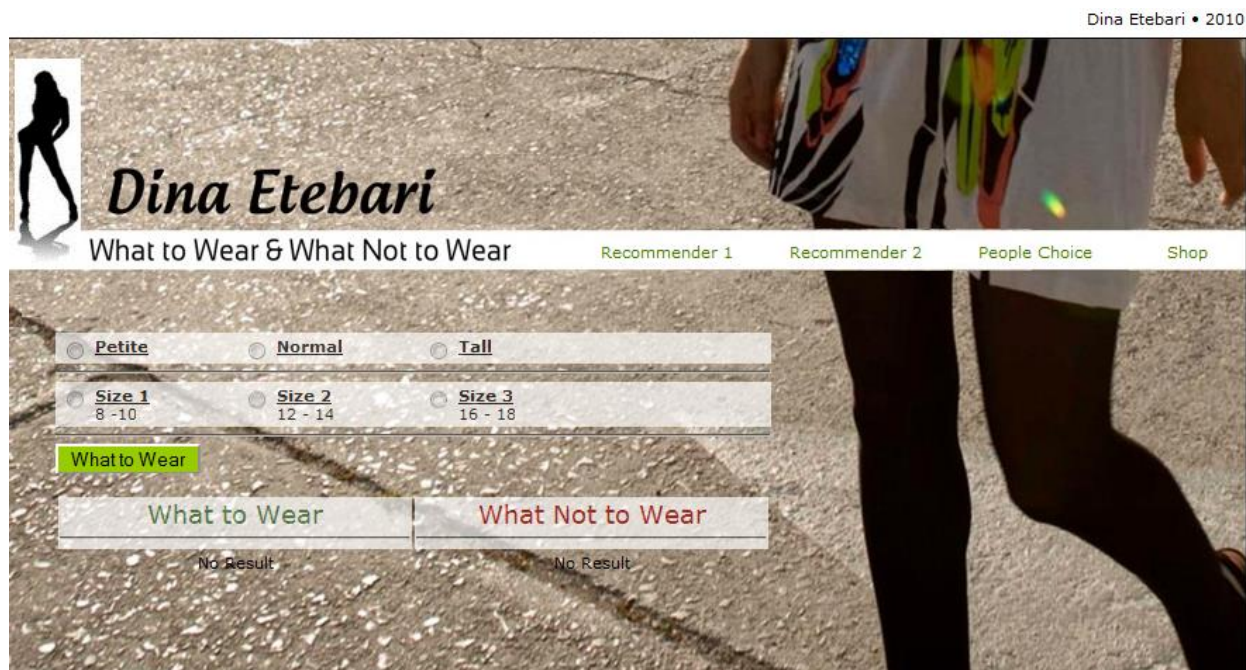


Figure 18.Recommender Website

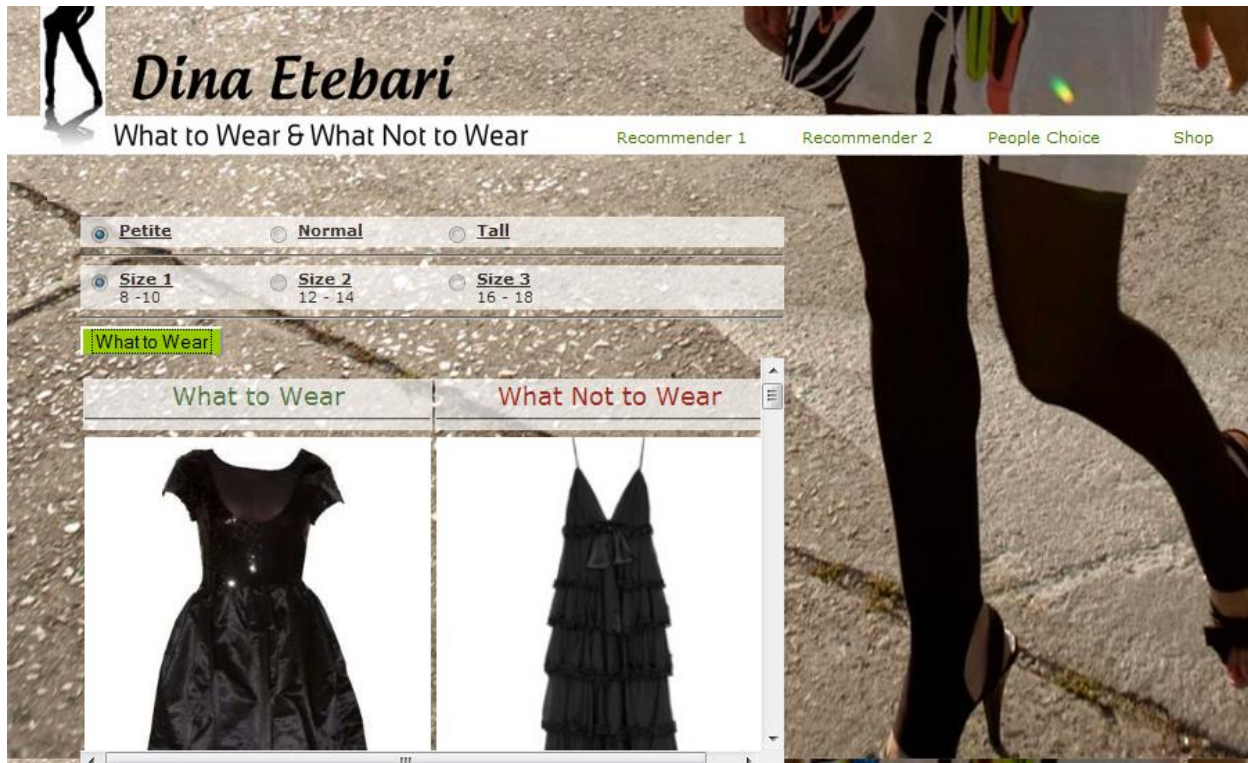


Figure 19.Recommender Result

This recommender was designed to help users to decide what to wear and what to buy by showing them the picture and shape of the clothes. A survey has been designed to compare a personal choice and recommendation from recommender which is mentioned in the last section of this chapter. Also to see if the users are happy and it is easy for them to use this recommender, in chapter 5 we asked people to start joining Intelligent wardrobe website and use this recommender.

All the shown options in the recommender 2 webpage are implemented and ready to use for the users. Adding more options into this webpage is the future work of this project.

### Recommender 3

For the third part (people choice) a Webpage was designed which allows the users to choose what they like to wear by their own opinion. So users need to go through all the pictures and choose what they like to wear by simply clicking on the radio button. This is shown in Figure 19.



This part can help users to compare what they like and what recommender system recommend them to wear, so they can change their opinion by searching about the disagreement between their choices and recommender choices. For instance a petite girl is recommended to not wear a maxi dress because it can make her shorter but maybe the user in her mind like to wear maxi dress and by finding out about the reason of why recommender system recommend her not to wear maxi dresses she can change her mind and find another suitable outfit for her body shape and height.

All the designed survey can help this project to see if the users like the project and get familiar with how it works. In this part by designing the following webpage we can realize and compare people choice with the recommender system. Also users can see how the system can help them to decide and choose their suitable outfit.

The selected dresses which are stored in the system are all the same for recommender 2 and people choice. For the future work it will be many dresses in the data base, also dresses can be found from the online stores for recommendation.

In this part we choose check box , this page is a php page that loads all images from picture folder and show up. Each check box has an ID which makes it unique. All these check box are in the form which can post the data to the PHP page, and on the next page these data will be received by REQUEST and will be process. This webpage is shown in Figure 20.

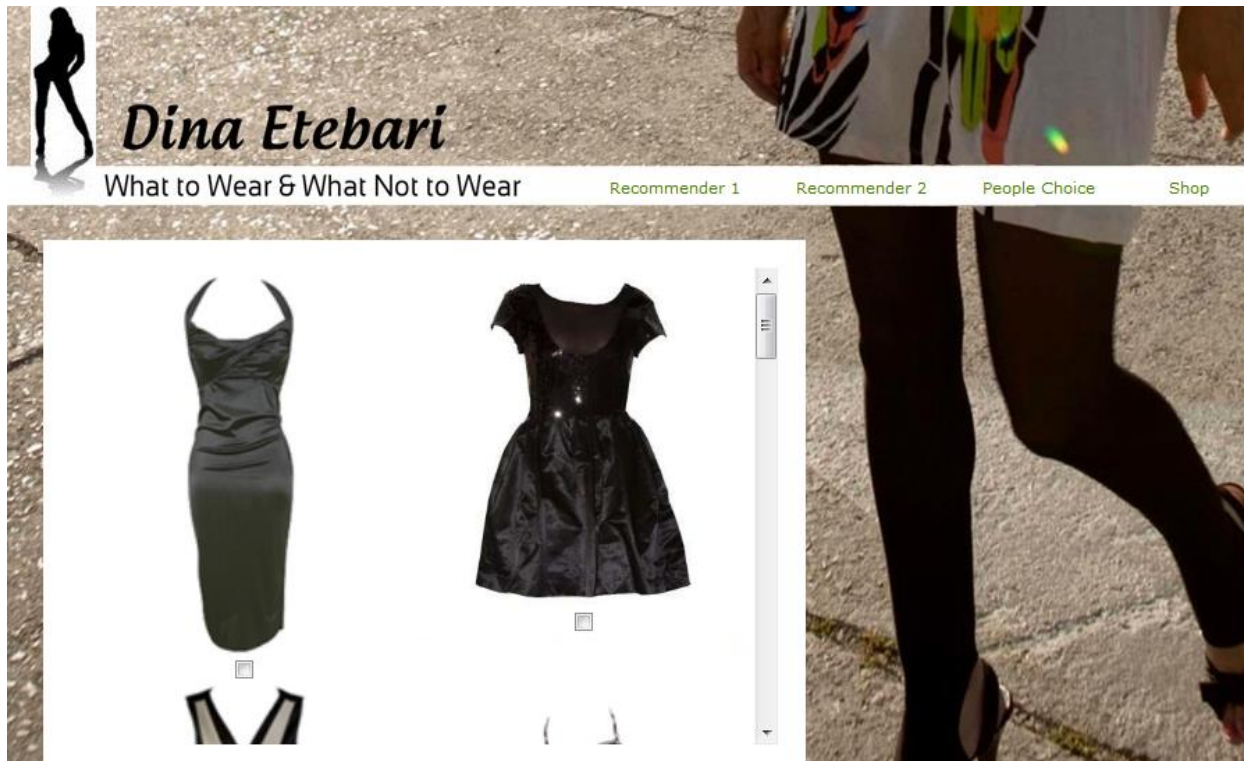


Figure 20. People choice

The last webpage was designed to help users to buy what they like to wear. The system links all the clothes to the WebPages that they came from, in this case when the users click on the clothes they wanted to buy; will be automatically linked to the related WebPages. This webpage is shown in Figure 21. All these programs for recommender WebPages are provided in appendix G.

So in the shop part of recommender system, after users get recommendation from part two and like to have the recommended dress she can simply click on the shop icon that is placed on the right hand side of webpage and find the dress that she wanted to buy by simply clicking on the specific dress, so the webpage will link user to the related online store which user can purchase the item.

The available dresses which are shown the following webpage are linked to their own online shopping. The future work for this part is to let the users buy what they want after getting recommendation from the system.



This page is written in HTML, all the picture with the related link are stored in the table in a , and all these link are linked to the corresponding webpage URL , by using hyperlink.

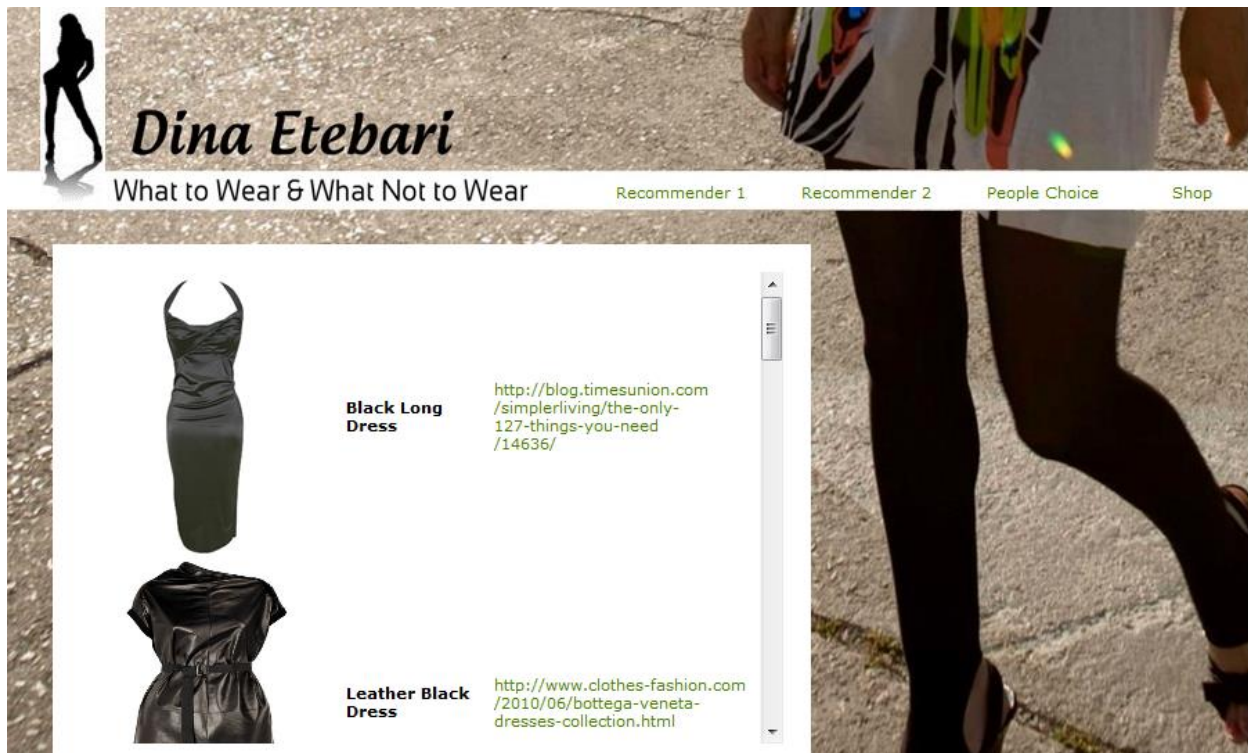


Figure 21.Shop

#### 4.6 Comparing personal choice with recommender

Finally for recommender system part, a survey has been designed to compare what people choose with their own opinion and what recommender system recommend people what to wear by using the WebPages.

## Method

We asked people to go through all recommender part (recommender 1 and 2) and get recommendation, and after having recommendation we asked them to choose what they like to wear by their own opinion by going through people choice part and clicking on what they like to wear. To test this survey, six different people were not the same as those who took the formative survey, between age of 18 to 27 with different nationalities such as Iranian, British and Spanish were asked to complete the questionnaire; this survey provides feedback on what type of clothes users like to wear according to their own opinion and what recommender system recommend them to wear through their size and heights, and at the end compare the results together.

20 different black dresses were stored in data base and recommender system recommends people according to their size what to wear and not to wear by going through all those black dresses, and also people can see all 20 black dresses in people choice section to choose what they like to wear and buy. For this part after asking people what they like to wear and don't like to wear, the comparison occurred between all the answers from recommender system and people choice.

## Results

At the end the results that we came up with, about 90% of people have agreed with recommender system. This survey is provided in appendix D and 2 chosen sample of answered survey is also provided in appendix O.

Table 7 shows the comparison of recommender system and people's choice and also what people like to wear and choose with their own opinion and what recommender system recommend them to wear, this survey designed to see how recommender system can be helpful for users. As you can see in table 6 blue ticks represents whether the recommender system recommend people to wear that dress or the users like to wear, and the red cross represent whether the recommender system recommends users not to wear that style. , Basically two red cross or two blue cross represent the agreement between users and recommender system and one red cross with one blue mark represent the disagreement between users and recommender system.

As a result of this table most of people agreed with recommender system for testing a number of agreements between people and recommender system Cronbach alpha test were used. Cronbach's alpha is a test for a survey's internal consistency and measures the reliability of a rating summarizing a group of test or survey answers which calculate some underlying factor. A score is calculated from each survey item and the overall rating, called a 'scale' is defined by the sum of these scores over all the survey items. Then reliability is defined to be the square of the [correlation](#) between the measured scale and the underlying factor the scale was supposed to measure (Definition of Cronbach's Alpha, 2011).

The Cronbach's Alpha of this survey were calculated by going through number of items (14 items) and the average of correlation between the items which is about 0.47, and as a result the cronbach's Alpha of this survey is 0.925 which shows 90 % of agreement between recommender system and people choice.

DRESSES	1		2		3		4		5		6	
	R	P	R	P	R	P	R	P	R	P	R	P
Black bow dress	✓	✓	✗	✗	✓	✓	✗	✓	✓	✓	✗	✗
Leather dress	✗	✗	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
Maxi dress	✗	✓	✓	✓	✓	✓	✗	✓	✗	✓	✗	✓
Boyfriend style dress	✗	✗	✓	✓	✓	✓	✗	✓	✗	✗	✓	✓
Stripe dress	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✗	✗
Long sleeve dress	✗	✓	✓	✓	✓	✓	✗	✓	✓	✓	✓	✓
Lousy dress	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓
Strapless dress	✗	✗	✓	✗	✓	✓	✓	✓	✓	✓	✓	✓
Formal dress	✓	✓	✓	✓	✓	✓	✗	✗	✓	✓	✓	✓
Dot dress	✗	✗	✓	✓	✓	✓	✗	✗	✓	✓	✗	✓
Puff dress	✓	✓	✗	✗	✓	✓	✗	✗	✓	✓	✗	✓
Pencil skirt dress	✗	✗	✗	✗	✓	✓	✓	✓	✓	✓	✓	✓
Citro dress	✗	✗	✗	✗	✓	✓	✓	✓	✗	✗	✓	✓
Black/white bow dress	✓	✓	✗	✗	✓	✓	✗	✗	✓	✓	✗	✗

R: Recommender system

P: Personal choice

✓ what to wear

✗ what not to wear

Table 7.Survey 4

## Conclusion

For error analysis of this table we choose person number four which has the most disagreement with recommender system, for example for maxi dress, recommender system recommend her that maxi dress is not suitable for her based on her height and body shape, but because at that time maxi dresses was in the fashion, she decided to choose it with her own opinion. In this case recommender system can recommend users that maxi dress is not suitable for you because of your height and no matter if it is in the fashion or not, maxi dress can makes you look shorter.

So as we mentioned before, Room 1 ('Recommender') provides different recommendations for users. For example, it gives users general information about what to wear and buy on different occasions, perhaps in response to different dress code, where to find what users are looking for by looking at the favorite shops of the users or their friends with the same personas, match

clothes, add clothes and remove clothes from wardrobe. As you can see in Figure 22 following reasons show why the recommender room is connected to different room:

- This room is connected to the social network room to compare what other users with same and different personas like to buy and what they think about the recommendation
- It is also connected to the intelligent wardrobe for checking what users have in their wardrobe by going through wardrobe database to mix and match new clothes with the existing clothes and also see if the users have the same shape or style or colour for recommending user to buy or not to buy the clothes from the shop

There is more usage of recommender system such as add/ removing clothes from wardrobe or managing wardrobe which is mentioned in the next chapter after going through how to save a picture in the data base.

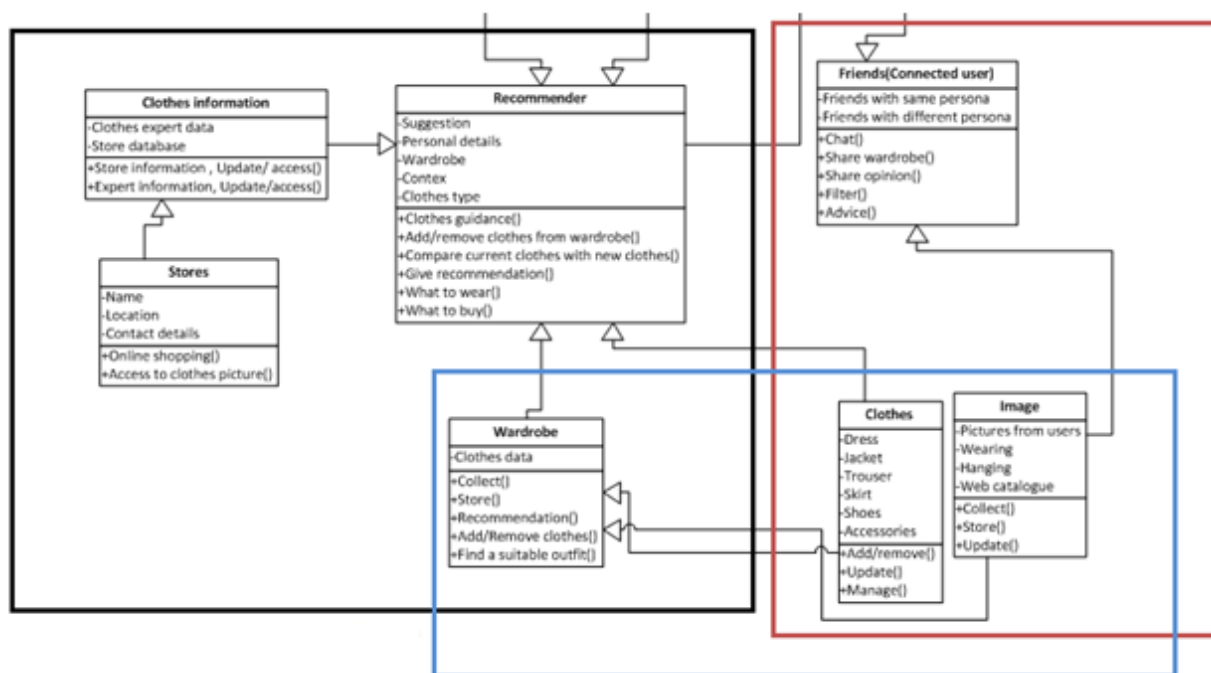


Figure 22.Connection between rooms

In this chapter three different recommenders were implemented for people to get recommendation about what to wear and what not to wear , the first recommender is designed to

get recommendation to users by text about what to wear and what not to wear based on their size and body shape, the second recommender were designed to show the users the picture and the shape of the clothes that they can or can not wear, and the third recommender were designed to let the users to choice their own outfit by their own opinion, this recommender were designed for rating part of this project, so users can compare other people rating and opinion with what recommender system recommend them to wear.

The final design which is the future work of this project is to combine all these recommenders to work together, so users can easily compare people rating with the picture of clothes that recommender system recommends them to wear and not to wear and make their decision easier to find a suitable outfit. The picture below (Figure 23) shows the sample of final version of this project.

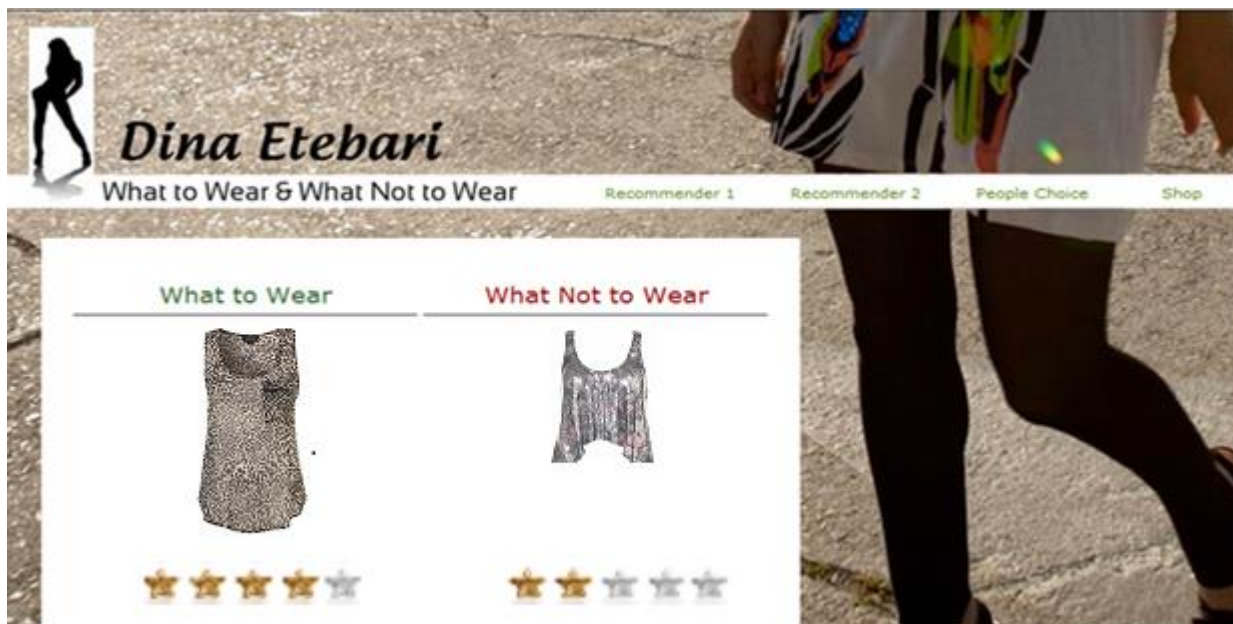


Figure 23.Final version

## Chapter 5

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### 5.1 Web design and evaluation

After dealing with recommender room and connected user room, new Webpages were designed to allow users provide their information in database and get familiar with the whole idea of this project.

In this chapter, we explain what Web Pages Forwarding is, how it works, how people can make their own profile, and couple of examples about web pages forwarding by our database is also provided.

The whole idea of designing these webpages are, first to show people how does the system will look like in future with most of the features and usages, and secondly to see how easy is for people to use this system for further implementation.

At the end of this chapter the last two surveys have been designed. The first survey was designed to see how likely is for the users to use this system after getting familiar with the finished sample of the system and in the last survey (QUIS) 20 people were asked to sit with me and use the system manually to realise how easy or hard is for them to get familiar with system and to realise how easy and clear is to follow the direction on the webpages.

Following section explains how users can join this system, to login into their own profile and how they can use the system step by step.

### 5.2 Versions of web pages

The first and second web pages were designed for users to sign up for the system or login to use the system. These programs are provided in appendix H and I.

The software part of these web pages is written in different programming software. For storing data in database PHP and SQL were used and for making the web pages SQL, Java, HTML and C programming were used via Dreamweaver software.

First users can use this system by going to [www.dina.etebari.net](http://www.dina.etebari.net). For using this system users need to use Mozilla Firefox because the program is written in JAVA and only Mozilla Firefox support this program.

It is really simple and easy for users to sign up for the system , from the sign up page they just need to provide the system with their full name, Username, desired password, Profile picture, Size, Date of birth, Height, Gender, Personas and hair colour.

Username and password let users to login in to the system, by putting name, surname, gender, and age, and also by uploading a profile picture user can make her/his own profile to communicate with other people and to be introduced to the system and other users. On one hand size, height and persona will be used in the recommender system for what to wear and what not to wear part which has been implemented in this project. On the other hand this entire information plus knowing user's hair colour can be used for recommender system in mix and matching clothes, general information, find a suitable store and find a suitable outfit for users in future works of this project.

If the users are not familiar with the personas definition, there is a table that explains all the personas.

In order to be eligible to sign up for Intelligent wardrobe, users must be fourteen (14) years of age or older.

Ideally, the password users select should be easy for them to remember but hard for someone else to Figure out. For added security, users can choose different password than other passwords that they use on the internet. When creating a password there is no characters limitation but it is better to be at least 6 characters in length and that users can use a complex string of numbers, letters, and punctuation marks. After user complete the sign up form, they can easily enter created username and password to login.

To access into account, user need to enter one of the following of pieces of information into the "Email" field on the login page and also enter their password into the "Password" field, and click on the "Login" button:



- Any email address that is currently listed as username on intelligent wardrobe database.
- A created username by the user which can contain their full name, nickname or etc.

Each users need to put their own information to the system, so by having users data in to the system , the recommender can recommend users about different needs based on each person records.

These website are shown in Figure 24 and 25.

The following page is the main page which is written in HTML. This page contains basic elements like pictures and texts which are tabled and also a form. This form in formed from two text boxes (one for username and the other is for password) and also two buttons (one to sign up and one to log in). By clicking on the login button, the variable of username and password will be passed to checkuser.php page along the buttons name. This page is written in PHP and its task is to check the username and password with the records in database to allow the user to login



Figure 24. Login Page

The signup button has been linked to W2.html page, which is written in HTML program and contains a form with several inputs such as text boxes, drop boxes and a file browser, plus a submission button.

By clicking on submit button, all data in the field along with the name of each field (e.g. my username=DinDin and password=DinDin) will be passed to User.php which been written in php.

This page is responsible to save users input data in the database; but before that it check the fields to have the valid inputs. For example the length of username and password can not be less than 3 characters.

MySQL is used for database. Database contains some tables like USERS, and queries are written in php language.



The screenshot shows a web form for signing up. It includes the following fields and controls:

- Name:
- Surname:
- Name/Surname (Username):
- Password:
- Upload Profile Picture:
- Size: 8-10
- Age: 14-17
- Height: Petite
- Gender: Male
- personas: Persona1
- Hair colour: Black
- 

There are two decorative images on the right side of the form:

- A large image with the text "I Hate Shopping" in a stylized, colorful font.
- A smaller image showing a woman shopping with the text "I love Shopping!" in a stylized font.

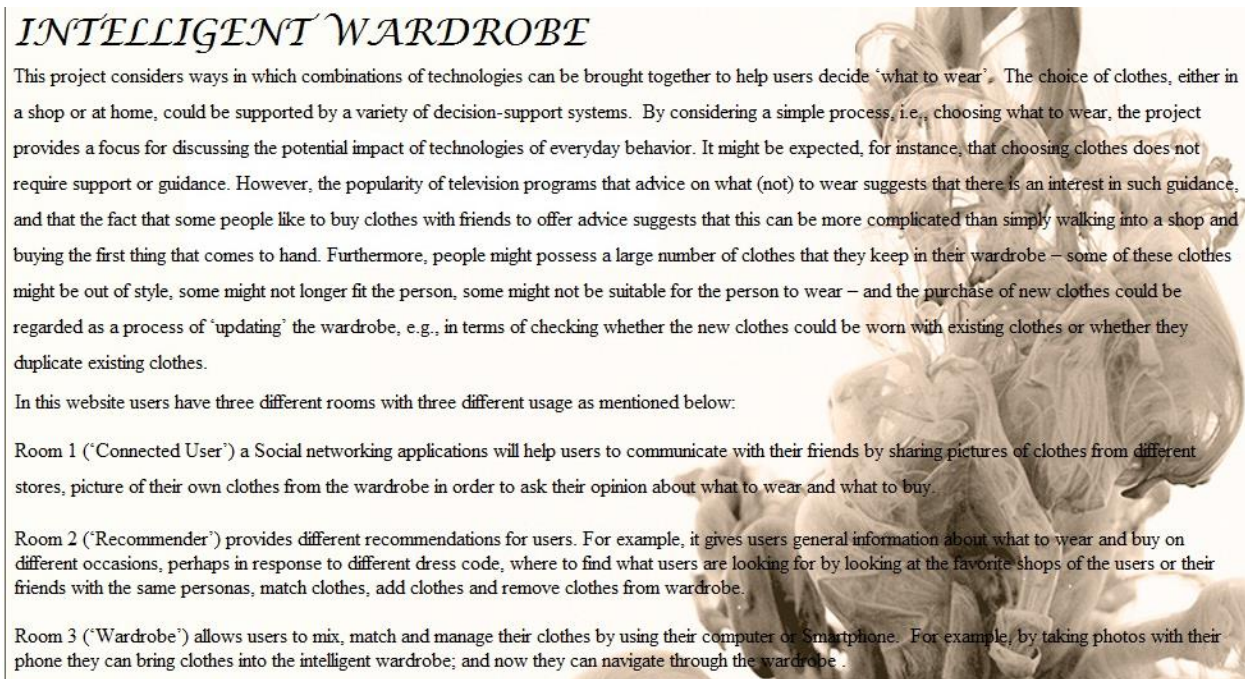
At the bottom of the form, there is a table with two columns: "Personas" and "Description".

Personas	Description
1	I shop every month and I prefer shopping directly from stores to see the exact colour and find the suitable size, for that reason I don't trust online shopping. I always go shopping with my friends, when I am with them I can have lots of fun and I can ask for their opinion as well. I have more than 50 clothes in my wardrobe and I manage them by colour and sometime

Figure 25. Sign up page

In the first page (login page), there is a link that forwarded to the explanation page (What is intelligent wardrobe) and can help users to get familiar with the concept of project and each room as it is shown in Figure 26.

The following page is a w2.html which is written in html and the main page will be linked to the following page by a hyper link on “about the project” button.



**INTELLIGENT WARDROBE**

This project considers ways in which combinations of technologies can be brought together to help users decide 'what to wear'. The choice of clothes, either in a shop or at home, could be supported by a variety of decision-support systems. By considering a simple process, i.e., choosing what to wear, the project provides a focus for discussing the potential impact of technologies of everyday behavior. It might be expected, for instance, that choosing clothes does not require support or guidance. However, the popularity of television programs that advice on what (not) to wear suggests that there is an interest in such guidance, and that the fact that some people like to buy clothes with friends to offer advice suggests that this can be more complicated than simply walking into a shop and buying the first thing that comes to hand. Furthermore, people might possess a large number of clothes that they keep in their wardrobe – some of these clothes might be out of style, some might not longer fit the person, some might not be suitable for the person to wear – and the purchase of new clothes could be regarded as a process of 'updating' the wardrobe, e.g., in terms of checking whether the new clothes could be worn with existing clothes or whether they duplicate existing clothes.

In this website users have three different rooms with three different usage as mentioned below:

Room 1 ('Connected User') a Social networking applications will help users to communicate with their friends by sharing pictures of clothes from different stores, picture of their own clothes from the wardrobe in order to ask their opinion about what to wear and what to buy.

Room 2 ('Recommender') provides different recommendations for users. For example, it gives users general information about what to wear and buy on different occasions, perhaps in response to different dress code, where to find what users are looking for by looking at the favorite shops of the users or their friends with the same personas, match clothes, add clothes and remove clothes from wardrobe.

Room 3 ('Wardrobe') allows users to mix, match and manage their clothes by using their computer or Smartphone. For example, by taking photos with their phone they can bring clothes into the intelligent wardrobe; and now they can navigate through the wardrobe.

Figure 26. Definition of intelligent wardrobe

After logging into the intelligent wardrobe the next page comes up so they have to click on Login, Enter username and password to login immediately. When the user login, this will take him/her into the profile page and if the user has accessed the site before, user information will be supplied and they will be able to see all their information and profile picture on Profile page. In this page users can get access to the recommender system room, social networking room and wardrobe room. There is an example of my own profile which I sign up for it and as it is shown below, all my information and picture will appear on the page after signing up for the system. The webpage is shown in Figure 27.

This page represents the three main concept of this project to users, which are social networking, recommender system and intelligent wardrobe. (This page can be tested by using the following information, User Name: DinDin , Pass:DinDin)



Figure 27. Profile page (case 1)

If the user has not accessed the site before, no data will be found as it is shown in Figure 28, so they should proceed back to the home page and select the “signup” option located near the login box and follow instructions for New Users on the second page of this document.

After system pass the username and password from the login page to the following page which is written in PHP, first the system will found the username with the SELECT query from the user table and then it will check the entered password with the stored one. If the user password matches with the existing password in database then the page will be redirected to the user’s profile, otherwise login process will be failed.





Figure 28. Profile page (case2)

All the above webpages were designed implemented and can be tested by the users in this system via their computers or mobile phone (Firefox required).

After logging into profile page, there are three options that users can select. The first option is to get advice (Recommender system). The second option is for updating wardrobe which users can put new data base (picture of their clothes), mix and match what they like to wear, dress mannequin and play with their clothes and find a suitable outfit without going through their wardrobe by simply using their computer or via mobile phone. There are different ways of uploading data (picture of clothes or information of clothes) as it is mentioned below:

- Typing clothes name or clothes code (bar code) or clothes style
- By taking picture of clothes via camera, mobile phone or webcam and uploading the picture into the database and by tagging picture which is already taken by the users in different location with different outfits (As used in this project)
- By using stores websites and saving the picture of clothes
- Picture recognition

The first option which is get advice (recommender system) has been linked to recommender webpage (which is seen in chapter 4), to help users to get recommendation. This part of project has been implemented and user by registering in the system can get recommendation about what to wear and what not to wear. As it is mentioned in chapter 4, all the options for recommender system are not working and only some options were chosen and implemented for users to test.

The following pages program has been written in html. There is a hyper link connection between speak to friends and update wardrobe, and these pages which connect them together. These two webpages were only designed for users to get familiar with the idea of the project and how they can connect to other rooms and what options are available when they want to start using the system, and the final implementation is the future work of this project.

The wardrobe page sample is shown in Figure 29 and the program is provided in appendix J.

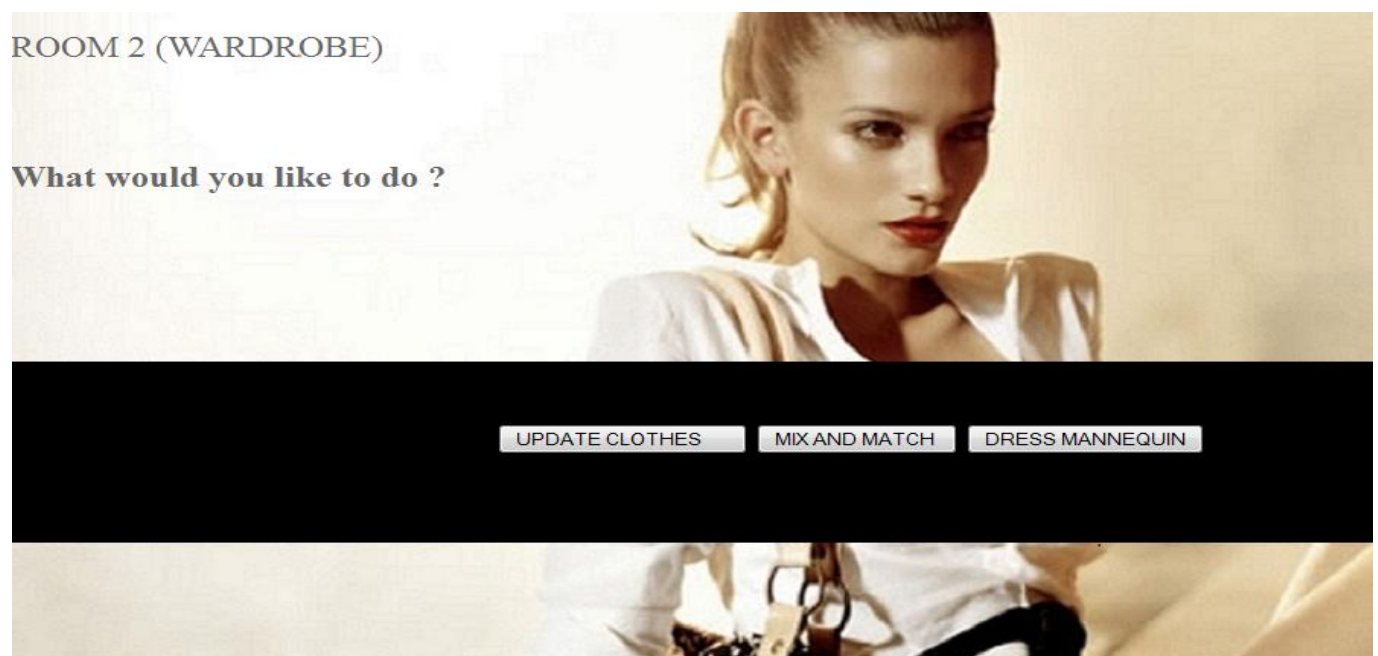


Figure 29.Room 2 (Wardrobe)

And finally the last page was designed as a sample of social networking room which let the users to communicate with their friends via computer or mobile phone. In this room users can share their wardrobe with their friend and ask their opinion about what they want to wear and also can communicate with their friends when they're doing shopping and ask their opinion about what

they want to wear. There are different feature in this room such as dress the mannequin, chat with friends, limited profile, compare the favorite store of their friends with same or different personas and etc., as it is shown in Figure 30. This program is provided in appendix K.

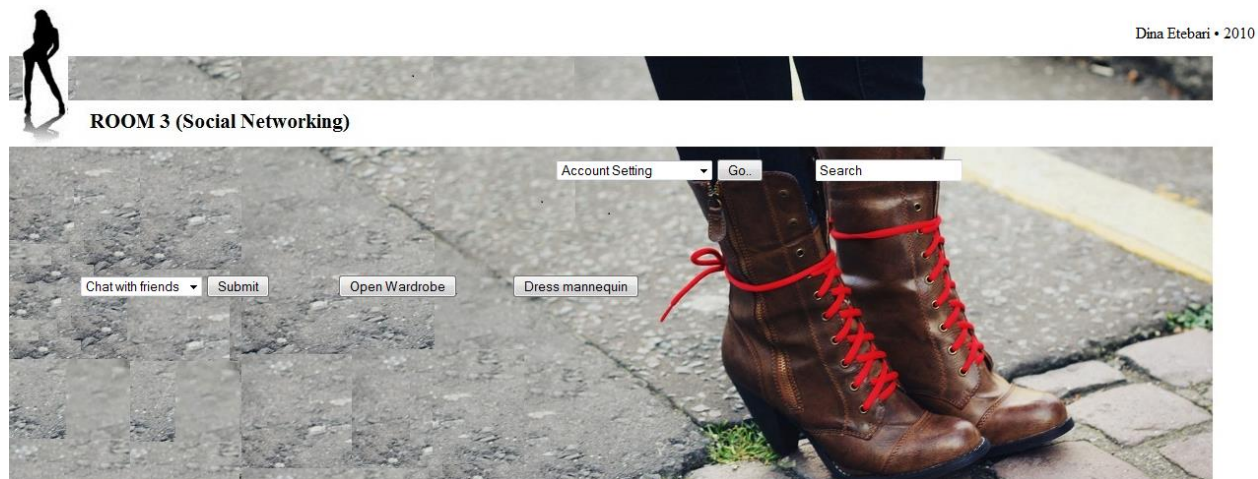


Figure 30.Room 3 (social networking)

### 5.3 Final survey

The final survey is designed to find out what people wear and buy in 6 months, and how recommender system can help them to do shopping easier and to match and find their suitable outfit. For example if user bought different black dresses (same colour) in a year, then the recommender system can recommend user to buy that clothes, but in a different colour or a different style. For completing this survey 6 people between age of 19 to 24 with different gender (4 female and 2 male) from different country and culture such as British, Iranian and Italian were asked to write what they bought in last 6 month with details such as what colour, what kind of clothes, how much they spend money on the clothes, what kind of personas they are, and finally what they think of the recommender system, social networking and intelligent wardrobe.

These people are the same people who were asked to complete the survey for the consumer behavior which is mentioned in chapter1, but this time they were asked about how they feel

about the system (as it is mentioned below), to find out about how they can use the system with their own taste of shopping and how likely and useful it is for the users to use this system.

At the end the following question is given to them to find out about how likely is it for users to use this system.

- 1) If there is a program (Recommender system) to help you find a suitable outfit, how likely is it that you would use it?

Most of people find the system helpful and useful by asking recommendation from recommender system, or communicating with their friends for their opinion about the outfit and something that allows them to plan their outfits by looking out what works with other items in their digital wardrobe. This survey is provided in appendix E. (As it is mentioned before 2 sample of answered survey is provided in appendix L)

Person#1: It is very likely for me to use this system because I think it is a fantastic idea to get recommendation about what to buy by going through my wardrobe in store.

Person#2: It will be great as it will make it easy for me to shop. I will prefer to use it over going to the shops.

Person#3: Definitely, I would love to have something to allow me to plan my outfits and see what works with other items in my wardrobe.

Person#4: I would definitely use the system to communicate with my friends according to ask their opinion about what wear.

Person #5: It is very likely for me to use the system because it will make it easier to shop.

Person #6: I would certainly use the system, I would find it helpful to have a place to store my clothes digitally and mix and match to screen potential purchases.

The idea of designing this survey is to realise how likely it is for people to support this system by using the recommender part which is implemented in this project. After looking through all 6 people answers, we came up with a conclusion that, it does not matter if a person likes to shop alone, with friends, online or in store. This project can help them in different ways. For example



for those who like to shop online, the recommender can help them to find a suitable stores and get users satisfaction, for people who hate shopping recommender system can help them to decide what to wear and what to buy, so they can save a lot of time. And also for those people who loves shopping social networking room can help them to communicate with their friends and discuss what they want to buy or wear, also recommender room can help them to find a suitable store by going through his/her friends with the same persona favorite stores and finally this person by having an intelligent wardrobe room can easily go through all his/her owned clothes, mix and match them together, add or remove a new clothes and old ones and also decide what to wear easier by saving a lot of time.

In the next section by using QUIS, we want to find out about how easy and flexible are, for the users to use these webpages.

## 5.4 QUIS

“The Questionnaire for User Interaction Satisfaction (QUIS) is a tool developed by a multi-disciplinary team of researchers in the Human-Computer Interaction Lab (HCIL) at the University of Maryland at College Park. The QUIS was designed to assess users' subjective satisfaction with specific aspects of the human-computer interface. The QUIS team successfully addressed the reliability and validity problems found in other satisfaction measures, creating a measure that is highly reliable across many types of interfaces” (QUIS,2010).

“The QUIS 7.0 is the current version. It contains a demographic questionnaire, a measure of overall system satisfaction along six scales, and hierarchically organized measures of nine specific interface factors (screen factors, terminology and system feedback, learning factors, system capabilities, technical manuals, on-line tutorials, multimedia, teleconferencing, and software installation). Each area measures the users' overall satisfaction with that facet of the interface, as well as the factors that make up that fact, on a 9-point scale. The questionnaire is designed to be configured according to the needs of each interface analysis by including only the sections that are of interest to the user” (QUIS, 2010).

The QUIS were used to see how easy and clear for users to use the webpages and this survey is not about concept, it is about using web-interface. For this part, 20 people between age of 23 to 37 with different nationalities and taste (Iranian and British) with a different occupation such as student, business people and sales assistance were asked to complete the QUIS form, to find out how easy and flexible is to use the website by going through all the Webpages. (QUIS form is provided in Appendix F)

First the whole idea of the project and how they can use these webpages has been explained to the users, and then I asked them to sit with me, joining the website and start using it step by step. After these task, working through the tasks of registering and getting advice on what to wear they were asked to complete a QUIS questioner and start rating each question on how satisfy are they from the scale between 1 to 7.

The following table (Table 8) has been designed to see how many people were allocated to each persona with different age, gender and nationality. (4 chosen answered sample of this survey is provided in Appendix P)

As it is mentioned before users answered 19 questions and if their rating was more than 4 or 4 than 4 and less than 4 they determined as a person who is not happy with the system (dissatisfied)and if the user rate the questions more likely with 4 or less than 4 he/she described as a satisfied user.

	Name	Age	Gender	Nationality	Persona	Satisfied	dissatisfied
1	Sarah	16	Female	British	Persona 1	S	
2	Jessica	23	Female	American	Persona 3	S	
3	Tom	19	Male	British	Persona 2		D
4	Jose	27	Male	Spanish	Persona 2	S	
5	lyon	20	Female	Spanish	Persona 7	S	
6	Maria	30	Male	French	Persona 1		D
7	Mara	24	Female	Iranian	Persona 1	S	
8	Pooja	17	Female	Indian	Persona 3	S	
9	Martina	25	Female	Iranian	Persona7		D
10	Dara	30	Male	Iranian	Persona2	S	
11	Bruno	31	Male	Italian	Persona7	S	
12	Mandana	32	Female	Iranian	Persona2		D
13	Daniel	20	Male	Iranian	Persona7	S	
14	Erika	42	Female	Canadian	Persona3	S	

15	Marta	21	Female	Spanish	Persona1	S	
16	Antonio	24	Male	Spanish	Persona7	S	
17	Emma	19	Female	British	Persona2	S	
18	Ariel	23	Female	American	Persona3	S	
19	Alex	37	Male	British	Persona7	S	
20	Geof	29	Male	French	Persona2	S	

Table 8. Users QUIS rating

The following table (Table 9) shows 14 out of 20 are people who like to shop every week or every month with different shopping behavior (Persona 1, 2, 3) .As you can see in table 8 most of people, (8 out of 10 female and 3 out of 10 male) who like shopping were satisfied and only, 3 out of 10 were not happy when they used the websites (Female=2, Male=1).

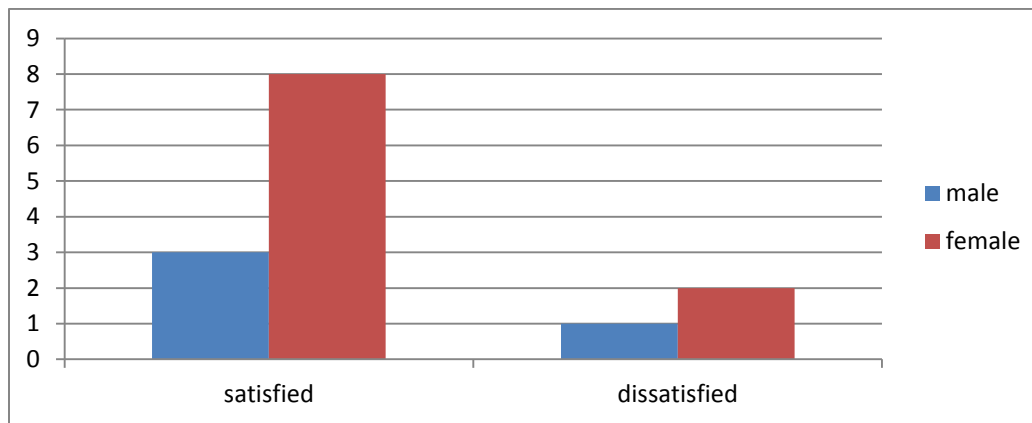


Table 9. QUIS1

Table 10 shows 6 out of 20 (Female=1, Male=5) (persona 7) are people who don't like to shop. As you can see in table 9, 5 out of 6 people who don't like shopping were satisfied (Male=5) and only, one person was not happy to use the system (Female).

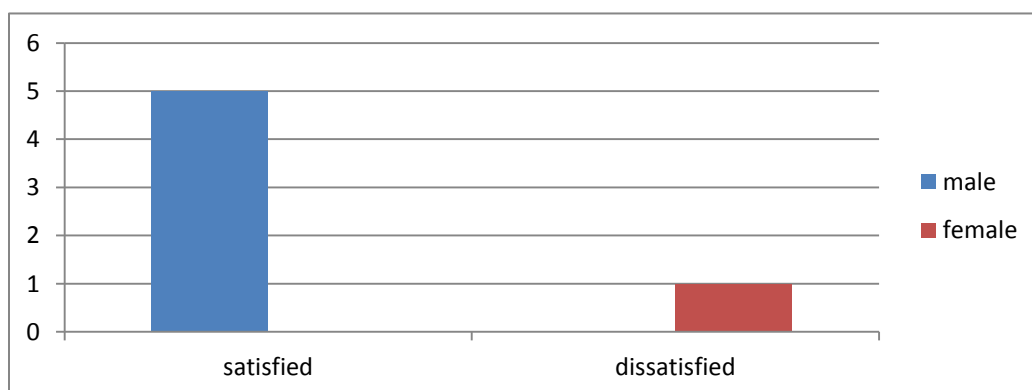


Table 10. QUIS2

The results of these two tables (Table 9, 10) is the evidence that people who like shopping and don't like to shop, are both happy and satisfied in using the system.

Some of these questions are provided below and the full version of questionnaire form is provided in appendix F.

1. How easy is it for you to use this website?
2. How convenient is it for you to find information you need from the website?
3. How quick can you finish your work?
4. How easy is it for you to understand the information provided by website?
5. How productive you can be by using this system?

So basically the last table represent the satisfaction of users while they using these webpages. The table below shows how people think it is easy and flexible for them to use the system and, we only have few red charts in the table and most of them are between green and yellow chart which shows the flexibility of usage of this website.

Green charts: user satisfied

Red charts: user dissatisfied

Yellow charts: user happy with the system but not extremely satisfied

Purple charts: Not applicable in this system

With respect to the below table most of users can find this system easy to use, they feel comfortable using it and they can find information easily; but they also disagree with online services and communication with friend which need to be improved.

The red charts below shows user dissatisfaction and green charts shows users' satisfaction, yellow charts represent that users are happy with the system but not extremely satisfied.

By having a table below and looking through each user's answer we can understand which part of the system is easy for users to use and focus more on red charts and yellow charts to improve system in future work for user's satisfaction. For example on one hand most people gave green chart on question number 13 (The information provided by the website is easy to understand), so we can understand that we provide enough information on how this system works and how this system can help users and on the other hand most people gave a red chart on the 4<sup>th</sup> question (I am able to complete my work quickly using this website). As we know the whole idea of this project is not implemented yet and many parts of it is the future work of this system, so by completing all these parts, users can complete all their work quickly and fast enough.

Overall Reaction to the Website		1	2	3	4	5	6	7	NA
1. Overall, I am satisfied with how easy it is to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
2. It was simple to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
3. I can effectively complete my work using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
4. I am able to complete my work quickly using this website	strongly disagree	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
5. I am able to efficiently complete my work using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
6. I feel comfortable using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
7. It was easy to learn to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
8. I believe I became productive quickly using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
9. The website gives error messages that clearly tell me how to fix problems	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input checked="" type="radio"/>
10. Whenever I make a mistake using the website, I recover easily and quickly	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
11. The information (such as online help, on-page messages, and other documentation) provided with this website is clear	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
12. It is easy to find the information I need	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
13. The information provided by the website is easy to understand	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
14. The information is effective in helping me complete the tasks and scenarios	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
15. The organization of information on the website pages is clear	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input checked="" type="radio"/>
16. The interface of this website is pleasant	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
17. I like using the interface of this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
18. This website has all the functions and capabilities I expect it to have	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
19. Overall, I am satisfied with this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>

Table 11. QUIS Survey

The above table (table 11) shows that most of users have positive respond to the survey and find the website clear and easy to use.

For calculating this matter first the table of how users rate each question have been designed to represent how users with different gender and personas rate each question and by looking through the numbers we can see in which part of the webpage people are more satisfy and in which parts they are not happy with it.

This table shows how people rate each question. 7 is the highest number for being satisfied (strongly satisfied), while 1 shows users dissatisfaction and 4 is an average rating which means people are happy with the system but not extremely satisfied.

The first vertical row shows the number of each question and the first horizontal row shows the user's number, personas and their gender. This table is provided in Appendix Q.

After doing further analysis and looking through the rating numbers in the designed table of rating numbers (which is provided in Appendix R), I came up with the following graph which shows a little difference between how people with different personas answer to each question.

For this graph the calculation has been done to see the difference between how each user with the same personas answered the questions, so first the surveys were divided into 4 parts, Mean1, Mean2, Mean3 and Mean 7. Each Mean represent user's personas, for instant Mean 1 represent all the users with persona 1 which are user number 1, 6, 7 and 15. The statistical test have been calculated in Microsoft excel to see the difference between how each users with the same personas respond to all 19 questions.

The above table (table 11) shows that most of users have positive respond to the survey and find the website clear and easy to use.

For calculating this matter first the table of how users rate each question have been designed to represent how users with different gender and personas rate each question and by looking through the numbers we can see in which part of the webpage people are more satisfy and in which parts they are not happy with it.

This table shows how people rate each question. 7 is the highest number for being satisfied (strongly satisfied), while 1 shows users dissatisfaction and 4 is an average rating which means people are happy with the system but not extremely satisfied.

The first vertical row shows the number of each question and the first horizontal row shows the user's number, personas and their gender.

So after entering all the rating numbers for each question which was answered by each Mean (Users with the same personas) and get the total number of each Mean with the same personas , As it is seen in the above graph there aren't statistically differences but there are still differences between people opinions.

The final result of each Mean was average 4 and the table of result for the following graph and how I came up with this statistical graph is also provided in appendix R.

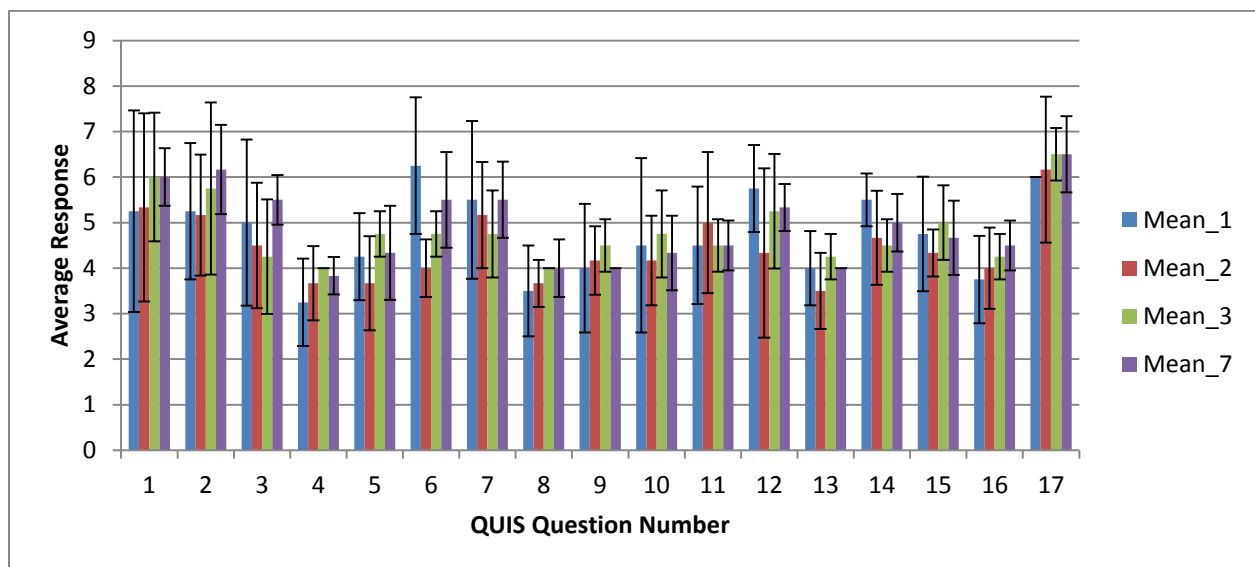


Figure 31. Average response

As a result of the above graph (Figure 31) we can say even when the calculation has been done between user's with the same personas there aren't a lot of difference with the other users with the different personas and all the usage and how flexible and easy is for the users is to use the website with different opinion is obvious and the same.



After the above mentioned table and the calculation we came up with a reasonable result but there are still many thought in the survey that can help us to understand why users with different personas have disagreement and sometimes have a same opinion and a same rating.

For instance some questions have obvious answer and users have a same opinion for it, such as question 4, 8 and 13.

Question 4 asked users if they are able to finish their work easily and quickly (I am able to complete my work quickly using this website), and as it is mentioned before the whole project and website is not implemented and only some chosen part is finished, so users can't finish their work while using this system, so in this case many users with different personas rate this question less than normal which is less than 4.

Question 8 asked about how productive users can be after finishing their work (I believe I became productive quickly using this website), and again because the concept of the project is mentioned to all 20 people before start completing the survey, so users can't finish all their work, or they can't use all the concept such as social networking room to communicate with their friends, so mostly the users with the same personas rate this question below the average rate.

Question 13 is about how easy it is for the users to understand the information provided in the website (The information provided by the website is easy to understand), some users rate this question more than the average rate because when the concept of project is mentioned to them they fully understood what is the project is about, also they are familiar with the fashion industry, online stores and social networking websites. The rest of people rate this question less than the average because they are unable to finish their work and they want to find out how the system work after it will be complete.

Some questions are rated differently with a same user, such as question 1 and 3. As it is mentioned before question 3 (I can effectively complete my work quickly using this website) has an obvious answer for all users and it is mostly below the average (below) or average (4), in this case if the user rate one question below the average he/she may rate another question above the average. For example questioner number 18 who is a female user with persona number 3 is satisfy with how easy it is for her to use the website and rate the first question 7 which means

strongly agree while she gave a average rating to question 3 because she could not able to finish her work the way that she wants.

There is another possibility in the survey, in some questions such as question one there are different answers between different users with a different personas. For example question 1 (overall I am satisfied with how easy it is to use this website) asked about how easy it is for users to use the website. So by looking through the above table, we can see there is different answer between user number 6(persona 1) and user 7 (persona 7).

User number 6 (female, persona1) rate this question below the average while user number 7 (female, persona7) is strongly agreed with this question. The reason behind these answers are, users number 6 who like shopping find the website hard to use because she is not really into online shopping and she is not very familiar with online websites and find it hard to work with computer, even in her personas categories we can see that she always prefer to shop in store, however user number 7 who hates shopping and not normally use online shopping and social networking website is very familiar with working with computers and websites, so she find it easy to work with each part of the system. As a conclusion of this paragraph, it doesn't matter if the users like shopping or like to use this system, they can find it easy or hard to use the website.

Overall between 20 users, only 4 users with persona 1, 2 or 3 who love shopping are dissatisfied with using the system (users number 3,6,10 and 12) and the rest are satisfied and mostly rate the question above the average rate or on the average rate.

Personas	1	2	3	7
1.Ease of use	M	M	H	H
2.Simple to use	M	M	H	H
6.Comfort of use	H	M	M	H
7.Easy to learn	H	M	M	H
13.easy to understand	H	M	M	M
16.Interface	H	M	M	M
12.Easy to find information	M	M	M	M
19.Satisfied	H	H	H	H
20.Like using	M	M	M	M

Table 12. Comparison between different users

For further analysis the following table (Table 12) has been designed to compare the rating between different people.

In QUIS survey 20 people with personas number 1, 2, 3 and 7 were asked to complete the questioner. In this table, 9 out of 19 questions with 4 different categories have been chosen to realize why users with 4 different personas rate each question differently.

Each question with different categories is separated with different color, and for the users answers M represent a medium rating and H represent a High rating.

As it is seen in the above table persona 1 and 2 gave a medium rating to question 1 and 2 while persona 3 and 7 gave a high rating to these questions. To compare why they gave a different rating we choose persona 1 and 7, persona 1 who like shopping gave a medium rating on how easy and simple it is to use the system and persona 7 who hate shopping gave a high rating, so as a conclusion we can say persona 7 who hate shopping is really familiar with the computer, electronic and internet system and like technology so he/she can find this system very easy to use, though persona 1 who love shopping are not very familiar with how to use these systems and don't like technology that much.

As it is mentioned before this questioner is not about if the users like the concept of project or not, this survey were designed to see how easy it is for users to register and start using the system through using their computer or mobile devices.

So it does not matter if the users like shopping, hate shopping, like to use the system or not like to use the system, the idea of having this survey is all about what users think after start registering and playing around with the options that is implemented in the website and at the end by having their feedbacks we can realize if the designed website is user-friendly and easy enough to use for different users.

## Chapter 6

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### 6.1 Conclusions

This project needs both technical and research skills. The technical skills are represented in designing, implementing and running the software application, database, and the website. The research skills are represented in the literature review and the design and analysis of user evaluations and requirements gathering. The technical work requires many skills such as visual studio, .Net application, database development and administration and many other technical skills.

The original idea of this project was to connect social networking, recommender system and intelligent wardrobe to work together as a new idea and new technology which is still not implemented by others. This system can be used in a different ways such as helping and answering people question about what to wear and what not to wear, general question, what to buy and what not to buy, get new information and recommendation from the server through looking at the other friends and people rating and interest, communication between friends, having all wardrobe items in computer and etc.

In the technical part of this project the most focus was on recommender system and also part of camera system for social networking. At the end, Webpages were designed for several reasons such as connection between three rooms to work to gather, showing the whole concept of this project, and letting users to start signing up for the system and using it.

In the research part, after designing different survey for each part of the project, different conclusions and ideas were explained based on other people's answer. The most useful survey, which helped this project, was using the concept of personas. The notion of persona helps our system in different ways such as knowing a different character of the user and different usage of the system.

The following sections explained what is implemented in this project and what can be improving in the future work of the project.

## 6.2 What was built

There has been much research on consumer behavior, recommender system, photo sharing, personas, Mobile technology, shopping advisor, social networking via computer or mobile and ambient technologies (smart wardrobe) reviewed in this thesis.

The system architecture was conceived to show how different parts of the system and all the rooms can work together. In order to design this system architecture a survey was defined, which would have established how the users would expect to use the system and find out how different consumers would behave, as well as how users would be interested in using different applications such as recommender system, social networking and intelligent wardrobe. Seven different personas resulted from this survey. Each persona can match to different types of system.

The concept of persona was useful in this project considering the essential role of finding out who belongs to the target of each design. The best solution to successfully accommodate different types of users is to design the system for each specific type of person with different needs. These seven Personas were used to identify different requirements and needs of the users.

Using the notion of persona helped to find out that even people who do not like shopping or can not decide what to buy still think some part of this system can help them in different ways.

For example, in persona number 7 a person who hates shopping can also use this system by just getting recommendation on what to wear and where to find it, which store and how he/she can match a new item with the owned clothes. Therefore, this system can help the user to decide easier, shop quicker and find his/her suitable outfit by simply using the recommender room.

Most of the focus was on the survey because it was the main study of this project that helped to get all the basic ideas and to realize how likely is for the users to use each part of the system.

For each part (room) of this project different systems architecture have been designed. For example, in social networking room, there were different possible ways of storing, receiving and sending pictures on the database and as it is mentioned before for this project after many researches the AQL system and Google Doc was chosen for this action.

AQL system can help users to send pictures to their friends and their personal computers and also receiving MMS and SMS back from the server. This part of the project which is mentioned in camera system chapter has been implemented and users can send pictures to the server while they want to add a new picture of clothes from the store or wants to share their clothes with their friends by registering in AQL. As the future work of recommender system, when the users get recommendation from recommender system they will also receive MMS from the server by using AQL method.

The AQL system is completed and ready to use for users. After users registration for this system (AQL) they can communicate with their friends or store their information within their own data base by sending SMS or MMS.

The next survey which was Survey of 'Advice' (what to wear and what not to wear) was designed to compare ideas of the recommender system to show how users themselves would have chose their clothes and to come up with the whole idea of implementing the recommender system.

For the recommender system, first a webpage was designed in order for users to select their personas (personality), size and body shape to get recommendation by text. Second, another webpage was designed in a way that each user could select their size and height by using their mobile phones and computers to find out what to wear and what not to wear themselves.

Many parts of recommender system are implemented in this project such as getting text recommendation on what to wear and what not to wear base on users body shape, heights and persona, getting recommendation by showing the picture of suitable outfit for the users again based on heights and size of the users. This characteristic lets the user choose what he/she like to wear and compare with recommendation and also at the end they can buy what they like to wear by clicking on that clothes.

After dealing with recommender system room and social networking room, several WebPages were designed to show the users the whole idea of the project and let them sign up for the system and also to connect all the link such as recommender room, social networking room and intelligent wardrobe room to work together.

These WebPages are designed for users to sign up or login into the system. After logging into the intelligent wardrobe the next page comes up as user's profile, and if the users have not been accessing the site before, no data will be found. However, when users login into the profile page, there are three options for users such as, recommender room, social network room and intelligent wardrobe to choose.

The explanation page was designed (Intelligent wardrobe) to help users to get familiar with the concept of the system.

Finally, the last recommender webpage was designed to help users to find out where they can buy their suitable outfits.

These programs are written in different programming software such as dream weaver by HTML and C for designing websites, SQL and PHP for developing a database and visual studio by C and .Net application for taking picture and tagging photos.

The last survey has been designed to find out how recommender systems can help them to do shop easier, to match and to find their suitable outfits. This survey also can help us to improve our system by finding out how each user like to use this system with a different usage.

After going through all the surveys and Webpages, the user interaction satisfaction (QUIS) questionnaire was developed in order to find out how easy and flexible is for users to use the system.

Using QUIS helped to realise which part of these Webpages is needed to be focused more for improvement and which parts are easy to use by the users.

The main focus of our study in this project was to surveys user's response to the concept and evaluates the number of people who like to use or interested in knowing this system. Accordingly for taking each step before going through any further first a survey has been designed, tested and evaluated. After going through all these surveys some part were chosen to implement and the rest was the future work of this project.

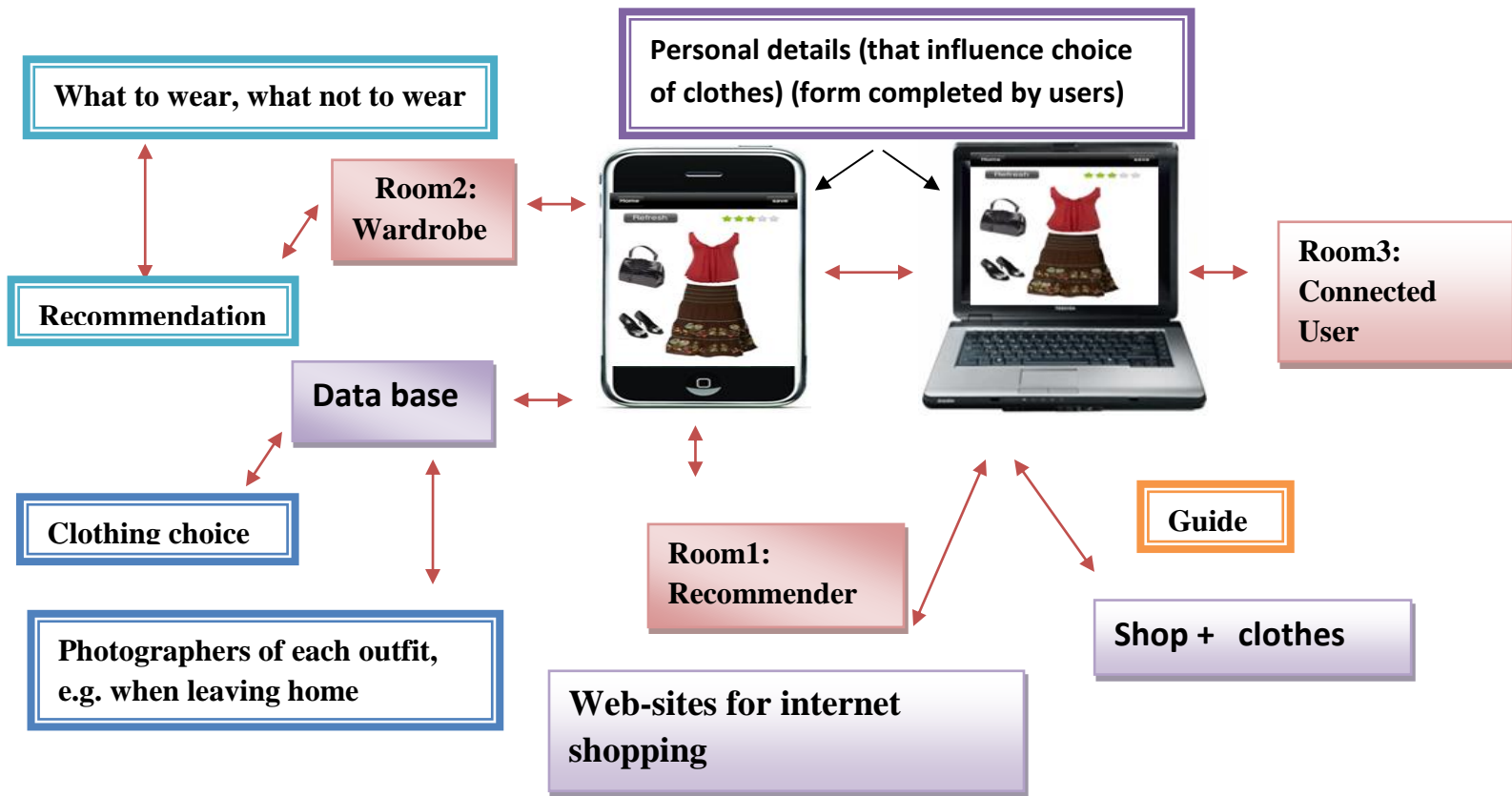


Figure 32. Overview of whole project

As it is illustrated in Figure 32 this project represents different types of applications with respect to user personas which is contain:

Photo sharing (Room3): discussing with friends what to wear and what not to wear by sharing pictures of clothes from the wardrobe. In order to implement this section, the sample webpage, AQL, tagging system and camera system was prepared.

Recommender system (Room 1): to find a suitable outfit and match an outfit from user's wardrobe. The main concern of this project is to design and implement this room. Towards this aim two websites were designed for the recommender system.

Digital wardrobe (Room 2): managing wardrobe, finding clothes and matching outfits. To develop this section first the data base is created, then tagging system was used to put



information on clothes pictures which is stored on a server. Finally the webpage was designed for digital wardrobe room.

These aspects come together in the form of an intelligent wardrobe that helps people to see their entire wardrobe, and choose outfits no matter where they are.

Recommender system and part of social networking is implemented in this project which these two will be part of intelligent wardrobe as well. For example, when the user wants to add or remove clothes from their wardrobe they still use AQL system.

### 6.3 How the project aims were met

This project considers ways in which combinations of technologies can be brought together to help users decide ‘what to wear’. The choice of clothes, either in a shop or at home, could be supported by a variety of decision-support systems. By considering a simple process, i.e., choosing what to wear, the project provides a focus for discussing the potential impact of technologies of everyday behavior. It might be expected, for instance, that choosing clothes does not require support or guidance. Furthermore, people might possess a large number of clothes that they keep in their wardrobe – some of these clothes might be out of style, some might not longer fit the person, some might not be suitable for the person to wear – and the purchase of new clothes could be regarded as a process of ‘updating’ the wardrobe, e.g., in terms of checking whether the new clothes could be worn with existing clothes or whether they duplicate existing clothes.

The primary aim of this project is to design and develop, using user-centred methods and techniques, a novel concept for the managing the purchase, storage and wearing of clothes. Initially, this involves defining different sorts of clothes shoppers (using the notion of Persona) who will use the resulting system in different ways. The project will explore ways in which combinations of technology can be used to support buying clothes and deciding what to wear.

- Discuss what to wear or buy with friends by using social networking sites(sharing picture of clothes)

- By using recommender system find a suitable outfit
- By managing their wardrobe, via their computer or mobile phone, to find a suitable outfit or to help add or remove clothes from the wardrobe

In this project it is most focused on room 1 which is recommender system part that helps people to get recommendation from the application. Users can use this application by going through the [www.dina.etebari.net](http://www.dina.etebari.net)

As it is mentioned in the previous chapters, there are only limited options for the user to get recommendation, but they can completely sign up for the webpage and getting familiar with the system.

Users can store, send and receive picture from the other users, communicate and get the other users opinion for what to wear and not to wear, what to buy and not to buy, mix and match clothes and share their wardrobe. This part is implemented and users by using AQL can communicate with their friends.

As it is mentioned in previous chapters there are 3 different rooms with different usage for users. All three rooms are connected with each other, for instance when the users are in store and want to buy clothes, she/he can get recommendation from recommender by using recommender room or ask their friends opinion about the clothes by chatting with them by using social network room. They can also share or mix and match their clothes by using digital wardrobe room.

At the end, the website was designed as a sample of the whole idea for users to get familiar with this system and they can get recommendation from recommender system and shop online.

## 6.4 Did users like the concept?

After going through all the survey and how people respond to each questionnaire, it has been shown that people were totally comfortable using this system and they find out it is easy and flexible using this system.

All the responds from the survey shows that people with different personality (personas), with different shopping aspects are interested in using this system. As an example some users liked to get recommendation from recommender or getting other users opinion about what to wear and what to buy, perhaps other users like to mix and match or manage their wardrobe and etc. by using digital wardrobe.

## 6.5 What could be developed in future?

The table below (Table 13) shows a future works of this project in each room and how they help the concept of this project to get improve.

Rooms	Suggestions	Improvements
Social networking	Write a program for limited profile, for those users who don't like to share their clothes with some specific people	This program can help people to have more privacy and it is good for the security of the system
Social networking	Write a program for communication between user and their friends	Encourage more sharing and better support
Intelligent wardrobe	Figuring out how to store all the clothes information from their wardrobe to database	Making users more comfortable when they want to add/remove or share a photo
Recommender system	Mix and match clothes by dragging pictures on a separate page	Users can choose a suitable outfit by looking through all of them together
Recommender system	Write a program for recommender room to connect all the existing programs to work together	Help people to decide easier whet to wear by comparing both people opinion and recommender system recommendation
Recommender system	Find a way to connect social networking, recommender system and digital wardrobe to work together	Help users to use all these system together and make it more interesting

Table 13. Rooms Improvements

There are many options and ideas for this project which can be considered as the future work of this project. The ideal version of this system is that the users can have all these three rooms connected and worked together. Each part of this project can have many different features which is mentioned in the above table.

The primary aim of this project is to design and develop, using user-centred methods and techniques, a novel concept for managing the purchase, storage and wearing of clothes. Initially, this involves defining different sorts of clothes shoppers (using the notion of Persona) who will use the resulting system in different ways. The project will explore ways in which combinations of technology can be used to support buying clothes and deciding what to wear.

The idea of this project is to connect social networking and recommendation (recommender system) and digital wardrobe together used for helping and answering people question about what to wear and what not to wear, what to buy and also get new information and recommendation from the server through looking at the other friends and people rating and interest. Also the digital wardrobe can help users to manage, mix and match their own wardrobe by putting all the data (picture of their clothes) in their personal computer or via mobile phone.

After going through all the survey it was realised that people shows interest in using this system. There are many different similar websites which are support recommender system and social networking (as it is mentioned before) and people all over the world are very interested in using these systems, so it is a good idea to combine all these programs to work together for the users.

This system, on the one hand can help people decide what to buy, what to wear, mix and match suitable outfit and manage their wardrobe, and on the other hand, it build on users own social networks and allow them to communicate with their friends and having fun.

## Chapter 7

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## Chapter 8

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### Appendix

#### Appendix A

Name:

Gender:

- 1) How many tops have you bought in the last 6 months? What colour?
- 2) How many jeans have you bought in the last 6 months? What colour?
- 3) How many shoes have you bought in the last 6 months? What colour?
- 4) How much money do you usually spend on clothes, monthly?
- 5) What is your purpose in buying clothes? (ex: like it or need it)
- 6) How do you decide if the clothes suit you or not?

#### Appendix B

Name:

Gender:

- 1) How often do you shop for clothing?
  - More than once a week
  - Once a week
  - Once a month
  - I don't like to shop
- 2) How do you prefer to shop?
  - Internet (online )
  - Shops
  - Catalogue
  - TV (shopping channel)
- 3) How do you prefer to shop?
  - Alone
  - With friends
  - With a shopping advisor

- I don't like to shop
- 4) Why do you go shopping with your friends?
- Opinion
  - Fun
  - Advice
  - I don't like to go shopping with my friends
- 5) How long does your shopping take?
- More than one hour
  - A whole day
  - Less than one hour
  - As long as it takes
- 6) How do you manage your wardrobe?
- Style basis
  - By colour scheme
  - By occasion
  - Randomly
- 7) How many items of clothing do you have?
- Between 10 to 30
  - Between 30 to 50
  - Between 50 to 100
  - More than 100
- 8) How often do you discuss what to wear with your friends?
- All the time
  - Most of the time
  - Sometimes
  - Never
- 9) How easy it is for you to choose an outfit?
- Very easy
  - Easy
  - Hard
  - Very hard
- 10) How often do you use your computer?
- Every day
  - Every week
  - Sometimes

- Only when I have to check my mail

11) How often do you use social networking sites on the internet (Facebook, MSN messenger, etc)?

- Every day
- Every week
- Sometimes
- I hate social networking sites

12) If there is a social networking site which let you discuss what to wear with your friends (showing pictures of your clothes), do you think you would use it?

- Definitely
- Maybe
- I don't know
- No , never

13) If there is a program to help you find a suitable outfit, how likely is it that you would use it?

- Not at all
- Unlikely
- Very likely
- I don't know

14) If there is a program helping you manage your wardrobe, how likely is it that you would use it?

- Not at all
- Unlikely
- Very likely
- I don't know

Any suggestions or comments on the above questionnaire would be highly appreciated. Please write your comments in the box below.

## Appendix C

Name:                                      Height:                                      Size:                                      Hair colour:  
skin colour:

- 1) What type of jeans you normally wear?
  - 1.4 Skinny
  - 1.5 Boy friend
  - 1.6 High wasted flare
  
- 2) What type of tops you normally wear?
  - 2.1 Blouse
  - 2.2 T-shirt
  - 2.3 Polo neck
  
- 3) What type of trousers you normally wear?
  - 3.1 The peg
  - 3.2 The chino
  - 3.3 Capri pants
  - 3.4 Straight
  
- 4) What type of shoes you normally wear?
  - 4.1 Flats
  - 4.2 High heels
  - 4.3 Boots
  
- 5) What type of jacket you normally wear?
  - 5.1 The blazer
  - 5.2 Military coat
  - 5.3 The statement coat
  
- 6) What type of dress you normally wear?
  - 6.1 Shirt dress
  - 6.2 Maxi dress
  - 6.3 Pencil skirt

## **Appendix D**

- 1) Use the recommender system # 1 and get advice.
- 2) Use the recommender system # 2 and get recommendation or what to wear and what not to wear.
- 3) Now choose what you would like to wear.
- 4) At the end compare # 1, 2 and 3.

## **Appendix E**

- 1) How many tops have you bought in the last 6 months? What colour?
- 2) How many jeans have you bought in the last 6 months? What colour?
- 3) How many shoes have you bought in the last 6 months? What colour?
- 4) How much money do you usually spend on clothes, monthly?
- 5) What is your purpose in buying clothes? (ex: like it or need it)
- 6) How do you decide if the clothes suit you or not?
- 7) If there is a program (Recommender system) to help you find a suitable outfit, how likely is it that you would use it?

## Appendix F

Overall Reaction to the Website		1	2	3	4	5	6	7		NA
1. Overall, I am satisfied with how easy it is to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
2. It was simple to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
3. I can effectively complete my work using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
4. I am able to complete my work quickly using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
5. I am able to efficiently complete my work using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
6. I feel comfortable using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
7. It was easy to learn to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
8. I believe I became productive quickly using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
9. The website gives error messages that clearly tell me how to fix problems	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
10. Whenever I make a mistake using the website, I recover easily and quickly	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
11. The information (such as online help, on-page messages, and other documentation) provided with this website is clear	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
12. It is easy to find the information I need	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
13. The information provided by the website is easy to understand	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
14. The information is effective in helping me complete the tasks and scenarios	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
15. The organization of information on the website pages is clear	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
16. The interface of this website is pleasant	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
17. I like using the interface of this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
18. This website has all the functions and capabilities I expect it to have	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
19. Overall, I am satisfied with this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>



## Appendix G

pecification.html

---

// Form template

+ Auto-generated from graphical design (Page Header)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Dina</title>
```

+ Defining style of elements in the page (CSS)

```
<style type="text/css">
```

+ Body, paragraph and table cell delimiter styles

```
body, p, td{
font-family:Verdana;
font-size:8pt;
font-weight:normal;
margin: 0px;
}
```

+ Body background

```
body{background-color:transparent}
```

```
ul, ol, blockquote {
margin: 0px 0px 0px 40px;
padding: 0px;
}
```

```
ul {
list-style-type: disc;
}
```

+ Heading 1 style

```
h1{
font-family:Verdana;
font-size:14pt;
font-weight:bold;
color:#000000;
margin: 0px;
}
```

#### + Heading 2 style

```
h2{
font-family:Verdana;
font-size:10pt;
font-weight:bold;
color:#4e7e02;
margin: 0px;
}
```

#### + Heading 3 style

```
h3{
font-family:Verdana;
font-size:8pt;
font-weight:bold;
color:#000000;
margin: 0px;
}
```

#### + Heading 4 style

```
h4{
font-family:Verdana;
font-size:8pt;
font-weight:normal;
font-style:italic;
color:#000000;
margin: 0px;
}
```

```
pre{
margin: 0px;
}
```

#### + Hyperlinks style

```
a{
color:#4e7e02;
text-decoration:none;
}
```

#### + On mouse-hover over hyperlink style

```
a:hover{
color:#b2c791;
text-decoration:none;
}
```

#### + Menu style

```
.menu td a{
color:#FFFFFF;
font-size: 8pt;
text-decoration: none;
}
```

```
font-weight:bold;
}

.menu td a:hover{
color:#b2c791;
text-decoration: none;
}
-->
</style>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">

</head>
```

+ Body starts

```
<body style="background-color:transparent">
```

+ Form starts. Form posts the elements information to the Results.php page

```
<form name="form1" method="post" action="Results.php">
```

+ Form elements:

```
<table width="100%" border="0">
```

+ Persona radio group

```
<tr>
  <td width="10" valign="top"> <input type="radio" name="Persona" id="Persona1"
value="Persona1"></td>
  <td width="150" valign="top"><p><u><strong>Persona 1</strong></u></p>
  <p>Store/internet, Alone,(hard)</p></td>
  <td width="10" valign="top"> <input type="radio" name="Persona" id="Persona2"
value="Persona2"></td>
  <td width="150" valign="top"><p><u><strong>Persona 2</strong></u></p>
  <p>Store/internet, friends,(easy)</p></td>
  <td width="10" valign="top"> <input type="radio" name="Persona" id="Persona3"
value="Persona3"></td>
  <td width="150"
  valign="top"><p><u><strong>Persona 3</strong></u><strong><u>3</u></strong><u></u></p>
  <p>Hate shopping</p>
  <p>Store/internet, Alone,(don't care)</p></td>
  <td width="926" valign="top" >&nbsp;</td>
</tr>
</table>
```

```
<hr />
```

```
<table width="100%" border="0">
```

+ Size radio group

```
<tr>
  <td width="10px" valign="top">
    <input type="radio" name="Size" id="Size1" value="Size1">
```

```

        </td>
        <td width="100px" ><p><u><strong>
          <label> </label>
          Size 1</strong></u>&#13;</p>

      <p>8 - 10</p></td>

      <td width="10px" valign="top">
        <input type="radio" name="Size" id="Size2" value="Size2">
      </td>
      <td width="100px"><p><u><strong>
        <label> </label>

Size 2</strong></u></p>
      <p>12 - 14</p>
      <p></p></td>

      <td width="10px" valign="top">
        <input type="radio" name="Size" id="Size3" value="Size3">
      </td>
      <td width="100px"><p><u><strong>
        <label> </label>

Size 3</strong></u></p>
      <p>16 - 18</p></td>

    <td> </td>
  </tr>
</table>
<hr />
<table width="100%" border="0">
+ Body type radio group
  <tr>
    <td width="110px" align="center"></td>
    <td width="110px" align="center"></td>
    <td width="110px" align="center"></td>
    <td> </td>
  </tr>
  <tr>
    <td align="center"><input type="radio" name="Shape" id="Shape1" value="Shape1" /></td>
    <td align="center"><input type="radio" name="Shape" id="Shape2" value="Shape2" /></td>
    <td align="center"><input type="radio" name="Shape" id="Shape3" value="Shape3" /></td>
  </tr>
</table>
<hr />
<td align="right" align="right">
+ Submit button

```

```

        <input name="Submit" type="submit" id="submit" style="background:#9C0" value="What to
Wear" />
    </td>
</form>

</body>
</html>

```

Result.php

---

// Form analysis

```

<?
+ PHP Part starts
+ Receives the parameters which are posted from the form
$Persona = $_POST[Persona];
$Size = $_POST[Size];
$Shape = $_POST[Shape];

$Case = "Case0";
+ A case would be selected based on different cases and possible results
//-----
if ($Persona=='Persona1' && $Size=='Size1' && $Shape=='Shape1'):
    $Case = "Case1";
elseif ($Persona=='Persona1' && $Size=='Size2' && $Shape=='Shape2'):
    $Case = 'Case2';
elseif ($Persona=='Persona1' && $Size=='Size3' && $Shape=='Shape3'):
    $Case = 'Case3';
//-----
elseif ($Persona=='Persona2' && $Size=='Size1' && $Shape=='Shape1'):
    $Case = 'Case4';
elseif ($Persona=='Persona2' && $Size=='Size2' && $Shape=='Shape2'):
    $Case = 'Case5';
elseif ($Persona=='Persona2' && $Size=='Size3' && $Shape=='Shape3'):
    $Case = 'Case6';
//-----
elseif ($Persona=='Persona3' && $Size=='Size1' && $Shape=='Shape1'):
    $Case = 'Case7';
elseif ($Persona=='Persona3' && $Size=='Size2' && $Shape=='Shape2'):
    $Case = 'Case8';
elseif ($Persona=='Persona3' && $Size=='Size3' && $Shape=='Shape3'):
    $Case = 'Case9';
endif;
//-----

?>

```

+ Html part starts

+ Auto-generated from graphical design (Page Header)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">
<html xmlns="http://www.w3.org/1999/xhtml">
<head>
<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />
<title>Dina</title>
+ Page and elements style (CSS)
<style type="text/css">
```

```
body, p, td{
font-family:Verdana;
font-size:8pt;
font-weight:normal;
margin: 0px;
}
```

```
body{background-color:transparent}
```

```
ul, ol, blockquote {
margin: 0px 0px 0px 40px;
padding: 0px;
}
```

```
ul {
list-style-type: disc;
}
```

```
h1{
font-family:Verdana;
font-size:14pt;
font-weight:bold;
color:#000000;
margin: 0px;
}
```

```
h2{
font-family:Verdana;
font-size:10pt;
font-weight:bold;
color:#4e7e02;
margin: 0px;
}
```

```
h3{
font-family:Verdana;
font-size:8pt;
```

```
font-weight:bold;
color:#000000;
margin: 0px;
}
```

```
h4{
font-family:Verdana;
font-size:8pt;
font-weight:normal;
font-style:italic;
color:#000000;
margin: 0px;
}
```

```
pre{
margin: 0px;
}
```

```
a{
color:#4e7e02;
text-decoration:none;
}
```

```
a:hover{
color:#b2c791;
text-decoration:none;
}
```

```
.menu td a{
color:#FFFFFF;
font-size: 8pt;
text-decoration: none;
font-weight:bold;
}
```

```
.menu td a:hover{
color:#b2c791;
text-decoration: none;
}
```

```
</style>
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1">
```

```
</head>
```

```
+ Body starts
```

```
<body style="background-color:transparent">
<table width="100%" border="0">
```

#### + What to wear and what not to wear header and results

```
<tr>
  <th align="center" valign="top" width="50%" style="color:#363;"><p style="font-size:18px">What to
Wear</p>
  <hr/>
</th>
  <p>&nbsp;</p>
  <th align="center" valign="top" width="50%" style="color:#900;"><p style="font-size:18px">What
Not to Wear</p>
  <hr/>
</th>
</tr>
```

#### + No result case

```
<tr>
  <td style="display:none" id='WCase0' align="center" valign="top">No Result</td>
  <td style="display:none" id='NCase0' align="center" valign="top">No Result</td>
</tr>
```

#### + Case 1

```
<tr>
  <td style="display:none" id='WCase1' align="center" valign="top"><p> Jeans: skinny, straight </p>
  <p>Tops: polo neck ,blouse </p>
  <p>Shoesoes : high heels ,wedges</p></td>
  <td style="display:none" id='NCase1' align="center" valign="top"><p>Jeans: High waisted </p>
  <p>Tops : short T-shirt</p>
  <p>Shoesoes :flat shoes </p></td>
</tr>
```

#### + Case 2

```
<tr>
  <td style="display:none" id='WCase2' align="center" valign="top"><p>Jeans:peg </p>
  <p>Tops: t-shirt ,knitwear </p>
  <p>Shoes: High heels</p></td>
  <td style="display:none" id='NCase2' align="center" valign="top"><p>Jeans: High waisted</p>
  <p>Tops:t-shirt ,<u>&#13;</u></p>
  <p>Shoes: Mid heels </p></td>
</tr>
```

#### + Case 3

```
<tr>
  <td style="display:none" id='WCase3' align="center" valign="top"><p> Jeans: straight </p>
```



```

    <p>Tops: boyfriend style, knitwear</p>
    <p>Shoes: high heels</p></td>
    <td style="display:none" id='NCase3' align="center" valign="top"><p>Jeans:boyfriend-high waisted
</p>
    <p>Shoes: sport </p>
    <p>Tops: blouse&#13;</p></td>
</tr>

```

#### + Case 4

```

<tr>
    <td style="display:none" id='WCase4' align="center" valign="top"><p>Jeans: Skinny</p>
    <p>Tops:T-Shoesirt, boyfriend</p>
    <p>Shoes:high heels </p></td>
    <td style="display:none" id='NCase4' align="center" valign="top"><p>Jeans:high waisted</p>
    <p>Shoes: Flat ,&#13;</p>
    <p>Tops:Poloneck</p></td>
</tr>

```

#### + Case 5

```

<tr>
    <td style="display:none" id='WCase5' align="center" valign="top"><p>Jeans: Skinny,straight </p>
    <p>Tops:blouse,knitwear</p>
    <p>Shoes: flat,high heels </p></td>
    <td style="display:none" id='NCase5' align="center" valign="top"><p>Jeans:boyfriend style </p>
    <p>Shoes: mid heels &#13;</p>
    <p>Tops:waistcoat </p></td>
</tr>

```

#### + Case 6

```

<tr>
    <td style="display:none" id='WCase6' align="center" valign="top"><p>Jeans: Bootcut </p>
    <p>Tops:blouse </p>
    <p>Shoes: flat,high heels </p></td>
    <td style="display:none" id='NCase6' align="center" valign="top"><p>Jeans:skinnyĀ </p>
    <p>Shoes: Boots &#13;</p>
    Tops: T-shirt </td>
</tr>

```

#### + Case 7

```

<tr>
    <td style="display:none" id='WCase7' align="center" valign="top"><p> Jeans: Peg pants </p>
    <p>Top: blouse</p>
    <p>Shoes: high heels, long boots</p></td>
    <td style="display:none" id='NCase7' align="center" valign="top"><p>Jeans:boyfriend</p>

```

```

    <p>Shoes: Flat</p>
    <p>Top: skinnyblouse&#13;</p></td>
  </tr>

```

#### + Case 8

```

<tr>
  <td style="display:none" id='WCase8' align="center" valign="top"><p> Jeans: Chino</p>
    <p>Top: knitwear</p>
    <p>Shoes: wedges</p></td>
  <td style="display:none" id='NCase8' align="center" valign="top"><p>Jeans:high waisted </p>
    <p>Shoes: Mid heels </p>
    <p>Tops: blouse</p></td>
</tr>

```

#### + Case 9

```

<tr>
  <td style="display:none" id='WCase9' align="center" valign="top"><p> Jeans: capri pants </p>
    <p>Top: boyfriend style, waist coat</p>
    <p>Shoes: high heels,flat</p></td>
  <td style="display:none" id='NCase9' align="center" valign="top"><p>Jeans:peg, skinny</p>
    <p>Shoes: long boots</p>
    <p>Tops: T-shirt</p></td>
</tr>

```

```

</table>

```

```

// Javascript language

```

```

+ Display the selected case:

```

```

<script type="text/javascript">

```

```

+ Please note that all the 10 cases are generated, but they are hidden. These two lines appear only the
case which should be suggested.

```

```

document.getElementById('W<?=$Case?>').style.display='table-cell';
document.getElementById('N<?=$Case?>').style.display='table-cell';
</script>

```

```

</body>

```

```

</html>

```

// This is the index page  
+ Html part starts  
+ Auto-generated from graphical design (Page Header)

```
<html>  
<head>  
<title>Dina</title>
```

+ Page and Body style (CSS)  
<style type="text/css">

```
body, p, td{  
font-family:Verdana;  
font-size:8pt;  
font-weight:normal;  
color:#000000;  
margin: 0px;  
}
```

```
ul, ol, blockquote {  
margin: 0px 0px 0px 40px;  
padding: 0px;  
}
```

```
ul {  
list-style-type: disc;  
}
```

```
h1{  
font-family:Verdana;  
font-size:14pt;  
font-weight:bold;  
color:#000000;  
margin: 0px;  
}
```

```
h2{  
font-family:Verdana;  
font-size:10pt;  
font-weight:bold;  
color:#4e7e02;  
margin: 0px;  
}
```

```
h3{
font-family:Verdana;
font-size:8pt;
font-weight:bold;
color:#000000;
margin: 0px;
}
```

```
h4{
font-family:Verdana;
font-size:8pt;
font-weight:normal;
font-style:italic;
color:#000000;
margin: 0px;
}
```

```
pre{
margin: 0px;
}
```

```
a{
color:#4e7e02;
text-decoration:none;
}
```

```
a:hover{
color:#b2c791;
text-decoration:none;
}
```

```
.menu td a{
color:#FFFFFF;
font-size: 8pt;
text-decoration: none;
font-weight:bold;
}
```

```
.menu td a:hover{
color:#b2c791;
text-decoration: none;
}
```

```
</style>
```

```
<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1"></head>
```

```
<body style="background: #FFFFFF; margin: 0px">
```

```

<div id="maindiv1" align="center">
    <div id="maindiv2" style="width: 900px; position:relative ">
+ Auto-generated from graphical design (Main Page)

        <table id="maintable" style="position: relative; border-collapse: collapse "
width="900" cellpadding="0" cellspacing="0" align="center" border="0">
            <tbody>

                <tr>
                    <td height=45 valign="bottom">
                        <table style="right: 2px; position: absolute; top: 25px; border-collapse:
collapse" cellpadding="0" cellspacing="0" width="450" border="0">
                            <tbody>
                                <tr>
                                    <td valign="top" align="right">Dina Etebari &bull; 2010</td>
                                </tr>
                            </tbody>
                        </table>
                    </td>
                </tr>

                <tr>
                    <td valign="top">

                        <table style="border-collapse:collapse" width="900" cellpadding="0"
cellspacing="0" border="1" bordercolor="#000000">
                            <tr>
                                <td valign="top"><table style="border-collapse:collapse" width="100%"
cellpadding="0" cellspacing="0" border="0">
                                    <tbody>
                                        <tr>
                                            <td height="600" valign="top" style="background:
url(images/Back.jpg)"><table width="100%" height="574" border="0">
                                                <tr>
                                                    <td height="180">&nbsp;</td>
                                                </tr>
                                                <tr>
                                                    <td height="388" valign="top"><table hei width="100%" border="0">
                                                        <tr>
                                                            <td width="3%" height="384" >&nbsp;</td>
                                                            <td width="62%" style="background:#FFF; padding: 20px; vertical-
align:top">
+ iFrame, a page inside the index page. This is used to keep the style of website unique in all the pages.
Other pages are mainly being load in this iFrame.

                                                        </td>
                                                        <td width="35%" height="384" style="background:#FFF; padding: 20px; vertical-
align:top">
+ iFrame, a page inside the index page. This is used to keep the style of website unique in all the pages.
Other pages are mainly being load in this iFrame.
                                                        </td>
                                                    </tr>
                                                </table>
                                            </td>
                                        </tr>
                                    </tbody>
                                </table>
                            </td>
                        </tr>
                    </td>
                </tr>
            </tbody>
        </table>
    </div>
</div>

<iframe width="508px" height="340px" src ="Specifications.html" id='Frame1'
    name="Frame1" frameborder="0" scrolling="no" allowtransparency="true">
</iframe>

```

```

        </td>
        <td width="35%" >&nbsp;</td>
            </tr>
            </table></td>
        </tr>
        </table>

        <tr>
        </tbody>
    </table>

    </td>

        </tr>
        </table></td>
    </tr>

    </tbody>
    </table>

    </div>
</div>
</body>
</html>

```

<p>&nbsp;</p></td>

## Appendix H

+ Auto-generated from graphical design (Page Header)

```
<html>
```

```
<head>
```

```
<title>Dina</title>
```

+ Body style (CSS)

```
<style type="text/css">
```

```
body, p, td{
```

```
font-family:Verdana;
```

```
font-size:8pt;
```

```
font-weight:normal;
```

```
color:#FFFFFF;
```

```
margin: 0px;
```

```
}
```

```
ul, ol, blockquote {
```

```
margin: 0px 0px 0px 40px;
```

```
padding: 0px;
```

```
}
```

```
ul {
```

```
list-style-type: disc;
```

```
}
```

```
h1{
```

```
font-family:Verdana;
```

```
font-size:14pt;
```

```
font-weight:bold;

color:#FFFFFF;

margin: 0px;

}

h2{

font-family:Verdana;

font-size:10pt;

font-weight:bold;

color:#4e7e02;

margin: 0px;

}

h3{

font-family:Verdana;

font-size:8pt;

font-weight:bold;

color:#FFFFFF;

margin: 0px;

}

h4{

font-family:Verdana;

font-size:8pt;

font-weight:normal;

font-style:italic;

color:#FFFFFF;

margin: 0px;
```



```
}

pre{
margin: 0px;
}

a{
color:#4e7e02;
text-decoration:none;
}

a:hover{
color:#b2c791;
text-decoration:none;
}

.menu td a{
color:#FFFFFF;
font-size: 8pt;
text-decoration: none;
font-weight:bold;
}

.menu td a:hover{
color:#b2c791;
text-decoration: none;
}

</style>

<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-1"></head>
```

+ Html body starts

```
<body style="background: #000; margin: 0px">

  <div id="maindiv1" align="center">

    <div id="maindiv2" style="width: 900px; position:relative ">

      <table id="maintable" style="position: relative; border-collapse: collapse "
width="900" cellpadding="0" cellspacing="0" align="center" border="0">

        <tbody>

          <tr>

            <td height=45 valign="bottom">

              <table style="right: 2px; position: absolute; top: 25px; border-collapse:
collapse" cellpadding="0" cellspacing="0" width="450" border="0">

                <tbody>

                  <tr>

                    <td valign="top" align="right">Dina Etebari &bull; 2010</td>

                  </tr>

                </tbody>

              </table>

            </td>

          </tr>

          <tr>

            <td valign="top">

              <table style="border-collapse:collapse" width="900" cellpadding="0"
cellspacing="0" border="1" bordercolor="#000000">

                <tr>

                  <td valign="top"><table style="border-collapse:collapse" width="100%"
cellpadding="0" cellspacing="0" border="0">
```

```

        <tbody>

        <tr>

            <td valign="top" style="background: url(images/page%201.png); width:
200px"><table width="100%" height="100%" border="0">

                <tr>

                    <td height="20px"></td>

                </tr>

                <tr>

                    <td height="65">

```

```

<table width="100%" border="0">

```

+ Login form with username and password fields

This form sends the username and password which user enters to the CheckUser.php page, where they are analysed and checked with the database.

```

    <form id="form1" name="form1" method="POST" action="CheckUser.php">

```

+ Username

```

        <tr>

            <td width="285" >&nbsp;</td>

            <td width="246" style="color:#CC3"></td>

            <td width="71" style="color:#CC3">Username:</td>

            <td width="153" style="color:#CC3">

```

```

<input name="Username" type="text" id="Username" />

```

</td>

#### + Password

<td width="13">&nbsp;</td>

</tr>

<tr>

<td >&nbsp;</td>

<td style="color:#CC3"></td>

<td style="color:#CC3">Password:

<label for="textfield"></label></td>

<td style="color:#CC3"><input name="Password" type="password"  
id="Password" /></td>

<td>&nbsp;</td>

</tr>

<tr>

<td height="42" >&nbsp;</td>

<td style="color:#CC3"></td>

<td style="color:#CC3"></td>

<td style="color:#CC3"><input type="submit" name="submit"  
id="Login" value="&nbsp;Login&nbsp;" />

#### + Submit button

<input type="button" name="submit2" id="Signup" value="Sign  
Up" onclick="window.location = 'w2.html'"/>

</td>

<td>&nbsp;</td>

</tr>

</form>

</table>

</td>

</tr>

<tr>

<td valign="top"><table height="300px" width="100%" border="0">

<tr>

<td width="3%">&nbsp;</td>

<td width="62%" style="">&nbsp;</td>

<td width="35%">&nbsp;</td>

</tr>

</table>

</td>

</table>

<p>&nbsp;</p></td>

</tr>

</tbody>

</table>

</td>

</tr>

```

        </table></td>

    </tr>

    <td style="text-align:center">

+ Site info

    <a href="w3.html"><span style="color:#FFF; font-size:12px; text-align: center;">About Intelligent
Wardrobe</span></a>

    </td>

    </tbody>

</body>

</html>

```

## Appendix I

```
<?php
// PHP code, authorizing access to the users.

+ Database connection
$con =
mysql_connect("mhzolfaghari.com.mysql","mhzolfaghari_co","58RsJhpn");
if (!$con)
{
    die('Could not connect: ' . mysql_error());
}

+ Database name
mysql_select_db("mhzolfaghari_co", $con);

+ Receives username and password, entered by user in the login page
$username = $_REQUEST['Username'];
$password = $_REQUEST['Password'];

+ Initializing the parameter
$user->Name = "Login Failed!";
$user->Photo = "Unknown";

+ Select query: reads everything from users table, where username is the one which user entered
$query = "SELECT * FROM Users WHERE Username='".$username."' LIMIT 1";
$result = mysql_query($query);

+ Retrieve the query result
if($row = mysql_fetch_array($result)):
    $user->Password = $row['Password'];

+ Checking the password
    if ($password == $user->Password)
    {
+If the password is correct, fill the User array with his/her information:
        $user->Name = $row['Name'];
        $user->Family = $row['Family'];
        $user->Username = $row['Username'];
        $user->Size = $row['Size'];
        $user->Height = $row['Height'];
        $user->HairColour = $row['HairColour'];
        $user->Personas = $row['Personas'];
        $user->Age = $row['Age'];
        $user->Gender = $row['Gender'];
        $user->Photo = $row['Photo'];
        if (strlen($user->Photo) < 3)
        {
            $user->Photo = "Unknown";
        }
    }
else
{
```

#### + Else login fails

```
        $User->Name = "Login Failed!";  
    }  
endif;
```

#### + Closing the connection to database

```
mysql_close($con);  
?>
```

#### // HTML part starts – Showing the user's information

#### + Auto-generated from graphical design (Page Header)

```
<html>  
<head>  
<title>Dina</title>
```

#### + Page style (CSS)

```
<style type="text/css">
```

```
body, p, td{  
font-family:Verdana;  
font-size:8pt;  
font-weight:normal;  
color:#FFFFFF;  
margin: 0px;  
}
```

```
ul, ol, blockquote {  
margin: 0px 0px 0px 40px;  
padding: 0px;  
}
```

```
ul {  
list-style-type: disc;  
}
```

```
h1{  
font-family:Verdana;  
font-size:14pt;  
font-weight:bold;  
color:#FFFFFF;  
margin: 0px;  
}
```



```

h2{
font-family:Verdana;
font-size:10pt;
font-weight:bold;
color:#4e7e02;
margin: 0px;
}

h3{
font-family:Verdana;
font-size:8pt;
font-weight:bold;
color:#FFFFFF;
margin: 0px;
}

h4{
font-family:Verdana;
font-size:8pt;
font-weight:normal;
font-style:italic;
color:#FFFFFF;
margin: 0px;
}

pre{
margin: 0px;
}

a{
color:#4e7e02;
text-decoration:none;
}

a:hover{
color:#b2c791;
text-decoration:none;
}

.menu td a{
color:#FFFFFF;
font-size: 8pt;
text-decoration: none;
font-weight:bold;
}

.menu td a:hover{
color:#b2c791;
text-decoration: none;
}

```

```

#maindiv1 #maindiv2 #maintable tbody tr td table tr td table tbody tr
td table tr td table tr td table tr td img {
    text-align: center;
}
</style>

<meta http-equiv="Content-Type" content="text/html; charset=iso-8859-
1"></head>

<body style="background: #000; margin: 0px">
    <div id="maindiv1" align="center">
        <div id="maindiv2" style="width: 900px; position:relative
">

            <table id="maintable" style="position: relative;
border-collapse: collapse " width="900" cellpadding="0"
cellspacing="0" align="center" border="0">
                <tbody>

                    <tr>
                        <td height=45 valign="bottom">
                            <table style="right: 2px; position: absolute;
top: 25px; border-collapse: collapse" cellpadding="0" cellspacing="0"
width="450" border="0">
                                <tbody>
                                    <tr>
                                        <td valign="top" align="right">Dina Etebari
&bull; 2010</td>
                                    </tr>
                                </tbody>
                            </table>
                        </td>
                    </tr>

                    <tr>
                        <td valign="top">

                            <table style="border-collapse:collapse"
width="900" cellpadding="0" cellspacing="0" border="1"
bordercolor="#000000">
                                <tr>
                                    <td valign="top"><table style="border-
collapse:collapse" width="100%" cellpadding="0" cellspacing="0"
border="0">
                                        <tbody>
                                            <tr>
                                                <td valign="top" ><table width="100%"
height="574" border="0">
                                                    <tr>
                                                        <td height="20px"></td>
                                                    </tr>
                                                <tr>

```

```
<td height="65">
```

+ Table which contains user's information. Variables are from PHP.

```
<table width="100%" border="0">

    <tr>
        <td width="200" >&nbsp;</td>
        <td width="680" style="color:#CC3"></td>
    </tr>
    <tr>
        <td ><p></p>

        <table width="200" border="10">
            <tr>
                <td>Name</td>
                <td width="91"><?=$User-
>Name?></td>

            </tr>
            <tr>
                <td>Family</td>
                <td><?=$User->Family?></td>
            </tr>
            <tr>
                <td>Age</td>
                <td><?=$User->Age?></td>
            </tr>
            <tr>
                <td>Gender</td>
                <td><?=$User->Gender?></td>
            </tr>
            <tr>
                <td>Personas</td>
                <td><?=$User->Personas?></td>
            </tr>
            <tr>
                <td>Height</td>
                <td><?=$User->Height?></td>
            </tr>
            <tr>
                <td>Size</td>
                <td><?=$User->Size?></td>
            </tr>
            <tr>
                <td>Hair Colour</td>
                <td><?=$User->HairColour?></td>
            </tr>
        </table>
        <p>&nbsp;</p></td>
```

### + Three choices for user: Get advice, Update wardrobe and speak to friends

```

<td style="color:#CC3"><table width="100%" border="0">
    <tr>
        <td style="text-align:
center">&nbsp;</td>
    </tr>
    <tr>
        <td style="text-align: center"><p><a
href="index1.html"></a></p>
            <p>&nbsp;</p></td>
        </tr>
        <tr>
            <td style="text-align: center"><p><a
href="w8.html"></a></p>
                <p>&nbsp;</p></td>
            </tr>
            <tr>
                <td style="text-align: center"><a
href="w11.html"></a></td>
            </tr>
            <tr>
                <td style="text-align:
center">&nbsp;</td>
            </tr>
        </table></td>
    </tr>
</table>
</td>
</tr>
</tbody>
</table>
</td>
</tr>
</table></td>
</tr>
</tbody>
</table>

```

```
        </div>
    </div>
</body>
</html>
```

## Appendix J

// HTML – Wardrobe

+ Auto-generated from graphical design (Page Header)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">

<html xmlns="http://www.w3.org/1999/xhtml">

<head>

<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />

<title>Untitled Document</title>
```

+Page style (CSS)

```
<style type="text/css">

body,td,th {

    font-size: 24px;

    color: #666;

}

body {

    background-image: url(Photographs-in-Web-Design-cover.jpg);

    background-repeat: no-repeat;

}

</style>

</head>
```

+ Body starts

```
<body>

<p>ROOM 2 (WARDROBE)</p>

<p>&nbsp;</p>

<p><strong>What would you like to do ?
```

```
</strong></p>
```

```
<p>&nbsp;</p>
```

+ Form for three choices

```
<form id="form1" name="form1" method="post" action="">
```

```
<p>&nbsp;</p>
```

```
<p>&nbsp;</p>
```

```
<blockquote>
```

```
<p>
```

+ Three button for three choices

```
<input type="submit" name="button" id="button" value="UPDATE CLOTHES " />
```

```
<input type="submit" name="button4" id="button4" value="MIX AND MATCH " />
```

```
<input type="submit" name="button5" id="button5" value="DRESS MANNEQUIN" />
```

```
</p>
```

```
</blockquote>
```

```
</blockquote>
```

```
<p>&nbsp;</p>
```

```
<blockquote>
```

```
<p>&nbsp;</p>
```

```
</blockquote>
```

```
</blockquote>
```

```
</form>
```

```
<p>&nbsp;</p>
```

```
</body>
```

```
</html>
```

## Appendix K → Repetitive (exactly same as previous one)

```
<!DOCTYPE html PUBLIC "-//W3C//DTD XHTML 1.0 Transitional//EN"
"http://www.w3.org/TR/xhtml1/DTD/xhtml1-transitional.dtd">

<html xmlns="http://www.w3.org/1999/xhtml">

<head>

<meta http-equiv="Content-Type" content="text/html; charset=utf-8" />

<title>Untitled Document</title>

<style type="text/css">

body,td,th {

    font-size: 24px;

    color: #666;

}

body {

    background-image: url(Photographs-in-Web-Design-cover.jpg);

    background-repeat: no-repeat;

}

</style>

</head>

<body>

<p>ROOM 2 (WARDROBE)</p>

<p>&nbsp;</p>

<p><strong>What would you like to do ?</strong></p>

<p>&nbsp;</p>
```



```
<form id="form1" name="form1" method="post" action="">

<p>&nbsp;</p>

<p>&nbsp;</p>

  <blockquote>

    <p>

      <input type="submit" name="button" id="button" value="UPDATE CLOTHES  " />

      <input type="submit" name="button4" id="button4" value="MIX AND MATCH " />

      <input type="submit" name="button5" id="button5" value="DRESS MANNEQUIN" />

    </p>

    <p>&nbsp;</p>

  </blockquote>

</form>

<p>&nbsp;</p>

</body>

</html>
```

## Appendix L

	Maria	Female	②
	1) 5, all black		
	2) 2, blue		
	3) 4, black and white		
	4) £150-£200		
	5) usually out of need		
	6) I usually try them on		
	7) it will be great as I will make it easy for me to shop. I will prefer it over going to the shops.		
	(Appendix A, E)		

Robert

Male

③

1. ~~35~~ 35 white, blue, red, orange, yellow, pink, green, black
2. 10 blue, washed-out blue
3. 5 brown, white, red
4. \$600
5. Compulsive shopper
6. I usually impulse buy what I like
7. Definitely. I'd love to have something to allow me to plan my outfits and see what works with ~~the~~ other items in my closet.

(Appendix A, E)

## Appendix M (example for persona 1 and 2)

22

Name: Nana(Roxy) Gender: Female

- 1) How often do you shop for clothing?
  - More than once a week
  - Once a week
  - Once a month ☒
  - I don't like to shop
- 2) How do you prefer to shop?
  - Internet (online )
  - Shops ☒
  - Catalogue
  - TV (shopping channel)
- 3) How do you prefer to shop?
  - Alone ☒
  - With friends
  - With a shopping advisor
  - I don't like to shop
- 4) Why do you go shopping with your friends?
  - Opinion ☒
  - Fun
  - Advice
  - I don't like to go shopping with my friends
- 5) How long does your shopping take?
  - More than one hour
  - A whole day
  - Less than one hour
  - As long as it takes ☒
- 6) How do you manage your closet?
  - Style basis ☒
  - By colour scheme
  - By occasion
  - Randomly

40

- 7) How many items of clothing do you have?
- Between 10 to 30
  - Between 30 to 50
  - Between 50 to 100
  - More than 100 X
- 8) How often do you discuss what to wear with your friends?
- All the time
  - Most of the time
  - Sometimes X
  - Never
- 9) How easy it is for you to choose an outfit?
- Very easy
  - Easy X
  - Hard X
  - Very hard
- 10) How often do you use your computer?
- Every day X
  - Every week
  - Sometimes
  - Only when I have to check my mail
- 11) How often do you use social networking sites on the internet (Facebook, MSN messenger, etc)?
- Every day X
  - Every week
  - Sometimes
  - I hate social networking sites
- 12) If there is a social networking site which let you discuss what to wear with your friends (showing pictures of your clothes), do you think you would use it?
- Definitely
  - Maybe
  - I don't know X
  - No, never
- 13) If there is a program to help you find a suitable outfit, how likely is it that you would use it?
- Not at all
  - Unlikely X
  - Very likely
  - I don't know



14) If there is a program helping you manage your closet, how likely is it that you would use it?

- Not at all
- Unlikely
- Very likely
- I don't know X

Any suggestions or comments on the above questionnaire would be highly appreciated. Please write your comments in the box below.

shopping habits depend on a person's mood;  
therefore some answers might vary given  
different circumstances.

5?

Name: *Monir*

Gender: *female*

1) How often do you shop?

- More than once a week
- Once a week
- ✓ ▪ Once a month (*more than once a month*)
- I don't like to shop

2) How do you prefer to shop?

- Internet (online )
- ✓ ▪ Shops
- Catalogue
- TV (shopping channel)

3) How do you manage your closet?

- Style basis
- ✓ ▪ By colour scheme
- By occasion
- Just randomly

4) How often do you discuss what to wear with your friends?

- All the time
- Most of the time
- ✓ ▪ Sometimes
- Never

5) How easy it is for you to choose an outfit?

- Very easy
- ✓ ▪ Easy
- ✓ ▪ Hard
- Very hard

6) How often do you use your computer?

- ✓ ▪ Every day
- Every week
- Sometimes
- Only when I have to check my mail

6



7) How often do you use social networking sites on the internet (Facebook, MSN messenger, etc)?

- ☐ Every day
- ☒ Every week
- ☐ Sometimes
- ☐ I hate social networking sites

8) If there is a social networking site which let you discuss what to wear with your friends (showing pictures of your clothes), do you think you would use it?

- ☐ Definitely
- ☐ Maybe
- ☒ I don't know
- ☐ No, never

9) If there is a program to help you find a suitable outfit, how likely is it that you would use it?

- ☐ Not at all
- ☒ Unlikely
- ☐ Very likely
- ☐ I don't know

10) If there is a program helping you manage your closet, how likely is it that you would use it?

- ☐ Not at all
- ☐ Unlikely
- ☒ Very likely
- ☐ I don't know

Any suggestions or comments on the above questionnaire would be highly appreciated. Please write your comments in the box below.

my suggestion is , that you better do something about the prices and quality.

⑪ fun

⑫ with friends

⑬ whole day

⑭ more than 100



(Persona 3, 4)

22

Name: Tara kangarlu Gender: female

1) How often do you shop for clothing?

- More than once a week ✓
- Once a week
- Once a month
- I don't like to shop

2) How do you prefer to shop?

- Internet (online )
- Shops ✓
- Catalogue
- TV (shopping channel)

3) How do you prefer to shop? Sometimes alone, sometimes with friends.

- Alone ✓
- With friends ✓
- With a shopping advisor
- I don't like to shop

4) Why do you go shopping with your friends?

- Opinion
- Fun ✓
- Advice
- I don't like to go shopping with my friends

5) How long does your shopping take?

- More than one hour
- A whole day
- Less than one hour
- As long as it takes ✓

6) How do you manage your closet?

- Style basis ✓
- By colour scheme ✓
- By occasion ✓
- Randomly

25

7) How many items of clothing do you have?

- Between 10 to 30
- Between 30 to 50
- Between 50 to 100
- More than 100 ✓

8) How often do you discuss what to wear with your friends?

- All the time ✓
- Most of the time
- Sometimes
- Never

9) How easy it is for you to choose an outfit?

- Very easy ✓
- Easy
- Hard
- Very hard

10) How often do you use your computer?

- Every day ✓
- Every week
- Sometimes
- Only when I have to check my mail

11) How often do you use social networking sites on the internet (Facebook, MSN messenger, etc)?

- Every day ✓
- Every week
- Sometimes
- I hate social networking sites

12) If there is a social networking site which let you discuss what to wear with your friends (showing pictures of your clothes), do you think you would use it?

- Definitely
- Maybe ✓
- I don't know
- No, never

13) If there is a program to help you find a suitable outfit, how likely is it that you would use it?

- Not at all
- Unlikely ✓
- Very likely
- I don't know

14) If there is a program helping you manage your closet, how likely is it that you would use it?

- Not at all
- Unlikely
- Very likely
- I don't know ✓

Any suggestions or comments on the above questionnaire would be highly appreciated. Please write your comments in the box below.

The program might be helpful, except that I have personally worked in the fashion industry and trust my own judgment; yet for others who are less confident in what they do, the program could be of great help.

Name: Tara emrani

Gender: female

1) How often do you shop for clothing?

- More than once a week
- Once a week ✓
- Once a month
- I don't like to shop

2) How do you prefer to shop?

- Internet (online )
- Shops ✓
- Catalogue
- TV (shopping channel)

3) How do you prefer to shop?

- Alone
- With friends ✓
- With a shopping advisor
- I don't like to shop

4) Why do you go shopping with your friends?

- Opinion ✓
- Fun ✓
- Advice ✓
- I don't like to go shopping with my friends

5) How long does your shopping take?

- More than one hour
- A whole day ✓
- Less than one hour
- As long as it takes

6) How do you manage your closet?

- Style basis ✓
- By colour scheme
- By occasion
- Randomly

- 7) How many items of clothing do you have?
- Between 10 to 30
  - Between 30 to 50
  - Between 50 to 100
  - More than 100 ✓
- 8) How often do you discuss what to wear with your friends?
- All the time
  - Most of the time ✓
  - Sometimes
  - Never
- 9) How easy it is for you to choose an outfit?
- Very easy
  - Easy
  - Hard ✓
  - Very hard
- 10) How often do you use your computer?
- Every day ✓
  - Every week
  - Sometimes
  - Only when I have to check my mail
- 11) How often do you use social networking sites on the internet (Facebook, MSN messenger, etc)?
- Every day ✓
  - Every week
  - Sometimes
  - I hate social networking sites
- 12) If there is a social networking site which let you discuss what to wear with your friends (showing pictures of your clothes), do you think you would use it?
- Definitely
  - Maybe
  - I don't know ✓
  - No , never
- 13) If there is a program to help you find a suitable outfit, how likely is it that you would use it?
- Not at all
  - Unlikely
  - Very likely ✓
  - I don't know

14) If there is a program helping you manage your closet, how likely is it that you would use it?

- Not at all
- Unlikely
- Very likely ✓
- I don't know

Any suggestions or comments on the above questionnaire would be highly appreciated. Please write your comments in the box below.

The questions were simple, clear and easy to answer .

Name: Kimia

Gender: female

1) How often do you shop for clothing?

- More than once a week
- Once a week ✓
- Once a month
- I don't like to shop

2) How do you prefer to shop?

- Internet (online )
- Shops ✓
- Catalogue
- TV (shopping channel)

3) How do you prefer to shop?

- Alone
- With friends ✓
- With a shopping advisor
- I don't like to shop

4) Why do you go shopping with your friends?

- Opinion
- Fun ✓
- Advice
- I don't like to go shopping with my friends

5) How long does your shopping take?

- More than one hour
- A whole day
- Less than one hour
- As long as it takes ✓

6) How do you manage your closet?

- Style basis
- By colour scheme
- By occasion
- Randomly ✓

- 7) How many items of clothing do you have?
- Between 10 to 30
  - Between 30 to 50
  - Between 50 to 100 ✓
  - More than 100
- 8) How often do you discuss what to wear with your friends?
- All the time
  - Most of the time ✓
  - Sometimes
  - Never
- 9) How easy it is for you to choose an outfit?
- Very easy
  - Easy
  - Hard ✓
  - Very hard
- 10) How often do you use your computer?
- Every day ✓
  - Every week
  - Sometimes
  - Only when I have to check my mail
- 11) How often do you use social networking sites on the internet (Facebook, MSN messenger, etc)?
- Every day ✓
  - Every week
  - Sometimes
  - I hate social networking sites
- 12) If there is a social networking site which let you discuss what to wear with your friends (showing pictures of your clothes), do you think you would use it?
- Definitely
  - Maybe
  - I don't know ✓
  - No, never
- 13) If there is a program to help you find a suitable outfit, how likely is it that you would use it?
- Not at all
  - Unlikely
  - Very likely ✓
  - I don't know



14) If there is a program helping you manage your closet, how likely is it that you would use it?

- Not at all
- Unlikely ✓
- Very likely
- I don't know

Any suggestions or comments on the above questionnaire would be highly appreciated. Please write your comments in the box below.

I definitely check shopping websites every week and sometimes i purchase. I'm more like a browser and also I don't trust buying from many websites apart from few, e.g Asos and NET-A-PORTER

Name: *Masal*

Gender: *Female*

1) How often do you shop?

- More than once a week ✓
- Once a week
- Once a month
- I don't like to shop

2) How do you prefer to shop?

- Internet (online) ✓
- Shops ✓
- Catalogue
- TV (shopping channel)

3) How do you manage your closet?

- Style basis
- By colour scheme ✓
- By occasion
- Just randomly

4) How often do you discuss what to wear with your friends?

- All the time
- Most of the time ✓
- Sometimes
- Never

5) How easy it is for you to choose an outfit?

- Very easy
- Easy
- Hard ✓
- Very hard

6) How often do you use your computer?

- Every day
- Every week ✓
- Sometimes
- Only when I have to check my mail

7) How often do you use social networking sites on the internet (Facebook, MSN messenger, etc)?

- Every day
- Every week
- Sometimes ✓
- I hate social networking sites

8) If there is a social networking site which let you discuss what to wear with your friends (showing pictures of your clothes), do you think you would use it?

- Definitely
- Maybe ✓
- I don't know
- No , never

9) If there is a program to help you find a suitable outfit, how likely is it that you would use it?

- Not at all



- Unlikely
- Very likely ✓
- I don't know

10) If there is a program helping you manage your closet, how likely is it that you would use it?

- Not at all
- Unlikely
- Very likely ✓
- I don't know

Any suggestions or comments on the above questionnaire would be highly appreciated. Please write your comments in the box below.

My most important concern is to be able to manage my closet and find what I need. Also if there is a program which can help me choose an outfit for example by style or colour it will be great.

- ⑪ 2
- ⑫ 2
- ⑬ 2
- ⑭ 4

(Persona 5, 6)

25

Name: ~~Adam~~ ~~Adam~~

Gender: male

1) How often do you shop for clothing?

- ☐ More than once a week
- ☒ Once a week
- ☐ Once a month
- ☐ I don't like to shop

2) How do you prefer to shop?

- ☐ Internet (online )
- ☒ Shops
- ☐ Catalogue
- ☐ TV (shopping channel)

3) How do you prefer to shop?

- ☒ Alone
- ☐ With friends
- ☐ With a shopping advisor
- ☐ I don't like to shop

4) Why do you go shopping with your friends?

- ☐ Opinion
- ☒ Fun
- ☐ Advice
- ☐ I don't like to go shopping with my friends

5) How long does your shopping take?

- ☐ More than one hour
- ☐ A whole day
- ☐ Less than one hour
- ☒ As long as it takes

6) How do you manage your closet?

- ☒ Style basis
- ☐ By colour scheme
- ☐ By occasion
- ☐ Randomly

24



7) How many items of clothing do you have?

- ☐ Between 10 to 30
- ☒ Between 30 to 50
- ☐ Between 50 to 100
- ☐ More than 100

8) How often do you discuss what to wear with your friends?

- ☐ All the time
- ☐ Most of the time
- ☒ Sometimes
- ☐ Never

9) How easy it is for you to choose an outfit?

- ☐ Very easy
- ☒ Easy
- ☐ Hard
- ☐ Very hard

10) How often do you use your computer?

- ☐ Every day
- ☐ Every week
- ☐ Sometimes
- ☐ Only when I have to check my mail

11) How often do you use social networking sites on the internet (Facebook, MSN messenger, etc)?

- ☐ Every day
- ☐ Every week
- ☐ Sometimes
- ☐ I hate social networking sites

12) If there is a social networking site which let you discuss what to wear with your friends (showing pictures of your clothes), do you think you would use it?

- ☐ Definitely
- ☐ Maybe
- ☐ I don't know
- ☒ No, never

13) If there is a program to help you find a suitable outfit, how likely is it that you would use it?

- ☐ Not at all
- ☒ Unlikely
- ☐ Very likely
- ☐ I don't know

14) If there is a program helping you manage your closet, how likely is that you would use it?

- ☐ Not at all
- ☒ Unlikely
- ☐ Very likely
- ☐ I don't know

Name: *Saeed*Gender: *Male*

- 1) How often do you shop for clothing?
  - More than once a week
  - Once a week
  - ✓ Once a month
  - I don't like to shop
- 2) How do you prefer to shop?
  - Internet (online )
  - ✓ Shops
  - Catalogue
  - TV (shopping channel)
- 3) How do you manage your closet?
  - Style basis
  - By colour scheme
  - By occasion
  - ✓ Randomly
- 4) How often do you discuss what to wear with your friends?
  - All the time
  - Most of the time
  - ✓ Sometimes
  - Never
- 5) How easy it is for you to choose an outfit?
  - Very easy
  - Easy
  - ✓ Hard
  - Very hard
- 6) How often do you use your computer?
  - ✓ Every day
  - Weekly
  - Sometimes
  - Only when I have to check my mail

- 7) How often do you use social networking sites on the internet (Facebook, MSN messenger, etc)?
- ☐ Every day
  - ☒ Weekly
  - ☐ Sometimes
  - ☐ I hate social networking sites
- 8) If there is a social networking site which let you discuss what to wear with your friends (showing pictures of your clothes), do you think you would use it?
- ☒ Definitely
  - ☐ Maybe
  - ☐ I don't know
  - ☐ No, never
- 9) If there is a program to help you find a suitable outfit, how likely is it that you would use it?
- ☐ Not at all
  - ☐ Unlikely
  - ☒ Very likely
  - ☐ I don't know
- 10) If there is a program helping you manage your closet, how likely is it that you would use it?
- ☒ Not at all
  - ☐ Unlikely
  - ☐ Very likely
  - ☐ I don't know

Any suggestions or comments on the above questionnaire would be highly appreciated. Please write your comments in the box below.

I would love to have software which can simulate my body type and I could easily change the clothes and different colours on the model and see which one is most suite me.

- ⑪ 1  
⑫ 2  
⑬ 4  
⑭ 3



**(Persona 7)**

5?

Name: Mossi

Gender: male

- 1) How often do you shop for clothing?
  - More than once a week
  - Once a week
  - Once a month
  - ☒ I don't like to shop
- 2) How do you prefer to shop?
  - Internet (online )
  - ☒ Shops
  - Catalogue
  - TV (shopping channel)
- 3) How do you manage your closet?
  - Style basis
  - By colour scheme
  - By occasion
  - ☒ Randomly
- 4) How often do you discuss what to wear with your friends?
  - All the time
  - Most of the time
  - ☒ Sometimes
  - Never
- 5) How easy it is for you to choose an outfit?
  - Very easy
  - ☒ Easy
  - Hard
  - Very hard
- 6) How often do you use your computer?
  - ☒ Every day
  - Weekly
  - Sometimes
  - Only when I have to check my mail

5

7) How often do you use social networking sites on the internet (Facebook, MSN messenger, etc)?

- ☒ Every day
- ☐ Weekly
- ☐ Sometimes
- ☐ I hate social networking sites

8) If there is a social networking site which let you discuss what to wear with your friends (showing pictures of your clothes), do you think you would use it?

- ☐ Definitely
- ☐ Maybe
- ☐ I don't know
- ☒ No, never

9) If there is a program to help you find a suitable outfit, how likely is it that you would use it?

- ☐ Not at all
- ☐ Unlikely
- ☐ Very likely
- ☒ I don't know

10) If there is a program helping you manage your closet, how likely is it that you would use it?

- ☐ Not at all
- ☐ Unlikely
- ☒ Very likely
- ☐ I don't know

Any suggestions or comments on the above questionnaire would be highly appreciated. Please write your comments in the box below.

I prefer the system give me information about of varieties of choice in different shops in regards to models and prices, if I will be looking for specific item then the system inform me about different shops that I can get my requirement. -when the system has been introduced and used to and by me, people then you can enrol some shops with membership fee to introduce those shops to your customer.

- 11) 4
- 12) 4
- 13) 4
- 14) 4

Name: Bruno

Gender: Male

- 1) How often do you shop for clothing?
  - More than once a week
  - Once a week
  - Once a month
  - ☒ I don't like to shop
- 2) How do you prefer to shop?
  - Internet (online )
  - ☒ Shops
  - Catalogue
  - TV (shopping channel)
- 3) How do you prefer to shop?
  - Alone
  - With friends
  - With a shopping advisor
  - ☒ I don't like to shop
- 4) Why do you go shopping with your friends?
  - Opinion
  - Fun
  - Advice
  - ☒ I don't like to go shopping with my friends
- 5) How long does your shopping take?
  - More than one hour
  - A whole day
  - ☒ Less than one hour
  - As long as it takes
- 6) How do you manage your closet?
  - Style basis
  - By colour scheme
  - By occasion
  - ☒ Randomly

12/10



7) How many items of clothing do you have?

- ☒ Between 10 to 30
- ☒ Between 30 to 50
- ☐ Between 50 to 100
- ☐ More than 100

8) How often do you discuss what to wear with your friends?

- ☐ All the time
- ☐ Most of the time
- ☐ Sometimes
- ☒ Never

9) How easy it is for you to choose an outfit?

- ☐ Very easy
- ☒ Easy
- ☐ Hard
- ☐ Very hard

10) How often do you use your computer?

- ☒ Every day
- ☐ Every week
- ☐ Sometimes
- ☐ Only when I have to check my mail

11) How often do you use social networking sites on the internet (Facebook, MSN messenger, etc)?

- ☐ Every day
- ☐ Every week
- ☒ Sometimes
- ☐ I hate social networking sites

12) If there is a social networking site which let you discuss what to wear with your friends (showing pictures of your clothes), do you think you would use it?

- ☐ Definitely
- ☐ Maybe
- ☐ I don't know
- ☒ No, never

13) If there is a program to help you find a suitable outfit, how likely is it that you would use it?

- ☒ Not at all
- ☐ Unlikely
- ☐ Very likely
- ☐ I don't know

14) Not at all

## Appendix N

Recommender

①

Name: Mona Height: 1.64 Size: 8-10 Hair colour: Brunette  
Skin colour: olive (white)

1) What type of jeans you normally wear?

- ✓ (1.1) Skinny ✓
- X 1.2 Boy friend X ←
- X 1.3 High wasted flare X ←

2) What type of tops you normally wear?

- ✓ 2.1 Blouse ✓
- ✓ 2.2 T-shirt 50% ✓
- X 2.3 Polo neck ✓

3) What type of trousers you normally wear?

- ✓ 3.1 The peg 50% ✓
- ✓ 3.2 The chino ✓
- ✓ 3.3 Capri pants 50% ✓
- ✓ 3.4 Straight ✓

4) What type of shoes you normally wear?

- ✓ 4.1 Flats ✓
- ✓ 4.2 High heels ✓
- X 4.3 Boots 50% ✓

5) What type of jacket you normally wear?

- X 5.1 The blazer 50% ←
- X 5.2 Military coat ✓
- ✓ 5.3 The statement coat 50% ✓

6) What type of dress you normally wear?

- ✓ 6.1 Shirt dress ✓
- ✓ 6.2 Maxi dress 50% ✓
- ✓ 6.3 Pencil skirt 50% ✓

②  
↓  
X

①  
↓  
50%

③  
↓  
✓



Name: Emy Height: 1.62 Size: 12 Hair colour: Ginger  
Skin colour: white

1) What type of jeans you normally wear?

- X 1.1 Skinny ✓
- ✓ 1.2 Boy friend 50% ←
- ✓ 1.3 High wasted flare 50% ✓

2) What type of tops you normally wear?

- ✓ 2.1 Blouse 50% ✓
- X 2.2 T-shirt X ✓
- ✓ 2.3 Polo neck 50% ←

3) What type of trousers you normally wear?

- X 3.1 The peg ✓
- X 3.2 The chino ✓
- ✓ 3.3 Capri pants 50% ✓
- ✓ 3.4 Straight ✓

4) What type of shoes you normally wear?

- ✓ 4.1 Flats 50% ✓
- ✓ 4.2 High heels ✓
- ✓ 4.3 Boots 50% ←

5) What type of jacket you normally wear?

- ✓ 5.1 The blazer 50% ✓
- X 5.2 Military coat ✓
- ✓ 5.3 The statement coat ✓

6) What type of dress you normally wear?

- X 6.1 Shirt dress ✓
- ✓ 6.2 Maxi dress 50% ✓
- X 6.3 Pencil skirt ✓

③  
50%  
③  
✓

## Appendix O

①	Female	24	Maral
persona 1	,	size 1	, $\Sigma$ , Normal
Recommender # 1			
WW:; Jean: skinny, straight - Tops: polo neck, blouse shoes: high heels, wedges			
WN:; Jeans: high waisted - Tops: short T-shirt, shoes: flat shoes.			
Recommender # 2			
WW: Black Bow dress, Black/white Bow dress, Black puff dress, lady dress, leather dress stripe dress, formal dress, dot dress, Black/white stripe dress, Bow puff dress, white puff dress, strapless dress, lousy dress			
WN: Maxi shape dress, Boyfriend style dress, Normal Maxi dress, long sleeve dress.			
Personal choice			
Black Bow dress, formal dress, lousy dress, stripe dress, Bow puff dress, Maxi dress, long sleeve dress.			
compare			
✓			
long sleeve dress, Maxi dress X			



⑤

F

22

Sayna petite

persona 2 , size 1 , 1 , petite

### Recommender # 1

wn; Jeans: skinny , high waisted , Tops: T-shirt,  
Shoes: high heels blouse

WN: Jeans: straight , Runner , Tops: boyfriend style  
Shoes: Mid heels , flat shoes . waist coat

### Recommender # 2

wn: puff dress, white Bow dress, Bow black dress,  
leather dress, stripe dress, formal dress, dot dress  
Black / white stripe dress, Black Bow dress ,  
lousy dress, strapless dress.

WN: Maxi shape dress, Maxi Normal dress,  
lousy dress , Boyfriend style dress .

### Personal choice

leather dress , Maxi dress, pencil skirt dress,  
white Bow dress, formal dress.

### Compare

✓

Maxi dress

X



## Appendix P

① Persona 1  
Female  
Sarah  
British  
Age  
16  
QUIS

Overall Reaction to the Website		1	2	3	4	5	6	7		NA
1. Overall, I am satisfied with how easy it is to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
2. It was simple to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
3. I can effectively complete my work using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
4. I am able to complete my work quickly using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
5. I am able to efficiently complete my work using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
6. I feel comfortable using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
7. It was easy to learn to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
8. I believe I became productive quickly using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
9. The website gives error messages that clearly tell me how to fix problems	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	N/A
10. Whenever I make a mistake using the website, I recover easily and quickly	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
11. The information (such as online help, on-page messages, and other documentation) provided with this website is clear	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
12. It is easy to find the information I need	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
13. The information provided by the website is easy to understand	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	strongly agree	<input type="radio"/>
14. The information is effective in helping me complete the tasks and scenarios	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
15. The organization of information on the website pages is clear	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	N/A
16. The interface of this website is pleasant	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
17. I like using the interface of this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
18. This website has all the functions and capabilities I expect it to have	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
19. Overall, I am satisfied with this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>

⑧

Persona 3

Indian

Female

Age: 17

Pooja

Overall Reaction to the Website	1	2	3	4	5	6	7	NA
1. Overall, I am satisfied with how easy it is to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/> strongly agree	<input type="radio"/>
2. It was simple to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	strongly agree	<input type="radio"/>
3. I can effectively complete my work using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
4. I am able to complete my work quickly using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
5. I am able to efficiently complete my work using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
6. I feel comfortable using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
7. It was easy to learn to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	strongly agree	<input type="radio"/>
8. I believe I became productive quickly using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
9. The website gives error messages that clearly tell me how to fix problems	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	N/A
10. Whenever I make a mistake using the website, I recover easily and quickly	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
11. The information (such as online help, on-page messages, and other documentation) provided with this website is clear	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
12. It is easy to find the information I need	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
13. The information provided by the website is easy to understand	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
14. The information is effective in helping me complete the tasks and scenarios	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
15. The organization of information on the website pages is clear	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	N/A
16. The interface of this website is pleasant	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
17. I like using the interface of this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
18. This website has all the functions and capabilities I expect it to have	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
19. Overall, I am satisfied with this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	strongly agree	<input type="radio"/>



⑨ Persona 7  
Female  
Martina

British  
Age: 25

Overall Reaction to the Website		1	2	3	4	5	6	7	NA
1. Overall, I am satisfied with how easy it is to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	strongly agree	<input type="radio"/>
2. It was simple to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
3. I can effectively complete my work using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
4. I am able to complete my work quickly using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
5. I am able to efficiently complete my work using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
6. I feel comfortable using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
7. It was easy to learn to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
8. I believe I became productive quickly using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
9. The website gives error messages that clearly tell me how to fix problems	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	N/A
10. Whenever I make a mistake using the website, I recover easily and quickly	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
11. The information (such as online help, on-page messages, and other documentation) provided with this website is clear	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
12. It is easy to find the information I need	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	strongly agree	<input type="radio"/>
13. The information provided by the website is easy to understand	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	strongly agree	<input type="radio"/>
14. The information is effective in helping me complete the tasks and scenarios	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
15. The organization of information on the website pages is clear	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	strongly agree	N/A
16. The interface of this website is pleasant	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
17. I like using the interface of this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	strongly agree	<input type="radio"/>
18. This website has all the functions and capabilities I expect it to have	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>
19. Overall, I am satisfied with this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	strongly agree	<input type="radio"/>

(12) Person 2  
Female  
Mandana

Iranian  
Age: 32

Overall Reaction to the Website		1	2	3	4	5	6	7	NA
1. Overall, I am satisfied with how easy it is to use this website	strongly disagree	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
2. It was simple to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
3. I can effectively complete my work using this website	strongly disagree	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
4. I am able to complete my work quickly using this website	strongly disagree	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
5. I am able to efficiently complete my work using this website	strongly disagree	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
6. I feel comfortable using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
7. It was easy to learn to use this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
8. I believe I became productive quickly using this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
9. The website gives error messages that clearly tell me how to fix problems	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	N/A
10. Whenever I make a mistake using the website, I recover easily and quickly	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
11. The information (such as online help, on-page messages, and other documentation) provided with this website is clear	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
12. It is easy to find the information I need	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
13. The information provided by the website is easy to understand	strongly disagree	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
14. The information is effective in helping me complete the tasks and scenarios	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
15. The organization of information on the website pages is clear	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	N/A
16. The interface of this website is pleasant	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
17. I like using the interface of this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
18. This website has all the functions and capabilities I expect it to have	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
19. Overall, I am satisfied with this website	strongly disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input checked="" type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

## Appendix Q

Q U E	#1 p1 F	#2 P3 F	#3 P2 M	#4 P2 M	#5 P7 M	#6 p1 F	#7 p1 F	#8 P3 F	#9 p7 F	#10 p2 M	#11 p7 M	#12 p2 F	#13 p7 M	#14 p3 F	#15 p1 F	#16 P7 M	#17 P2 F	#18 P3 F	#19 P7 M	#20 P2 M
<u>1</u>	6	4	4	5	5	2	7	7	6	7	6	2	6	6	6	7	7	7	6	7
<u>2</u>	6	3	4	6	6	3	6	6	5	6	7	3	7	7	6	5	6	7	7	6
<u>3</u>	4	3	4	5	5	3	7	4	5	6	5	2	6	6	6	6	5	4	6	5
<u>4</u>	3	4	4	4	4	2	4	4	3	4	4	2	4	4	4	4	4	4	4	4
<u>5</u>	4	5	3	4	4	3	5	4	3	5	5	2	4	5	5	6	4	5	4	4
<u>6</u>	7	4	4	5	6	4	7	5	4	4	6	3	5	5	7	7	4	5	5	4
<u>7</u>	6	4	3	6	5	3	7	6	5	5	6	5	5	4	6	5	6	5	7	6
<u>8</u>	4	4	3	4	3	2	4	4	5	4	4	3	4	4	4	4	4	4	4	4
<u>9</u>	N/ A	N/ A	N/ A	N/ A	N/ A	N/ A	N/ A	N/ A	N/ A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<u>10</u>	4	4	4	5	4	2	5	5	4	5	4	3	4	4	5	4	4	5	4	4
<u>11</u>	4	4	4	4	4	2	6	4	4	6	4	3	4	6	6	6	4	5	4	4
<u>12</u>	6	4	3	4	4	5	4	4	5	4	4	7	5	5	3	5	6	5	4	6
<u>13</u>	7	4	2	5	5	5	5	5	6	6	5	2	5	5	6	5	6	7	6	5
<u>14</u>	5	5	2	4	4	3	4	4	4	4	4	3	4	4	4	4	4	4	4	4
<u>15</u>	N/ A	N/ A	N/ A	N/ A	N/ A	N/ A	N/ A	N/ A	N/ A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
<u>16</u>	5	5	4	4	5	5	6	4	5	6	4	6	5	5	6	6	4	4	5	4
<u>17</u>	6	4	4	5	4	3	5	5	6	4	5	4	5	6	5	4	5	5	4	4

<u>18</u>	5	5	3	5	4	3	4	4	5	4	4	4	5	4	3	5	3	4	4	5
<u>19</u>	6	6	3	7	7	6	6	7	5	7	7	6	7	7	6	7	7	6	6	7

## Appendix R

QUE	1 1 F	6 1 F	7 1 F	15 1 F	MEAN_1 1 MEAN_1
<u>1</u>	6	2	7	6	5.25
<u>2</u>	6	3	6	6	5.25
<u>3</u>	4	3	7	6	5
<u>4</u>	3	2	4	4	3.25
<u>5</u>	4	3	5	5	4.25
<u>6</u>	7	4	7	7	6.25
<u>7</u>	6	3	7	6	5.5
<u>8</u>	4	2	4	4	3.5
<u>10</u>	4	2	5	5	4
<u>11</u>	4	2	6	6	4.5
<u>12</u>	6	5	4	3	4.5
<u>13</u>	7	5	5	6	5.75
<u>14</u>	5	3	4	4	4
<u>16</u>	5	5	6	6	5.5
<u>17</u>	6	3	5	5	4.75
<u>18</u>	5	3	4	3	3.75
<u>19</u>	6	6	6	6	6

4.76

	3 2 M	4 2 M	10 2 M	12 2 F	17 2 F	20 2 M	MEAN_2 2 MEAN_2
2.2	4	5	7	2	7	7	5.33
1.5	4	6	6	3	6	6	5.17
1.8	4	5	6	2	5	5	4.50
1.0	4	4	4	2	4	4	3.67

1.0	3	4	5	2	4	4	3.67
1.5	4	5	4	3	4	4	4.00
1.7	3	6	5	5	6	6	5.17
1.0	3	4	4	3	4	4	3.67
1.4	4	5	5	3	4	4	4.17
1.9	4	4	6	3	4	4	4.17
1.3	3	4	4	7	6	6	5.00
1.0	2	5	6	2	6	5	4.33
0.8	2	4	4	3	4	4	3.50
0.6	4	4	6	6	4	4	4.67
1.3	4	5	4	4	5	4	4.33
1.0	3	5	4	4	3	5	4.00
0.0	3	7	7	6	7	7	6.17

4.44

	<b>2</b>	<b>8</b>	<b>14</b>	<b>18</b>	<b>MEAN_3</b>
	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>
	<b>F</b>	<b>F</b>	<b>F</b>	<b>F</b>	<b>MEAN_3</b>
2.07	4	7	6	7	6
1.33	3	6	7	7	5.75
1.38	3	4	6	4	4.25
0.82	4	4	4	4	4
1.03	5	4	5	5	4.75
0.63	4	5	5	5	4.75
1.17	4	6	4	5	4.75
0.52	4	4	4	4	4
0.75	4	5	4	5	4.5
0.98	4	4	6	5	4.75
1.55	4	4	5	5	4.5
1.86	4	5	5	7	5.25
0.84	5	4	4	4	4.25
1.03	5	4	5	4	4.5
0.52	4	5	6	5	5
0.89	5	4	4	4	4.25
1.60	6	7	7	6	6.5



4.81

	<b>5</b>	<b>9</b>	<b>11</b>	<b>13</b>	<b>16</b>	<b>19</b>	MEAN_7	
	<b>7</b>	<b>7</b>	<b>7</b>	<b>7</b>	<b>7</b>	<b>7</b>	7	
	<b>M</b>	<b>F</b>	<b>M</b>	<b>M</b>	<b>M</b>	<b>M</b>	MEAN_7	
1.41	5	6	6	6	7	6	6.00	0.63
1.89	6	5	7	7	5	7	6.17	0.98
1.26	5	5	5	6	6	6	5.50	0.55
0.00	4	3	4	4	4	4	3.83	0.41
0.50	4	3	5	4	6	4	4.33	1.03
0.50	6	4	6	5	7	5	5.50	1.05
0.96	5	5	6	5	5	7	5.50	0.84
0.00	3	5	4	4	4	4	4.00	0.63
0.58	4	4	4	4	4	4	4.00	0.00
0.96	4	4	4	4	6	4	4.33	0.82
0.58	4	5	4	5	5	4	4.50	0.55
1.26	5	6	5	5	5	6	5.33	0.52
0.50	4	4	4	4	4	4	4.00	0.00
0.58	5	5	4	5	6	5	5.00	0.63
0.82	4	6	5	5	4	4	4.67	0.82
0.50	4	5	4	5	5	4	4.50	0.55
0.58	7	5	7	7	7	6	6.50	0.84

4.92



**Risk assessment** is considered as the initial and periodical step in a risk management process. Risk assessment is the determination of quantitative or qualitative value of risk related to a concrete situation and a recognized threat.

Risk assessment may be the most important step in the risk management process, and may also be the most difficult and prone to error. Once risks have been identified and assessed, the steps to properly deal with them are much more programmatically.

<b>Hazard</b>	<b>Activity</b>	<b>Consequences</b>	<b>Possibility</b>	<b>Identify the control measures</b>	<b>Identify action if incident occurs</b>
Data could be affected by viruses	Programming	Delay	High	Using anti viruses	Re-write the program
components out of stock, late, etc	Ordering	Delay	Medium	Try to find a same available component	Report to supervisor
Research in internet	University IT system falls over	Delay	Medium	The management should be change	Report to supervisor
Get sick	Illness	Lose power	Medium	Try to rest to get better soon and then work harder to get to schedule	Dived works to other weeks
Losing code in program	Programming	Delay	Low	Using correct programming language	Re-write code
Possibility of losing data base	Programming	Delay	High	Save information in different place	Writing data base again
Developing the wrong function properties	Programming	Delay	Low	Making a right decision at beginning	Try to find a problem and solve it